OBESITY EXPERTISE

A first-principles curriculum in 196 books

BOOK 7 8th of 196 in the series

Question selection and research strategy · Rung 1

Choosing what to study before you study it

THE RESEARCH QUESTION AS A DECISION, AND THE TEST OF WHO IS WAITING FOR ITS ANSWER

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Written for the author's own study, then shared. Drafted and checked with AI assistance (Claude, by Anthropic) under the author's direction. Every factual claim was checked against a source the checker had open, every quotation against its source text, and every worked answer recomputed. Mistakes can remain; the feedback page says how to report one.

NOT ADVICE

This book is for learning. It is not medical, legal or financial advice, and it does not replace a qualified professional who knows your situation.

About the author



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Harsh Maheshwari completed his MBBS at King George's Medical University (KGMU), Lucknow, and is a resident in MD Community Medicine at the All India Institute of Medical Sciences (AIIMS), Raipur. His MD thesis, on chrononutrition and obesity, was selected by the Indian Council of Medical Research (ICMR) for funding in 2026.

He learns best from first principles: rebuilding an idea from what came before it until the formula feels like the only reasonable answer. This series grew out of that habit.

His long-term aims are to reduce obesity in India and to help make India healthy.

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Introduction

Why this book exists

Most research questions are not chosen; they are inherited from a guide, a dataset that happened to be available, or the last paper someone read. The study that follows can be done well and still change nothing, because nobody was waiting for its answer. This book treats the question as the first and largest decision in a piece of research: how to state one precisely, how to tell a question that can be answered from one whose answer would change what someone does, and how to reject most of your own candidates on purpose. It ends with ten questions of your own, scored, and the reasons you set nine of them aside.

How to read it

Read Book 0's sections on evidence and study design first, or at least the ones this book names as it goes. Then read this one in order. The exercises are decisions, not sums: write the question, name who is waiting for it, and say what they would do differently. Do them as you go; the list of ten you build at the end is the point of the book.

Every section has the same shape. **Definition** states the idea exactly. **In plain terms** says it again in everyday words. **Illustration** works through one real case, usually with a source you can open yourself. **Where this picture breaks** says where the illustration stops being true. **Must-know points** are what should change what you do. Then come **exercises** and, in most sections, a graded **practice set**.

Do the exercises before you look anything up. The worked answers are in the appendix at the back, under the same numbers. The references for each Part follow that Part. The glossary lists every term of art in the plain words it was first given. The last pages list all 196 books in the series and show where this one sits.

If you are new to this

On a first reading, read each section's definition, plain-terms explanation, illustration and must-know points, and do the exercises. Worked derivations can be skimmed and revisited once the idea feels familiar. Keep a calculator beside you: every worked answer can be followed with pen, paper and a calculator. Anything beyond the stated prerequisites is explained where it first appears, or marked as beyond this book. The **Symbols used in this book** page lists every sign and Greek letter with how to read it and where it is first used.

How to send feedback

If something is wrong, unclear, or could be better, please write to **contact@drharshmaheshwari.com**. Put the book number, the version and the section in the subject line (for example: *Book 7, v1.0, section C5*). Say what the text says, what you think it should say, and, if you can, the source.

Corrections are made in new versions. The version number and the date of the last update are on the copyright page of every book, and the newest version of every book is at **drharshmaheshwari.com**.

> **WHERE THIS BOOK SITS**
> Book 7 of the series' 196 books (Book 0 and 195 rung books). Before it: Book 6, R, reproducibility engineering and data management · Rung 1. After it: Book 8, Teaching, mentorship and coalition building · Rung 1. The full list is at the back.

Symbols used in this book

Every sign and Greek letter this book prints, how to read it aloud, what it means in this series, and the section where it first appears. Each is also explained where it is first used.

Symbol	Read as	Meaning	First in
MARKS ON LETTERS			
x^2, 10^{-3}	superscript	Small raised characters are powers: x^2 = x × x, and 10^{-3} = 0.001	Before you start

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Before you start

This book uses the following Book 0 sections. Each is summarised where it is first needed; work through Book 0 itself if a summary is not enough.

- Book 0, A4 · Percentages, and the percentage of a percentage
- Book 0, B6 · Body-size units: kg, m, cm and kg/m^2
- Book 0, D1 · What a probability is
- Book 0, D5 · Average and spread, and why the average is not the person
- Book 0, D6 · Sampling: how a part can tell you about a whole
- Book 0, D7 · Random error and systematic error as different things
- Book 0, F3 · Checking a reference
- Book 0, F4 · Argument: premise, inference, conclusion

Rung 1 — Introductory

1 · A research question is a choice

DEFINITION. A research topic names an area of interest, such as obesity in adolescents. A research question is a sentence that asks one thing a study will find out about a topic. A study is built to answer one main question.

A research question is chosen when it is one of several candidates, set side by side, and the others are turned down.

The question is the first decision in a study. The methods that follow answer the question that was asked. None of them can turn it into a better question. [1, 2, 3, 4, 5, 6, 7, 8]

IN PLAIN TERMS. A topic is an area, like “obesity in school children”. A question asks one thing you will find out, like “What is the average measured waist of children aged 10 to 14 in one district’s government schools?” You cannot plan a study from a topic. You can plan one from a question, because the question tells you whom to find and what to measure.

The trouble starts when the first question to arrive is the one you keep, without setting it beside any other.

Choosing means this. You write down several candidates, put them side by side, and turn most of them down.

ILLUSTRATION. Here is the setting this book uses from start to finish. It is made up. You are a postgraduate student in community medicine at a medical college in Chhattisgarh. You must propose a first research question on obesity.

Suppose your guide says, in your first week, “Do something on obesity in school children.” You write that at the top of a page as your question.

Ask the page three things. Which children: what ages, which schools, where? What will you measure: weight, meals, games periods, screen time, or all of them? The page cannot answer any of them. “Obesity in school children” is a topic.

Now suppose, in the same made-up week, three more candidates reach you. Here are all four, each written as a question, with the route by which it arrived.

How it reached you	The candidate, written as a question
Your guide named a topic	What is the average measured waist of children aged 10 to 14 in government schools in Raipur district?
The department already holds weight and height records from last year's district screening camp	Among adults aged 30 and over screened at that camp, did those from the town have a higher average body mass index than those from villages?
The last paper you read ended with a line on future research into meal timing	Among students aged 18 to 25 at your college, do those who usually eat dinner late gain more weight over one year than those who eat early?
A senior told you to pick something you could finish quickly	What share of patients aged 30 and over at the district hospital's non-communicable disease (NCD) clinic know their own weight?

You chose none of the four. Each one arrived.

The fault would be to keep the first question that arrives, because it arrived first.

Put the four side by side. You do not yet have the tests that decide between them; the rest of this book builds them. Decide now that most of these will be turned down, and that you will write down the reason for each one.

WHERE THIS PICTURE BREAKS. The table sorts candidates by how they arrived. It says nothing about which one is best.

MUST KNOW POINTS FOR YOU.

- The error is to write a topic where the question should be. Refuse to plan a single step until you have a sentence that asks one thing.
- A question with no rivals has not been chosen.
- The future-research line at the end of a paper is a good place to find a candidate. It was written for the authors' own field and data, not for your district. Take it as one candidate among several, never as the choice already made.
- A careful sample and a correct analysis answer the question that was asked. If that question was the wrong one, the study is well done and still no use to anyone.
- When a trainee says "my guide gave me the topic", do not argue about the guide. Ask them to write three questions inside that topic and say which two they would drop, and why.
- Knowing how a question arrived tells you only whether it was compared with others. It does not tell you whether the question is good. An assigned or borrowed question can win a fair comparison. Judge it by the tests, not by where it came from.

EXERCISE 1 (critique). In a made-up department meeting, a senior colleague says: "Take the screening camp question. The data are already in the department, so it is a good question."

Lay the argument out as a premise and a conclusion. Then say where it fails, and what part of it survives.

EXERCISE 2 (design). Take the made-up topic "meal timing in college students", from the setting of this section. Write three different questions inside it, each asking one thing. For each, say which route might have brought it to you if you had not written it yourself.

EXERCISE 3 (teaching). A first-year resident has ten minutes and a whiteboard. They ask: "Why does it matter how I got my question, if I do the study properly?" Answer them.

2 · Population, exposure, outcome: a question in one sentence

DEFINITION. A research question can be written as one sentence with up to four parts.

The population is the group the answer is about. It is bounded by place, by person (an age band, and any other trait that decides who is in) and by time.

The exposure is what differs between the people being compared: something they have, do or meet. When a researcher or a programme gives it on purpose, as the thing being tested, it is called the intervention.

The comparison is the group, or the level of exposure, that the exposed group is set against.

The outcome is what is measured to answer the question. A question has one main outcome and at most one main exposure. “Risk factors” names many possible exposures, so it is not yet an exposure. [9, 10, 11, 12, 13, 14, 6, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24]

IN PLAIN TERMS. **Population** — who the answer is about.

Here the population needs a fence round it on three sides. Place: which district, which schools. Person: an age band, and anything else that decides who is in. Time: which year. “School children” has no fence. “Children aged 10 to 14 in government schools in Raipur district in the 2027–28 school year” has all three.

Exposure — what differs between the people you compare. It is something they have, do or meet: walking to school, a night shift, living near a sweet shop.

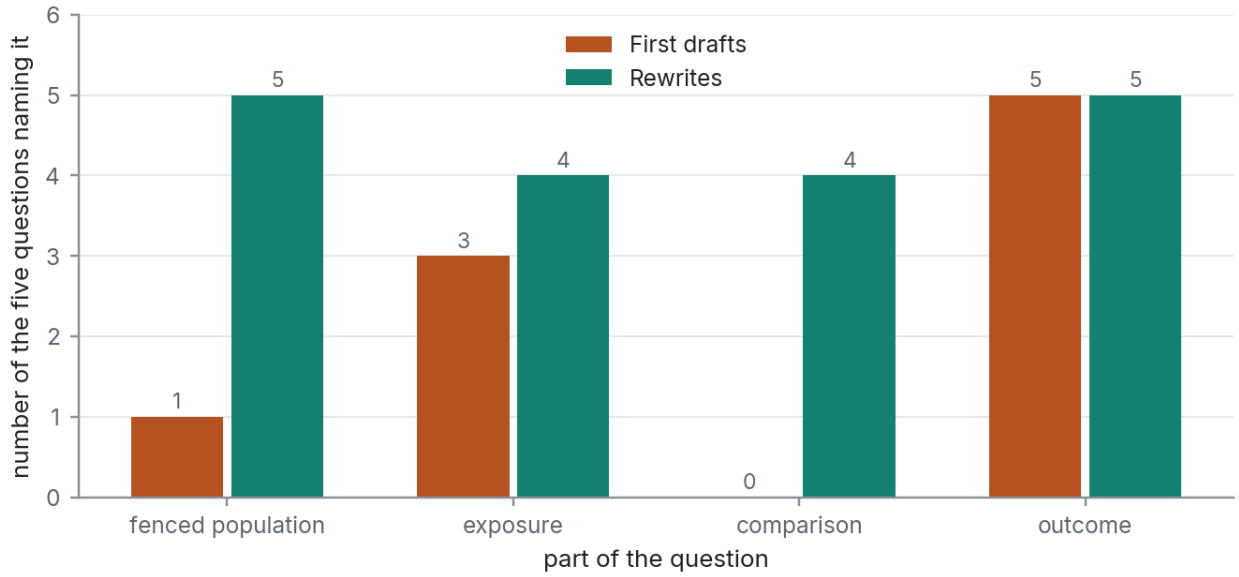
Comparison — the group you set the exposed group against. Children who walk to school are compared with children who are driven. Without a comparison, “children who walk have obesity less often” has nothing to be less often than.

Outcome — what you measure to answer the question. Obesity judged from measured weight and height is an outcome.

The set of four parts has two short names, made from their first letters. PICO is population, intervention, comparison, outcome. Use it when someone gives the thing being tested. PECO is population, exposure, comparison, outcome. Use it when people meet the exposure in their ordinary lives.

Not every question needs all four. “What share of these children have obesity?” has a population and an outcome, and nothing else. It asks how common something is.

Writing the question this way has a second use, later. When you search for what others have already found, you build the search from these same parts. How to search properly is taught in the next level of this subject.



The five made-up first drafts and their rewrites in the second illustration, counted by which part each names. All five drafts name an outcome, but only 1 fences its population and none names a comparison. After rewriting, all 5 fence the population and 4 name an exposure and a comparison; rewrite 1 has neither, because it is a how-common question.

Illustration 1. Start with a first draft that fails. Suppose your guide names the topic "obesity in school children", and you write this at the top of your made-up protocol, the written plan of a study drawn up before it starts:

"To study obesity and its risk factors among school children."

Try to find the four parts in it.

The population is "school children". Which place? Which ages? Which year? It does not say.

The exposure is "risk factors". Name one. The sentence does not.

There is no comparison, because there is no exposure to compare.

The outcome is "obesity". That part is there, because the topic was obesity. But the draft does not say how obesity will be judged.

Now rebuild it one part at a time.

Part	First draft	Rewrite
population	school children	children aged 10 to 14 in government schools in Raipur district, in the 2027–28 school year
exposure	risk factors	walking or cycling to school
comparison	none	coming to school by bus or motor vehicle
outcome	obesity	obesity, judged from measured weight and height

Put the rewrite together as one sentence:

"Among children aged 10 to 14 in government schools in Raipur district in the 2027–28 school year, do those who walk or cycle to school, compared with those who come by bus or motor vehicle, have obesity less often, judged from measured weight and height?"

Read the sentence and check that you can plan from it. You know which schools to visit, which children to include and in which year. You know the one thing to ask each child about, and the two groups it makes. You know what to measure.

Now notice two things about it.

Walking to school is something the children do. Nobody in the study gives it to them. So this is a PECO question. Suppose instead the schools started a walking programme and you asked whether it changed how many children had obesity. The programme would be given on purpose. It would be an intervention, and the question would be PICO.

Take out the exposure and the comparison, and the sentence still works: "What share of children aged 10 to 14 in government schools in Raipur district, in the 2027–28 school year, have obesity, judged from measured weight and height?" That is a how-common question. It is a smaller question than the first, and a complete one.

WHERE THIS PICTURE BREAKS. The rewrite is one choice among many. "Risk factors" could have become screen time, sleep or meals, and each would be a different question. The one-sentence form shows that you picked one. It does not show that you picked the right one.

"Judged from measured weight and height" is still a placeholder. A real protocol must say how it defines obesity in children, and where that definition comes from. This section does not teach that. The subject on obesity in children, adolescents and pregnancy does.

Illustration 2. Now run the check on a whole set. Here are five first drafts, made up, of the kind a batch of postgraduates might bring to a department meeting. Each one is marked for whether it names each part clearly.

No.	First draft	Fenced population	Exposure or intervention	Comparison	Outcome
1	To study obesity among school children.	no	no	no	yes
2	Prevalence and risk factors of obesity in urban slums.	no	no	no	yes
3	Effect of mobile phone use on obesity in college students.	no	yes	no	yes
4	Does eating dinner late cause weight gain?	no	yes	no	yes
5	Role of text-message reminders in follow-up of adults aged 30 to 60 at the district hospital's non-communicable disease (NCD) clinic, 2027.	yes	yes	no	yes

Draft 5 marks "yes" for its outcome, but loosely. "Follow-up" could mean coming to the next visit, or still coming after a year. The rewrite has to pick one.

Here are the same five, rewritten.

No.	Rewrite	Fenced population	Exposure or intervention	Comparison	Outcome
1	What share of children aged 10 to 14 in government schools in Raipur district, in the 2027–28 school year, have obesity, judged from measured weight and height?	yes	no	no	yes
2	Among women aged 20 to 45 in slum households in Bilaspur city in 2027, do those who work outside the home, compared with those who do not, have obesity less often?	yes	yes	yes	yes
3	Among first-year students aged 17 to 20 at one medical college in Chhattisgarh in 2027, do those who spend more than 3 hours a day on a phone screen, compared with those who spend less than 1 hour, have obesity more often?	yes	yes	yes	yes
4	Among students aged 18 to 22 at one medical college in Chhattisgarh in 2027, do those who usually eat dinner after 10 pm, compared with those who eat before 8 pm, gain more weight, in kilograms, over one academic year?	yes	yes	yes	yes
5	Among adults aged 30 to 60 with obesity attending the NCD clinic of the district hospital in Durg between January and June 2027, does a text-message reminder the day before each visit, compared with no reminder, raise the share who come to their next visit?	yes	yes	yes	yes

Rewrite 1 has no exposure on purpose. It is a how-common question, and that is allowed. Rewrite 2 had to drop “risk factors” and pick one. Rewrite 4 dropped the word “cause”: it asks whether the two groups differ, which is a smaller claim. Rewrite 5 is the only PICO question of the five, because the clinic sends the reminder on purpose.

Count each part down the columns of both tables. There are five drafts. In the count, an intervention is counted under exposure.

Part	First drafts	Rewrites
fenced population	1	5
exposure	3	4
comparison	0	4
outcome	5	5

Every one of the five drafts named its outcome, and only one fenced its population. That fits what you saw in the first draft above: the topic word, obesity, lands in the outcome slot by itself. The fence and the comparison are the parts you have to go looking for.

WHERE THIS PICTURE BREAKS. The five drafts are made up, and the counts describe only them. They are not a finding about how people write questions. What carries over is the check, not the numbers.

A “yes” in a column means the part is named. It does not mean the part is well chosen. Rewrite 3’s cut-offs of 3 hours and 1 hour are the drafter’s choice, and another drafter could defend different ones.

MUST KNOW POINTS FOR YOU.

- The error is to think "school children" is a population. A population has a fence of place, person and time. Refuse to plan a sample until the sentence names all three.
- Write the question as one sentence, then label its population, exposure or intervention, comparison and outcome. If you cannot label a part, the question does not have it.
- Obesity can be the exposure or the outcome. "Do adults with obesity miss more clinic visits?" has obesity as the exposure.
- A question with two outcomes is two questions. Split it, and keep the one you would choose if you could only have one.
- Morgan and colleagues report, from a 2009 review they cite, that over half (54%) of 313 research studies did not report on the four PICO parts. This course has not read that review. So when you read a paper, find its population, exposure, comparison and outcome yourself. Do this before you accept what it says it answered.
- A trainee brings a title like "Prevalence and risk factors of obesity in urban slums". Ask them to read out their one outcome and their one exposure. When they list several risk factors, ask which one they would keep if they could only keep one.
- The four-part check tells you a question is complete and asks one thing. A perfectly formed sentence can still be the wrong question to ask.

EXERCISE 1 (design). Go back to the four made-up candidates in the last section's table. They were about the Raipur schools, the district screening camp, meal timing at your college, and whether clinic patients know their own weight. Rewrite each as one sentence with its population fenced by place, person and time. Label the population, exposure or intervention, comparison and outcome in each. Say which are how-common questions.

EXERCISE 2 (teaching). A first-year resident has ten minutes and a whiteboard. Their draft title is "Risk factors of obesity among college students". Teach them why "risk factors" is not an exposure, and help them rewrite the title as one question.

PRACTICE. Ten problems on this technique, easiest first. Work them on paper before turning to the answers, which are in the appendix at the back under this section's name.

1. Label the population, the exposure, the comparison and the outcome in this question.

Among adults aged 40 to 60 living in one town in 2025, do those who work night shifts, compared with those who work day shifts, have a higher average weight?

2. Label the parts of each question. Say where a part is missing.

1. Among children aged 6 to 10 in the schools of one block in 2026, what share have obesity?
2. Among patients aged 30 to 60 at one clinic in 2026, does a weekly phone call from a nurse, compared with no call, raise the share who come to their next visit?
3. Do people who sleep less weigh more?

3. Label the parts of this question.

Is the weight gained over one year by first-year students aged 17 to 20 of one college in 2027 greater among those living in the hostel than among those living at home?

4. Take the made-up topic "obesity in school children in Raipur", from this book's setting. Write a one-sentence how-common question on it. Fence the population by place, person and time, and say how the outcome is judged. Label the parts.

5. Take the made-up topic "what school children eat at lunch", from this book's setting. Write a one-sentence PECO question on it, with a comparison. Label the parts.

6. A made-up report on the district screening camp ends with this sentence:

"Adults who lived within 2 km of the camp site came back for a second check more often than adults who lived further away."

Write the one-sentence question this sentence answers. Label its parts. Say which part the report leaves unfenced.

7. Here is a worked answer. Find what broke.

```
question: Among adults aged 30 to 60 attending the district hospital's NCD clinic in
2026, do those with obesity, compared with those without, miss more follow-up vis-
its?
population: adults aged 30 to 60 attending the NCD clinic in 2026
exposure: missing follow-up visits
comparison: adults without obesity
outcome: obesity
```

8. Here is a worked answer. Find the steps that broke.

```
question: Among school children in Chhattisgarh, does a daily games period, compared
with none, reduce obesity and raise exam marks?
population: school children in Chhattisgarh
intervention: a daily games period
comparison: no games period
outcome: obesity and exam marks
verdict: all four parts are present, so the question is ready
```

9. A line from a made-up draft protocol reads:

"The study will assess the nutritional status of adolescents and its determinants in the district."

Turn it into one question in one sentence. Then say what your question still cannot answer.

10. In a made-up meeting, the district NCD programme officer says:

"We need to know whether the screening camps are working."

Turn this into one question in one sentence. Then say what your question still cannot answer.

3 · Three kinds of question, and the study each needs

DEFINITION. A research question is one of three kinds, and its kind decides which study can answer it.

A describe question asks how common an outcome is, or how much of it there is, in a stated population at a stated place and time, and in which people it is commoner. It is what the last section called a how-common question. It names no exposure. Counting the outcome by age, sex or place is still describing. A trait becomes an exposure when the question sets two groups side by side to ask whether the trait goes with the outcome.

A relate question asks whether an exposure is associated with an outcome.

A cause question asks whether changing the exposure would change the outcome. An association is needed for this and is not enough.

A cross-sectional study enrols a sample of a population and measures exposure and outcome at the same time. It answers a describe question. For a relate question it can show an association, but it usually cannot show which of the two came first.

Studies built to answer relate questions have a comparison group.

In a randomised controlled trial the investigator sets the exposure, and chance decides who receives it. This is the design that answers a cause question directly, wherever the exposure can be assigned. [25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40]

IN PLAIN TERMS. There are three kinds.

The question asks	Kind	The study that answers it
How common is it, and in whom?	describe	a cross-sectional study: one visit, one count
Do people with the exposure have the outcome more often?	relate	a cohort study or a case-control study
If we change the exposure, does the outcome change?	cause	a randomised controlled trial

A describe question has no exposure. You answer it with a cross-sectional study. You take a sample, visit once, and count. The answer is a share: of the people in the group, how many have the condition at that time. That share is the prevalence.

A relate question asks whether an exposure and an outcome go together. To see that, you need a comparison group: people without the exposure, or without the outcome.

- A cohort study starts from the exposure. You start with people who do not yet have the outcome. You record who is exposed and who is not. You follow both groups over time and count who develops the outcome.

- A case-control study starts from the outcome. You enrol people who have it (cases) and people who do not (controls). Then you compare what each group was exposed to in the past.

In both, you watch the exposure happen. You do not decide it.

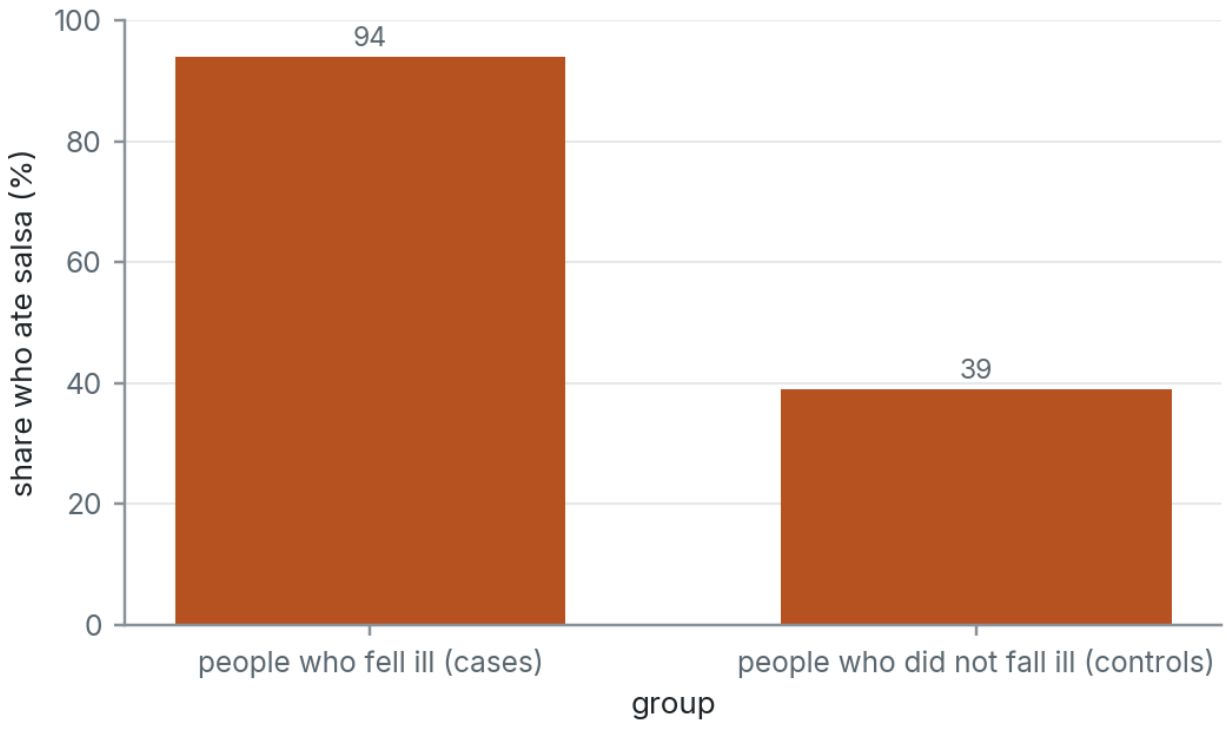
A cause question asks for more than going together. Two more things must hold. The exposure must come first. And no third thing may be moving both.

A randomised controlled trial is a way to test a treatment in which chance decides who gets it, and then the groups are compared. Chance does the deciding, not anything about the people. So no third thing can decide who is exposed.

Now the weak spot of the one-visit study. It measures the exposure and the outcome on the same day. So it can find that they go together. It usually cannot tell you which came first. The exception is an exposure fixed long before, such as sex.

Surveying more people does not repair this. Ten times the sample, measured on one day, is still silent about which came first.

A systematic review is a study of studies. It collects and combines the results of the studies already done on one question, in a planned and careful way. Because it pools studies, it answers the same kind of question as the studies it pools.



The hepatitis A outbreak in Pennsylvania, 2003, from the textbook of the Centers for Disease Control and Prevention (CDC): the share who ate salsa among people who fell ill (cases) and among people who ate at the same restaurant and did not fall ill (controls). The cases' 94% alone could mean only that salsa was popular; the controls' 39% is what shows that salsa went with falling ill.

Illustration 1. Suppose your first idea, made up for this section, is about college students' meal timing. You plan a survey of first-year students at your own medical college. On one day you

weigh and measure each student, and you ask what time they usually eat dinner. You hope to learn whether late dinners go with obesity.

Now suppose the made-up result comes back the other way round. Students with obesity more often say they eat dinner early.

Stop before you write “early dinner leads to obesity”. Ask which came first. You measured the dinner time and the weight on the same day. A student told by a doctor last year that her weight was high may have moved her dinner earlier since. Then the weight came first, and it changed the dinner time. Your survey cannot tell.

Next ask whether a third thing sits behind both. Students in the hostel eat when the mess serves. Students living at home eat when the family eats. Where a student lives could shape both dinner time and weight. Then the two would go together without either one moving the other.

Neither story is a fact about your college. Both are possible, and a one-day survey rules out neither.

Now the fix. Decide which question you meant, write it as one sentence, and let it choose the design. Here are three made-up versions.

Question	Kind	Study that answers it	What it still cannot tell you
What share of first-year students at this college eat dinner after 10 pm, in the first term of 2027?	describe	a cross-sectional study of a random sample of first-year students, on one visit	whether eating late matters for weight
Do first-year students who eat dinner after 10 pm gain more weight over their first year than those who eat before 8 pm?	relate	a cohort study: record dinner time and weight at the start of the year, and weigh the same students at the end	whether a third thing, such as where they live, explains the difference
Among first-year students, does eating dinner before 8 pm, compared with after 10 pm, change weight gain over one year?	cause	a randomised controlled trial: chance decides which students are asked to eat early	whether students outside a trial would keep to the change

Look at the first row. For a describe question, the one-day survey is exactly the right tool. Its weakness was never a weakness for this question.

Look at the second row. The cohort study records dinner time before it measures weight gain. So it settles which came first. It does not settle the third thing.

Look at the third row. Chance decides who is asked to eat early. So where a student lives cannot decide it. That is what the trial gives you and the cohort cannot.

WHERE THIS PICTURE BREAKS. The survey result is made up, and so is each story about it. They show what a one-day survey cannot rule out, not what is true at any college.

Chance removes the third thing only on average. In a small trial, bad luck can still put more hostel students in one group. This is the sampling variation of Book 0, and it shrinks as the groups grow.

Real questions often mix the kinds. “Which students eat late, and does it matter?” is a describe question and a relate question in one sentence. Split it, and give each half its own design.

A trial also needs the exposure to be something you can assign. You can ask a student to eat dinner early. You cannot assign a family’s income or a child’s age. For those, the cause question has to be argued from relate studies, with time order and third things dealt with in the argument.

Illustration 2. Here is a real case-control study, told in the CDC’s textbook Principles of Epidemiology in Public Health Practice. In 2003 there was a large outbreak of hepatitis A, an infection, in Pennsylvania. Almost all the people who fell ill had eaten at one restaurant. So the question was a relate question: which food on the menu goes with falling ill?

Start with what the investigators tried first. They asked the people who fell ill what they had eaten. The textbook says this showed only which foods were popular. The ill and the well both eat the popular dishes.

So they added a comparison group. They also interviewed people who ate at the same restaurant in the same weeks and did not fall ill. Those are the controls. Now compare past exposures between the two groups.

Group	Share who ate salsa
people who fell ill (cases)	94%
people who did not fall ill (controls)	39%

Of 133 items on the menu, this was the most striking difference. Further work on the salsa’s ingredients pointed to green onions.

Notice the direction. A case-control study starts from the outcome and looks back at exposures. The people who fell ill already existed. Nobody had to wait for anyone to fall ill.

Figures quoted in this illustration are from [41].

WHERE THIS PICTURE BREAKS. The 94% and 39% belong to this one outbreak, and to one meal eaten a few weeks earlier. They say nothing about salsa anywhere else.

Obesity questions look back much further. People asked what they ate over many years may remember differently depending on whether they have the outcome. The shorter and sharper the exposure, the better looking back works.

MUST KNOW POINTS FOR YOU.

- The error is to call a cross-sectional survey a weak study. It is weak for relate and cause questions. Judge a design against the question it was asked to answer.
- Write the question before you choose the design, then read its verb. If the question and the design you planned do not match, change one of them, and say which.
- When a one-visit survey is reported with the words “leads to”, “causes” or “effect of”, do not repeat them. Ask which came first.
- If the question needs time order, change the design, not the sample size.

- Matching the design to the question tells you what a study could answer. It does not tell you whether this study was done well.
- In a committee, say which kind of evidence you have before anyone decides.
- When a trainee proposes a trial for a describe question, ask them what chance would decide. If nothing is being assigned, there is nothing for chance to do, and the question needs a count.

EXERCISE 1 (design). Here are five made-up questions from the running setting. For each, say whether it is a describe, relate or cause question, and name the study that answers it.

1. What share of adults aged 30 and over screened at the district screening camp in 2027 had obesity, as the camp protocol defines it?
2. In two government schools in Raipur city, are children aged 10 to 14 who play a sport after school less likely to develop obesity over two years?
3. Does a weekly class on cooking with less oil, given to one adult in each household, change the weight of the adults in urban slum households over one year?
4. Were adults aged 30 to 60 at the non-communicable disease (NCD) clinic in 2027 with obesity, as the clinic protocol defines it, more likely than those without it to have worked night shifts in the past ten years?
5. In which age groups of women aged 18 and over attending the NCD clinic in 2027 is obesity, as the clinic protocol defines it, commonest?

EXERCISE 2 (critique). A made-up poster at a college research day reads:

"We surveyed 400 first-year students on one day. Students who slept less than six hours had obesity more often. Conclusion: short sleep causes obesity in medical students, and hostels should enforce a lights-out time."

Lay out what the study could and could not show. Then rewrite the conclusion so that it claims only what the study showed.

EXERCISE 3 (teaching). A journalist has three minutes. Their press release, made up for this exercise, says "Survey finds late dinners linked to obesity in college students". They ask whether they can write "late dinners cause obesity". Answer without jargon, and give one sentence they could quote.

4 · A question you can answer

DEFINITION. A research question is answerable when it passes two tests.

The first test is that it is an empirical question: one that can be answered by observing the world. A value question asks what ought to be done, and people answer it from their values.

The second test is that the question is feasible: the person asking can actually get the answer with what they have.

FINER is one published checklist for a research question: feasible, interesting, novel, ethical and relevant. Aslam and Emmanuel (2010) credit it to Hulley and colleagues. Whether an answer would change anything is taken up in section 5; who is waiting for it, in section 7. [42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57]

IN PLAIN TERMS. Before you keep a question, put it through two tests.

Test 1: can the world answer it? An empirical question is one that observing the world can answer. How many children buy snacks at the school gate is empirical. Whether snacks should be banned at the school gate is not. That second one is a value question — a question about what ought to be done, which people answer from their values. Blackstone's textbook calls it an ethical question.

It usually has empirical questions inside it. The decision itself still belongs to whoever has to make it.

Test 2: can you get the answer? A feasible question is one that you, with what you have, can actually answer. Go down this list and, for each line, write what you actually have.

- People you can reach, in enough number. How many is enough is a question of sample size. Book 0, D6 showed why more people give a narrower answer.
- A way to measure the exposure, if the question has one.
- A way to measure the outcome.
- Time.
- Money.
- Equipment, and the skill to use it.
- Approval from an ethics committee. That is a group of people at a hospital, college or research body. It reads a researcher's plan before any research starts, and can say yes, no, or change this first.

A line with nothing written beside it is a fail.

Then check the size. A question can pass both tests and still be too broad. "What causes obesity in children in Chhattisgarh?" is empirical. Nobody could answer it in one study. So you narrow

it. You give the population a boundary you can reach, pick one exposure, and name one outcome.

Watch what narrowing does to the kind of question. Cutting "what causes" down to "is this one thing associated with" turns a cause question into a relate question. That can be the right move. But the study now answers the relate question, and your report must not claim more than that.

Illustration 1. Suppose, in a made-up department meeting, the district non-communicable disease (NCD) programme officer says: "Someone should find out whether we ought to ban packaged snacks outside government schools." You write down your first candidate.

Should packaged snacks be sold outside government schools in Raipur district?

Put it through test 1. Ask what measurement could answer it. Weigh every child, count every packet, and you still have not answered "should". The answer depends on what people value: children's health, the vendors' earnings, the families' choice. It is a value question.

Do not throw it away. Ask what the officer would need to know before deciding. Here are three made-up empirical questions that sit inside it, with the kind of each.

Empirical question	Kind
What share of children in classes 6 to 8 in government schools in Raipur district buy packaged snacks outside school on most school days?	describe
Among those children, is buying packaged snacks on most school days associated with having obesity?	relate
What share of their parents would support stopping snack sales outside the school?	describe

Each of these can be answered by observing. None of them decides the ban. The decision stays with the officer, and with the people whose values it touches.

WHERE THIS PICTURE BREAKS. Some questions look empirical and hide a value inside. "Is the ban working?" sounds like a question about the world. But "working" has to be given an outcome first: fewer packets sold, lower weight gain, or no fall in vendors' earnings. Choosing that outcome is itself a value choice. Write the outcome into the question, and the hidden value becomes visible.

The three rewrites are illustrations, not a plan. Whether any of them is worth asking is a separate matter from whether it can be answered.

Illustration 2. Now a question that passes test 1 and is far too big. Suppose your guide's first suggestion, made up for this section, is this.

What causes obesity in school children in Chhattisgarh?

It is empirical. Nobody could answer it in one study. Narrow it one step at a time, and note what each step changed.

Step	The question	What changed
0	What causes obesity in school children in Chhattisgarh?	nothing yet

Step	The question	What changed
1	What causes obesity in children in classes 6 to 8 in government schools in Raipur district?	the population has a boundary of place and age
2	Is buying packaged snacks outside school associated with obesity in children in classes 6 to 8 in government schools in Raipur district?	one exposure; the kind changed from cause to relate
3	In 2027, among children in classes 6 to 8 in the four government schools of one Raipur ward, is buying packaged snacks outside school on most school days associated with obesity?	a population you can reach, a time, and an exposure stated precisely enough to measure

Step 2 is the one to watch. The question stopped asking what causes obesity. It now asks whether one thing goes with it. Your report will have to say so.

Now run test 2 on step 3. For each line, write what you have. What follows is made up.

Line	What you have
People you can reach	the four schools of the ward your department already visits for field training; the head teachers have not yet been asked
A way to measure the outcome	weight and height, and a stated rule for deciding which children have obesity
A way to measure the exposure	nothing yet: no tested set of questions about snack buying for children of this age
Time	the months your guide has set aside for fieldwork
Money	travel within one ward, which the department can cover
Equipment, and the skill to use it	a weighing scale and a height rod in the department; you have not yet weighed and measured children, so you need one training session with the department's staff
Ethics committee approval	not yet applied for; Blackstone's textbook notes that minors need a guardian's consent to take part, so the plan must say how parents will be asked

Two lines are not yet passes. The exposure has no way to be measured, and the head teachers have not agreed. Neither kills the question. Each is a task you can now name: write and try out a few questions on snack buying, and ask the head teachers.

WHERE THIS PICTURE BREAKS. The schools, the ward and the department's equipment are made up. The steps show how to narrow, not which narrowing is right for your college.

Narrowing buys an answer at the price of reach. An answer from four schools in one ward speaks for those four schools. Book 0's section on sampling showed why: it cannot stand for the district unless the schools were picked to stand for it.

A list written at a desk can still fail in the field. Ratan and colleagues warn that a question can look feasible and prove otherwise once fieldwork starts. Aslam and Emmanuel suggest a pilot: a small try-out of the hardest line before the main study. It is how you find out first.

MUST KNOW POINTS FOR YOU.

- The error is to keep a "should" question because it feels important. Find the empirical questions inside it, and leave the decision with the person who has to make it.
- Run the feasibility list in writing. A line you can only fill with "should be possible" is a fail until you have asked.
- When you shrink what you can reach, shrink the population in the question too.
- When narrowing turns a cause question into a relate question, say so in the protocol.
- Before the main study, run a pilot: a small try-out of the hardest line, usually the measurement.
- Passing both tests shows only that you can get an answer. It says nothing about whether anyone needs that answer.
- When a trainee cites FINER as if it settles a question, correct two things. It is a published guide, not a rule. And its E means a study a committee would approve, not a question about values.

EXERCISE 1 (critique). Here are four made-up candidate questions from the running setting. For each, say whether it is empirical or a value question. Rewrite each value question as one empirical question.

1. Ought the NCD clinic to weigh every patient at every visit?
2. What share of households in one urban slum of Raipur city cook with more than one litre of oil a week per person?
3. Is it right for colleges to set dinner times in hostel messes?
4. Do adults screened at the district screening camp who are told they have obesity return for a follow-up visit more often than adults who are not told?

EXERCISE 2 (design). Your guide proposes this made-up question: "What is the relationship between diet, physical activity, sleep, screen time and obesity among college students in Chhattisgarh?"

Say what makes it too broad. Then narrow it to one question, in one sentence, that you could answer at your own college. Name one line of the feasibility list you would still have to check.

EXERCISE 3 (teaching). The state health secretary writes to you: "Can your study tell us whether to stop snack sales outside government schools?" Reply in one page, answer first, no methods section.

5 · A question whose answer would change something

DEFINITION. A research question can be answerable and still not be worth answering. Worth answering is a separate judgement, and it rests on three tests.

First, the answer is in doubt: there are reasons to expect more than one answer before any data are collected. Second, the answer is not already known: nobody has answered the question well for the people, place and time you mean. Third, the answer has practical consequences: at least one possible answer would lead someone to decide or act differently from another possible answer. [58, 59, 60, 61, 62, 63, 4, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75]

IN PLAIN TERMS. So a question you can answer faces three more tests before you keep it.

1. **Is the answer in doubt?** Write down two different answers you might get, with a reason to expect each.
2. **Is it already answered?** Look for studies and reviews that have asked it for your people, place and time, and for counts that someone already holds.
3. **Would the answer change anything?** Write each possible answer on its own line. Beside each, write what someone would decide or do if that answer came back. If every line says the same thing, the answer changes nothing. You will learn to name that someone in section 7.

A question that passes all three is worth answering. One that fails any of them is not, as it stands. Often it can be changed until it passes.

Illustration 1. Here is the setting for this book again. You are a postgraduate in community medicine at a medical college in Chhattisgarh, and you must propose a first research question on obesity. Everything in this example is made up, including what the programme officer tells you.

Suppose your guide suggests this: “Find out how common obesity is among children in classes 6 to 8 in the government schools of the district.” Run the three tests on it.

Test one: is the answer in doubt? Try to write two different answers, each with a reason. Suppose a teacher tells you that most children walk a long way to school: a reason to expect a low share. Suppose another tells you that fried snacks are sold at every school gate: a reason to expect a higher one. Both reasons are made up for this example. You have a reason for each answer, so it passes.

Test two: is it already answered? Before you plan anything, go and look. Search for existing studies and reviews on children in the district. Then ask the district non-communicable disease (NCD) programme officer what the district already holds. Suppose the officer tells you that a school health team weighed and measured every child in those classes last year, and the counts are in the office.

Now your survey would count again what has just been counted. The question fails test two. Ioannidis lists eight features that, he argues, define useful clinical research. The second, context

placement, asks whether earlier evidence has been systematically assessed before a new study. Looking before you plan is that step. He asks for it to be done systematically.

Do not drop the topic yet. Jhangiani and colleagues advise refining a question that has been studied, not giving it up. Ask what the existing counts cannot tell you. They tell you which children the screening found to have obesity. They do not tell you what happened to those children next. That gives you a new candidate, written as one sentence:

"Among children in classes 6 to 8 found to have obesity, as the protocol of last year's school screening in the district defined it, what share were seen again by a health worker within six months?"

Run the tests again.

- **In doubt?** Here is a reason to expect a low share: nobody may have been told to follow the children up. Here is a reason to expect a high one: the screening team may have been told to refer every child it found. You have reasons for two answers, so it passes.
- **Already answered?** The screening counts record who was found, not who was seen again. Suppose the officer confirms that nobody has traced the children. It passes, for this district.
- **Would the answer change anything?** Write the two lines.

If the answer is	What could follow
most children were seen again	the referral step is left alone, and effort goes elsewhere
few children were seen again	the officer has a reason to change the referral step

The two lines differ, so the answer can change something. Notice too that the study is useful whichever answer comes back. Neither answer is the "good" result you would be tempted to find.

Last, ask his third feature, information gain: is the study large enough to inform? If the screening found only a handful of children, your share will rest on a handful of children. Ask whether that is enough for anyone to act on before you commit to it.

WHERE THIS PICTURE BREAKS. The officer, the screening and its records are made up to show the tests working. In a real district, "already counted" has to be checked, not taken on trust. Were all the schools covered? How were the children weighed? Can you actually get the counts? A record that exists but that you cannot open has answered nothing for you.

The third test here only shows that the two answers point to different actions. Whether the officer can in fact change the referral step, and would, is a separate question you still have to ask.

Illustration 2. Answerable and worth answering are two separate judgements, so a question can land in any of four places. Here are four made-up questions from the same setting. Before you look at the table, decide for each one: can you answer it, and is it worth answering?

- Q1. Among patients at the district hospital's NCD clinic, do those who wait longer in the queue spend longer at the clinic that day?
- Q2. The follow-up question from the example above.

- Q3. Would a state-wide tax on sugary drinks change how many children in Chhattisgarh develop obesity over ten years?
- Q4. What did students at your college eat for dinner on one evening in 1995?

Question	Answerable by you?	Worth answering?	Why
Q1	yes	no	the answer is fixed before you start: waiting is part of the time spent at the clinic, so it fails test one
Q2	yes	yes	it passes all three tests
Q3	no	yes	the answer is in doubt and would change policy, but a postgraduate cannot run the study
Q4	no	no	no record exists to answer it, and no answer would change anything now

The cell that catches people is Q1's. It is easy, cheap and quick, and it will produce a number and a table. It fails only the test you did not think to run.

Q3 is a different trap. It is worth answering, and that makes it tempting to propose. But being worth answering does not make it answerable by you.

WHERE THIS PICTURE BREAKS. The cells are not fixed. Q3 is out of your reach, but a state department with money and years might answer it. Q1 is circular in a way that shows at once. In a real proposal, the circle is usually hidden in how the groups were defined, and it takes a careful read to see it.

MUST KNOW POINTS FOR YOU.

- The error is to treat a question you can answer as a question worth answering. Run the three tests on every candidate you can answer before you keep it.
- Before you keep a candidate, write down two answers you might get, with a reason for each.
- Look for an existing answer before you plan a study, not after. Ask the programme what it already counts, and look for reviews that have gathered earlier studies.
- "It has been studied already" does not end a question, and "it has not been studied here" does not save one. Refine a studied question only where you have a reason to expect a different answer for your people or your place.
- Design the study so that it is useful whichever answer comes back.
- These tests judge a question on the day you run them. Run the tests again before each big step, such as writing the protocol or starting to collect data.

EXERCISE 1 (design). Here are three made-up candidate questions from your setting. For each, run the three tests: is the answer in doubt, is it already answered, would the answer change any-

thing? Say whether you would keep it, change it, or drop it, and why. Where you would change it, write the new question as one sentence.

1. Among first-year students at your medical college, do students living in the hostel eat dinner after 10 pm more often than students living at home?
2. A district screening camp sorts adults by a cut-off on body mass index. Book 0, B6 defined it as weight in kilograms divided by the square of height in metres. Among adults of the same height, do those above the cut-off weigh more than those below it?
3. Among adults registered with the NCD clinic for obesity, how many are also registered with the clinic for high blood pressure?

EXERCISE 2 (critique). A classmate says in a department meeting: "My question has never been studied in Chhattisgarh. So it is worth doing."

Lay the argument out as a premise and a conclusion. Say where it fails, and what your classmate would need to add to make it hold.

EXERCISE 3 (teaching). A first-year resident has ten minutes and a whiteboard. They have a question they can answer easily from the NCD clinic register. They ask you: "It is quick and I can get the data. So why would my guide say it is not worth doing?" Explain the difference between a question you can answer and a question worth answering.

6 · What happens to studies once published: citation, uncitedness and use

DEFINITION. A citation is an entry in the reference list of a later published work that points to an earlier one. A citation database records the reference lists of the journals it indexes. For each paper it holds, it counts how many of those later works cite it. Web of Science, owned by Clarivate, is the database behind most of the figures below; Scopus is another. A paper is uncited, in a given database, when that count is zero.

Every count of uncited papers rests on three choices. The first is the database, and which kinds of document in it are counted. The second is the set of papers, usually all those published in one year. The third is the citation window: how long after publication the counting runs.

The measurements depend on those choices. A 1990 report in the journal Science, as a 2017 news feature in the journal Nature describes it, found 55% of items published from 1981 to 1985 uncited 5 years later. It counted letters, corrections, meeting abstracts and other editorial material, which are rarely cited. The feature does not say which database it used. Nicolaisen and Frandsen give a different figure for the same Science reports: 47.4% for the sciences.

Counting research articles and reviews in Web of Science, Larivière and Sugimoto found 4% of biomedical papers published in 2006 uncited by December 2017. These figures come from an analysis done for the news feature, not a peer-reviewed paper (one checked by other researchers before the journal accepts it). The data behind its charts were later withdrawn from public view. A self-citation is a paper citing its own authors' earlier work. The feature's figures include self-citations; removing them raises the shares uncited.

Nicolaisen and Frandsen counted in Scopus. They took seven document types published from 1996 to 2015, among them articles, reviews, letters and notes, and counted citations up to 6 December 2018. They give each result as an uncitedness ratio, a share written as a fraction of 1, so 0.23 means 23 in every 100. For medical articles alone it was 0.18, and for medical notes 0.64.

A database misses citations: a paper it records as uncited may have been cited in a journal or book it does not index, or missed through an error. So the true share uncited is probably lower than the database shows.

A citation records that one work referred to another. It does not record whether the earlier work was used, and many citations are superficial. An uncited paper may still be read and used.

One study we found sorts papers by design.

Patsopoulos, Analatos and Ioannidis took 2646 articles published in 1991 and 2001 from the Science Citation Index in Web of Science. They sorted them into seven designs by the design named in the title; the second example below shows five of them. They counted each article's citations to the end of the second year after publication and gave the median for each design, not a share

uncited. Meta-analyses, which combine earlier studies, had the highest medians. Case reports, on one patient or a few, received negligible citations. The study has no cross-sectional category. So no study we found measures how often descriptive cross-sectional studies are cited, or go uncited. [76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126]

IN PLAIN TERMS. Here is the trap with citation figures. The same word, "uncited", gives numbers from under 1% to over 50%. It is because each one counted something different. Every figure rests on three choices.

- **The database, and what it counts.** A database such as Web of Science holds the reference lists of the journals it covers, about 12,000 of them in 2017. Some counts include letters and corrections, which are rarely cited.
- **Which papers.** Usually all the papers of one field published in one year.
- **How long you wait.** Counting stops at some date. The longer you wait, the fewer papers stay uncited.

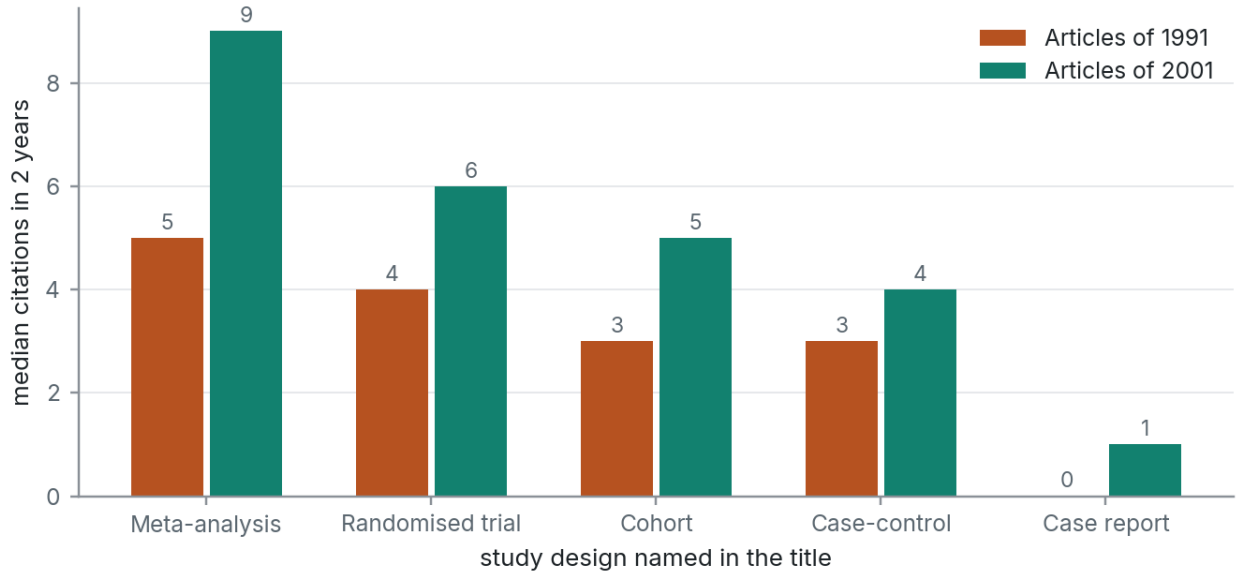
So before you use any figure for uncited papers, ask three questions. Which database, counting what? Papers from which year? Counted until when?

Three more facts change how you read a citation count.

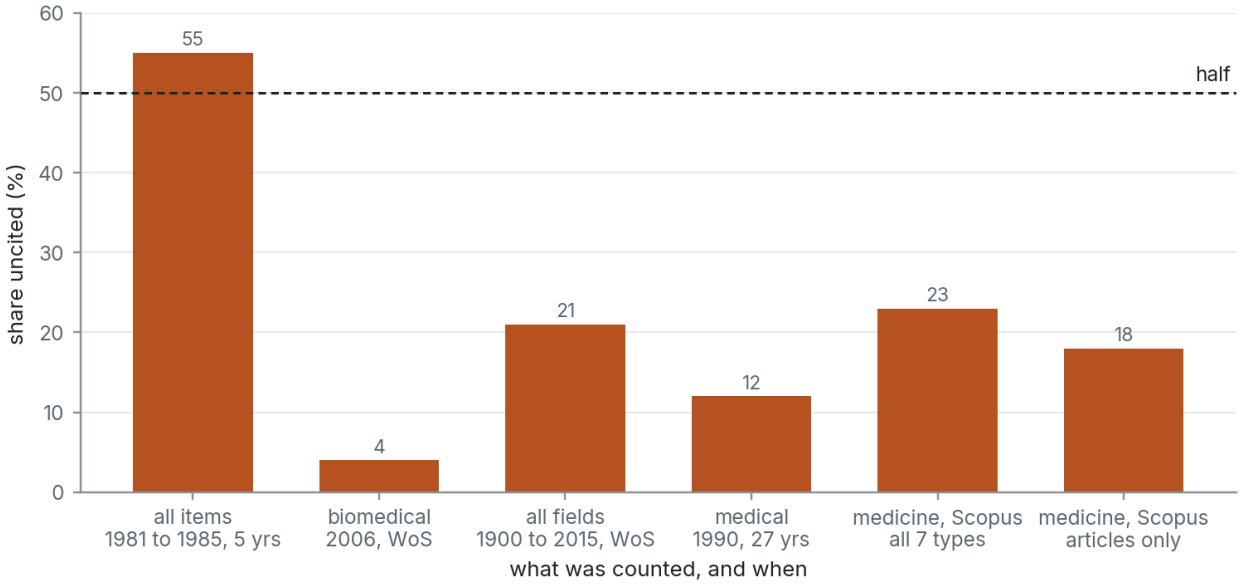
The database misses citations. In one check, a biologist named Heneberg looked at the Web of Science records of 13 Nobel prizewinners. At first glance about 1.6% of their papers looked uncited. After about 20 hours of checking by hand, he got it down to 0.3%. The rest had been cited, and the database had missed it.

Being cited is not being used. A reference can be one line in a long list.

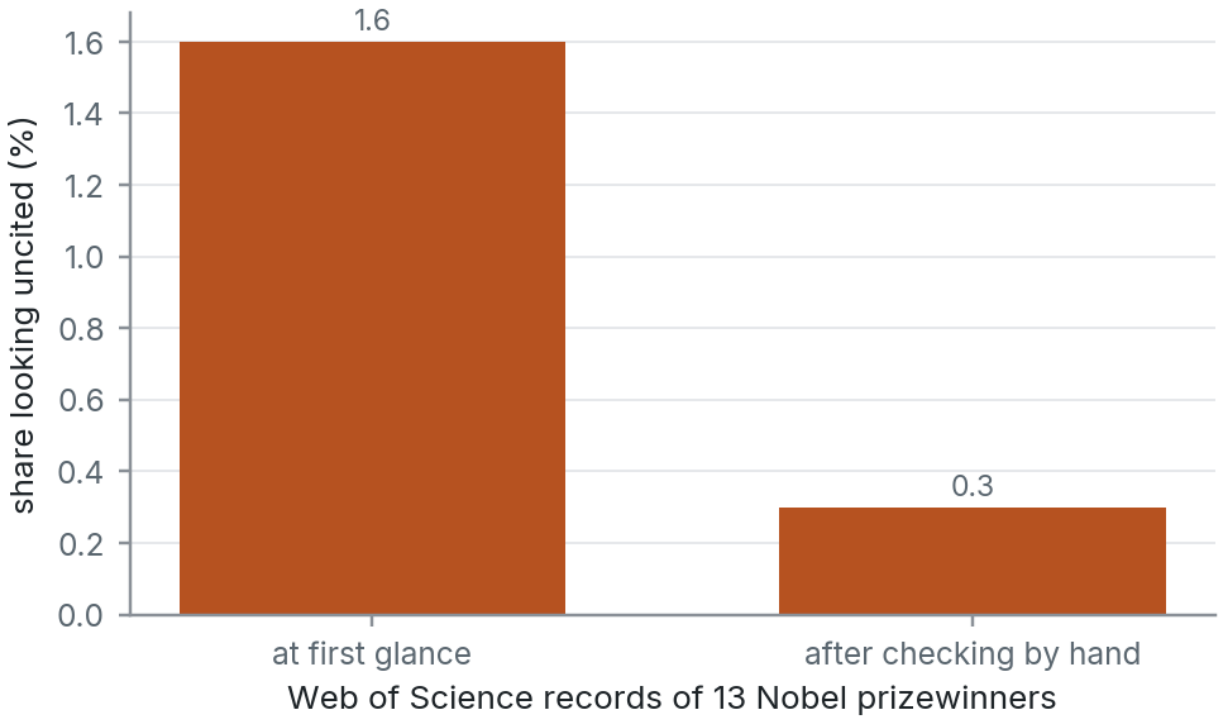
Being uncited is not being useless.



Median citations by the end of the second year after publication, for articles whose title named their design, Web of Science (Patsopoulos and colleagues). Articles of 1991: meta-analysis 5, randomised controlled trial 4, cohort 3, case-control 3, case report 0. Articles of 2001: 9, 6, 5, 4 and 1. There is no cross-sectional category.



The six shares uncited in the first example's table, each a count of something different. The 55% counted all items, letters and meeting abstracts included, over 5 years; the 4% counted biomedical research articles and reviews of 2006 until December 2017. The two Scopus rows differ only in what was counted: 23 in every 100 with all seven document types, letters and notes among them, 18 with articles alone. None counts descriptive cross-sectional studies. Line them up to see how much the choices matter, never to rank them.



Heneberg's check of the Web of Science records of 13 Nobel prizewinners. At first glance about 1.6% of their papers looked uncited; after about 20 hours of checking by hand, 0.3%. The rest had been cited, and the database had missed it.

Illustration 1. Start with a sentence you may already have heard: "more than half of all research papers are never cited." Take it apart before you use it.

Its source is a 1990 report in the journal Science. Van Noorden, a features editor at Nature, traced it in a 2017 news feature. The report found 55% of items published from 1981 to 1985 uncited 5 years after publication.

Now ask Book 0's question: per cent of what? The items counted included letters, corrections, meeting abstracts and other editorial material. Those are rarely cited by anyone. And 5 years is a short wait. So the 55% was a true count of the wrong thing, over a short time.

Now fill in the three labels for every figure you meet. Here are the figures this section uses. Read each row and say, in one sentence, what it is a share of.

Share uncited	What was counted	Database	Papers published in	Counted until
55%, as reported by Van Noorden	all items, including letters, corrections and meeting abstracts	not named in the feature	1981 to 1985	5 years after publication
4%	biomedical research articles and reviews	Web of Science	2006	December 2017
21%	research papers from all fields, 39 million of them	Web of Science	1900 to 2015	December 2017
12%	medical-science papers (document types not stated)	not named in the paper that reports it	1990	27 years after publication

Share uncited	What was counted	Database	Papers published in	Counted until
0.23 as a ratio (23%)	medicine, seven document types including letters and notes	Scopus	1996 to 2015	6 December 2018
0.18 as a ratio (18%)	medical articles only	Scopus	1996 to 2015	6 December 2018

Look at where the numbers come from, too. The 4% and 21% were worked out by Larivière, an information scientist, and Sugimoto, at Indiana University, for Van Noorden's feature. A feature is journalism, not a peer-reviewed paper, and the data behind its charts were later withdrawn from public view. The 12% reaches us through a 2021 paper by Golosovsky and Larivière, who report it from a 2018 book by Sugimoto and Larivière. This course has not been able to check that book. The 0.23 and 0.18 come from a peer-reviewed study by Nicolaisen and Frandsen, which names its database, its document types and its dates. Their two rows differ only in what was counted: take out letters, notes and the other document types, and the share uncited falls from 23 to 18 in every 100.

Now test the sentence from the course outline: "most descriptive cross-sectional studies are never cited". Which row measures descriptive cross-sectional studies? None of them. Every row counts papers by field, document type or year, never by study design. The rows for medicine give 12% after 27 years and 18% of articles in Scopus, and neither is anywhere near "most". The sentence has no row to stand on.

Figures quoted in this illustration are from [127, 128, 129].

WHERE THIS PICTURE BREAKS. The table holds only what the sources we found give. The counts come from two databases, Web of Science and Scopus, and several were reported rather than published with their data. The two Scopus rows run over an open window: a paper of 2015 had about 3 years to be cited, a paper of 1996 about 22, and the ratio lumps them together. A count by study design could show that some designs are cited much less than the field as a whole; the next example shows the one such count we found, and what it leaves out.

The rows are also not comparable with one another. Each answers its own question. Line them up to see how much the choices matter, never to rank the fields.

Illustration 2. Now look at the one count we found that sorts papers by design. Patsopoulos, Analatos and Ioannidis searched the Science Citation Index in Web of Science for articles published in 1991 and in 2001 whose titles named their design. For each design they gave the median number of citations an article received by the end of the second year after publication. The median is the middle value once the counts are put in order, as Book 0's section on average and spread showed.

A meta-analysis combines the results of earlier studies of the same question into one answer. A case report describes one patient, or a few. Randomised controlled trial is shortened here to randomised trial. Five of the study's seven designs are given; the other two, nonsystematic reviews and decision or cost-effectiveness analyses, are left out to keep it short. Each figure is a median

number of citations in the first two years. For articles of 1991: meta-analysis 5, randomised trial 4, cohort 3, case-control 3, case report 0. For articles of 2001, in the same order: 9, 6, 5, 4 and 1.

Read the labels first. The database is Web of Science. The papers are articles of 1991 and of 2001 whose design is in the title. The window is two years after the year of publication. And the figure is a median count of citations, not a share uncited.

A median can still tell you something about uncited papers. The median for case reports of 1991 is 0. The middle of the ordered counts is 0, so at least half of those case reports had no citation in their first two years. That is a floor, not the share itself: it could be more than half.

Now the question this section keeps asking. Which design is the descriptive cross-sectional study? None. The study has no cross-sectional category. Cohort and case-control studies relate an exposure to an outcome, and their medians sit between the meta-analyses and the case reports. Nothing in these figures tells you where a cross-sectional study would sit.

Figures quoted in this illustration are from [130].

WHERE THIS PICTURE BREAKS. A study was counted only if its design was named in its title, and most studies probably do not name their design there. The authors did not remove self-citations. The two-year window is short, and the counts come from one database. The authors add that citation impact does not necessarily translate into clinical or scientific impact. So these medians rank designs by early citations in one database, and nothing more.

MUST KNOW POINTS FOR YOU.

- Never quote a share of uncited papers without its three labels. Name the database and what it counted. Name the year the papers were published. Name how long the count ran.
- The belief that more than half of all papers are never cited is misleading. It goes back to two reports in Science, of 1990 and 1991. The 1990 one counted letters, corrections and meeting abstracts, over only 5 years. Refuse the “half” figure when you hear it.
- Read “uncited” as “no citation found in this database by this date”, not as a fact about the paper. Before you call a paper uncited, search for it in a second database and on the open web.
- Web of Science shows papers by Indian authors as more likely to go uncited than papers from the United States and Europe (the feature gives no figure). But it leaves out many regional-language journals, and counting them would narrow the gap. Before concluding that a department’s work goes uncited, find out whether the database covers the journals it was published in.
- Do not use citation as your test of whether a study was worth doing. Test a question by who needs its answer and what they would do with it, as the last section began to do.
- When someone says a kind of study, such as a descriptive cross-sectional study, is “never cited”, ask for the study that counted it. The one count by design we found, of Web of Science articles of 1991 and 2001, has no cross-sectional category.
- A paper’s title is not its finding. Golosovsky and Larivière’s paper is called “Uncited papers are not useless”. It shows that, in the fields it studied, uncited papers follow the

same statistical pattern as cited ones. Most of them, it finds, have some chance of being cited given enough time. It does not measure whether anyone used them.

- What would overturn the conclusion that few research articles go uncited is a peer-reviewed count, with articles and reviews only and a long window, that found a large share uncited. Until then, quote each figure with its three labels.

EXERCISE 1 (critique). In a made-up department meeting at your college, a senior colleague says: "Half of all research is never cited. A thesis that only counts how common something is will never be cited. So it is a waste of two years."

Lay the argument out as premises and a conclusion. Say which premises the measurements in this section support, which they do not, and whether the conclusion would follow even if every premise were true.

EXERCISE 2 (interpretation). A classmate's draft protocol says: "Uncited papers are not useless (Golosovsky and Larivière, 2021). So our small study will be useful even if nobody cites it."

Say what the cited paper measured, whether it supports the sentence, and what you would write instead.

EXERCISE 3 (teaching). A journalist has three minutes and asks you: "Is it true that most medical research is never cited?" Answer without jargon, say how sure you are and why, and give one sentence they could quote.

7 · Who is waiting for this answer, and what will they do differently

DEFINITION. The who-is-waiting test asks two things of a candidate research question.

First, name the person, or the named role in a body, that needs the answer for a decision they actually face. “Policy makers”, “the literature”, “future researchers” and “my thesis” do not pass this part, because each can be said of any question. Nor does a body you cannot name and reach.

Second, for each answer the study could give, state what they will do, in their own words. A guessed action does not pass. The question passes only when at least two possible answers lead to different actions. If every possible answer leads to the same action, the answer changes nothing for them, and nobody is waiting for it.

The test is a sharper form of criteria in published guides. Jhangiani and colleagues count an answer’s practical implications as one reason a question is worth asking. Ratan and colleagues ask that a question bear on health decisions made by one or more groups with a stake in them. Ioannidis calls clinical research useful when it can lead to a better decision. The two-part form, and the rule that the same action for every answer fails, are this course’s. [131, 132, 133, 134, 135, 136, 137, 138, 139]

IN PLAIN TERMS. So judge a question by who is waiting for its answer, not by whether it will be cited.

Then ask two things.

Part 1: who needs this answer? Name a person, or a named role in a body, with a decision in front of them. It must be someone you could go and talk to.

Four answers fail Part 1 every time: “policy makers”, “the literature”, “future researchers” and “my thesis”. So does a body you cannot reach.

Part 2: what will they do with each answer? Write down what the person will do if the answer comes out one way. Then write what they will do if it comes out the other way. If the two actions differ, someone is waiting. If they do the same thing either way, nobody is waiting, however important the topic sounds.

Do not guess Part 2. A guessed action fails, just as the same action either way fails. Go and ask the person.

The test is an argument, in the sense of Book 0’s section on premise, inference and conclusion. Check the premises: did they say it, or did you guess it? Check the inference: are the two actions really different?

A funder is one kind of party that can be waiting. There are two kinds of money. Research money pays to find out an answer. Implementation money pays to carry a programme out. The

kind matters to the test, because a party paying to run a programme may gain if the study says it works. Then they are hoping for a result, not waiting for an answer.

ILLUSTRATION. This setting is made up. You are a postgraduate in community medicine at a medical college in Chhattisgarh.

Suppose your first candidate is this one.

"What share of children aged 11 to 14 at government schools in Raipur city in the 2027 school year have obesity as the school health protocol defines it, from weight and height the study measures?"

Run Part 1. The answer most people write first is "It will add to the literature, and future researchers can use it." Strike it out. It names nobody.

Try again, and name someone: the district non-communicable disease (NCD) programme officer. Now run Part 2. You go to her office and ask the two questions.

Suppose she answers like this. "The school visits for this year are already planned and paid for. Whatever your number is, the plan stays the same."

Her two actions are the same. So she is not waiting for this answer.

Then she mentions a decision she does face. She worries that some adults pass the body mass index check but carry weight around the middle that the check does not catch. She calls them missed. She is deciding whether to buy tape measures and train staff to measure waists as well.

That gives you a second candidate.

"Among adults aged 30 and over at the district NCD screening camp in 2027 whom the camp's body mass index check does not flag, what share have central obesity as the officer's protocol defines it, from a waist the study team measures?"

Ask the same two questions. Suppose she says: "If it is more than about one in ten, I add the tape measure. If it is fewer, I leave the checklist as it is."

Set the two candidates side by side.

Step	School survey	Camp waist question
Who is waiting	district NCD programme officer	district NCD programme officer
If the answer is high	same school plan	adds tape measures and trains staff
If the answer is low	same school plan	leaves the checklist as it is
Different actions?	no	yes
Result	fails	passes

Now lay the second one out as an argument. Premise: she decides whether the camp measures waists. Premise: she said she adds the tape measure if more than about one in ten are missed, and not if fewer are. Conclusion: she is waiting for this answer.

Check the premises. She said both things herself, so you did not guess them. Check the inference. Adding tape measures and leaving the checklist alone are different actions, so it carries.

WHERE THIS PICTURE BREAKS. The test is only as good as what the person tells you, and plans change. Ask again before you write up.

A guideline group, the panel that writes the advice clinicians follow, rarely acts on one study. Ioannidis counts research as useful when it changes a decision "either by itself or when integrated with other studies". For such a group, ask what they would do with the pooled evidence your study joins, the systematic review of section 3, not with your study alone.

Some people want one answer and not the other. That person is not waiting for an answer. They are hoping for a result.

MUST KNOW POINTS FOR YOU.

- The error is to write "this will add to the literature" or "future researchers can use it" in the place of a person. Name a role you could go and talk to.
- Ask the person; do not guess for them. Put two questions: "If the study found this, what would you do? And if it found that?" Write down their words, with the date.
- Ask each waiting person which result would change their decision. That line tells you what the study has to be able to tell apart.
- "That would be very interesting" is not an action. When an officer or a head of department says it, ask again: "And what would you do differently?"
- If every answer leads to the same action, drop the question for that party.
- Your guide and your degree need a thesis. They are waiting for a thesis, not for this answer. Count neither as the waiting party.
- A party who gains from one answer has a conflict of interest. Write down who pays and what they gain from each answer, and declare it in the protocol. Keep their influence on design and analysis small.
- The test tells you someone would act on the answer. It does not tell you the question can be answered, that the study will be done well, or that the action is a good one.
- A textbook may call a question interesting because it interests the scientific community. It does not pass this test, because it names no decision.

EXERCISE 1 (critique). A made-up draft protocol for a thesis on obesity in college students says:

"This study will be useful to policy makers and will add to the literature on obesity in young adults in India."

Lay the claim out as premises and a conclusion. Run the who-is-waiting test on it. Then say what you would need to find out to rewrite the line.

EXERCISE 2 (design). Here is a made-up candidate question.

"Among adults aged 30 and over whom the district hospital NCD clinic records as having obesity in 2027, do those who get a phone call the day before their follow-up visit come back more often within three months than those who do not?"

Name two people or bodies who might be waiting for the answer. For each, write the two questions you would put to them. Then say what reply would pass the test, and what reply would fail it.

EXERCISE 3 (teaching). A first-year resident in your department says: "Every question is useful to someone, so the who-is-waiting test rejects nothing." You have ten minutes and a whiteboard. Explain why the test does reject questions, with one example that fails and one that passes.

8 · Ten candidates, one score each, nine rejections

DEFINITION. This book ends with one task: a list of ten candidate research questions. Each is written as one sentence that names a population with its boundary, an exposure where there is one, and an outcome. Each is scored on a five-item sheet, with 0, 1 or 2 points for each item.

The total, out of 10, puts the candidates in order. One rule overrides the total. A zero on item 4 or item 5, either half of the who-is-waiting test, rejects the question whatever its total. Among the survivors, the highest total is kept; a tie goes to the higher score on items 4 and 5 together.

The sheet is this course's working tool. Its totals put judgements in order. They do not measure anything. [140, 141, 142, 143, 144, 145, 146, 147]

IN PLAIN TERMS. The earlier sections of this book each gave you one check on a question. This section puts them on one sheet, so you can compare ten candidates and turn nine of them down on purpose.

Start with ten candidates. Then score each candidate on five items. Each item gets 0, 1 or 2.

Item	0	1	2
1. One sentence	a topic, not a question	a question, but a part is missing, doubled or has no boundary	population with its boundary of place, age and time; exposure and comparison where there are any; one outcome
1. Answerable	a value question, about what ought to be, or you cannot get the answer	answerable only after a change: narrower, or access still to arrange	about the world, and you can reach the people, measure the exposure and the outcome, pay for it, finish in time and get ethics approval
1. Not already answered	your look found a good answer for this population	your look found answers elsewhere, or weak ones	your look found no good answer for this population, and you can write two different answers you might get
1. Who is waiting	nobody; "the literature", "future researchers", "my thesis" or "policy makers"; or a body you cannot name and reach	a named role you can reach, whose decision you have heard of but not yet checked with them	a named role you can reach, who told you the decision they face
1. What they would do differently	the same action for every answer, or actions you guessed	different actions, heard second-hand, not yet checked with them	different actions for different answers, in their own words

Score item 3 only after you have looked for an existing answer, as the section on questions worth answering taught. A good answer comes from the same population, place and time, by a design that fits the question (section 3).

Item 5 is never higher than item 4. If item 4 is 0, item 5 is 0 too, because there is nobody to do anything differently.

A 1 on item 4 or item 5 means you have not yet checked with the person. Ask them before you write up.

Add the five scores. The total is out of 10.

A total can hide a zero.

So one rule comes before the total. **A zero on item 4 or item 5 rejects the question, whatever its total.**

Then rank the questions that are left, highest total first. If two totals tie, the one with more points on items 4 and 5 together goes first. If that ties too, read the items and decide, and write down why. Keep the top one.

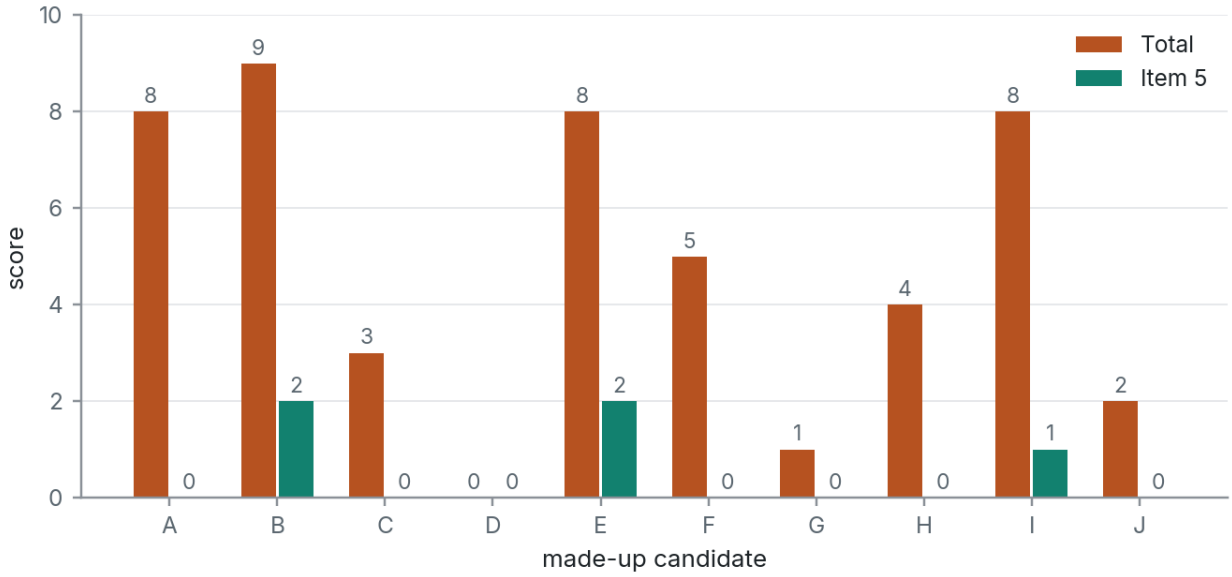
Reject the other nine. For each, write one line that names the item that decided it. For a rank rejection, the line names the items where it lost points.

File the nine, with the date and the line.

Next: match the question to a design (section 3), pilot the hardest line (section 4), note any narrowing in the protocol, and ask the waiting party again before you write up (section 7).

The question you keep is the seed of the one question you will own. The next book in this subject builds on it: a body of work, the data, a unit that houses them, and a three-year plan.

Nobody has tested whether two people give the same list the same scores. Use the total to put questions in order, not as a measurement.



The ten made-up candidates, A to J, with each one's total out of 10 and its score on item 5. A, C, D, F, G, H and J score 0 on item 5 and are rejected whatever their totals, including A's 8. A zero on item 4 always means a zero on item 5, so the item 5 bars show every rejection by the rule. B is kept at 9; E and I tie at 8.

Illustration 1. Back to the setting of this book, which is made up. You are the community medicine postgraduate in Chhattisgarh, and your guide wants one question by the end of the month. Suppose this is your list of ten candidates. Every question and every note is invented for the example.

Candidate	Question
A	What share of children aged 11 to 14 at government schools in Raipur city in the 2027 school year have obesity as the school health protocol defines it, from weight and height the study measures?
B	Among adults aged 30 and over at the district non-communicable disease (NCD) screening camp in 2027 whom the camp's body mass index check does not flag, what share have central obesity as the officer's protocol defines it, from a waist the study team measures?
C	Should the district spend more of its NCD budget on schools than on adults?
D	Obesity in urban slum households in Bilaspur.
E	Among adults aged 30 and over whom the district hospital NCD clinic records as having obesity in 2027, do those who get a phone call the day before their follow-up visit come back more often within three months than those who do not?
F	Among first-year students aged 17 to 20 at the medical college in 2027, is eating the evening meal after 10 pm associated with a larger measured waist than eating it before 8 pm?
G	How common is obesity in India?
H	Among women aged 30 to 50 in urban slum households in Bilaspur in 2027, is owning a refrigerator associated with measured body mass index?
I	Among adults aged 30 and over whom the district hospital NCD clinic records as having obesity in 2027, what share had their blood pressure recorded at their last visit, according to the clinic register?
J	Does a school yoga programme reduce obesity among adolescents in Chhattisgarh?

You score each one, with notes. Some notes, all made up. For A, the district NCD programme officer told you her school plan stays the same whatever the share. For B, she told you she adds tape measures if more than about one in ten are missed, and not if fewer are. For C, she told you she faces that budget choice. For E, the clinic's nurse in charge told you she phones every patient if calls bring more back, and nobody if they do not. For F, the only answer you had to "who is waiting?" was "future researchers". For G, suppose your look found a recent national survey report that already gives a figure. For H, the only waiting party you found was "the municipal corporation", and what it would do is your guess. For I, a colleague told you the clinic's medical officer would add a blood pressure line to the visit form if many are missing; you have not asked her. For J, the only answer was "policy makers".

D is a topic, and C is a value question that no study can answer. Their items that cannot be scored count as 0.

Candidate	Item 1	Item 2	Item 3	Item 4	Item 5	Total	Verdict
A	2	2	2	2	0	8	rejected by the rule
B	2	2	1	2	2	9	kept
C	1	0	0	2	0	3	rejected by the rule
D	0	0	0	0	0	0	rejected by the rule
E	2	1	1	2	2	8	rejected on rank
F	2	2	1	0	0	5	rejected by the rule
G	1	0	0	0	0	1	rejected by the rule
H	2	1	1	0	0	4	rejected by the rule
I	2	2	2	1	1	8	rejected on rank
J	1	0	1	0	0	2	rejected by the rule

Check two totals by hand.

```
A: 2 plus 2 plus 2 plus 2 plus 0 = 8
B: 2 plus 2 plus 1 plus 2 plus 2 = 9
```

First, the mistake to avoid. Sort by total alone and you get B at 9, then A, E and I at 8. If you took the top four to your guide, A would be one of them. A is the school survey the officer already told you changes nothing. Its 8 hides a zero on item 5.

Now apply the rule first. A, C, D, F, G, H and J each have a zero on item 4 or item 5. That is 7 of the 10, whatever their totals. As a percentage:

```
7 divided by 10 = 0.7
0.7 times 100 = 70
```

So the rule alone rejects 70 per cent of the list.

Rank the three that are left: B 9, E 8, I 8. Keep B. E and I tie. Break the tie on items 4 and 5 together.

```
E: 2 plus 2 = 4
I: 1 plus 1 = 2
```

E goes second, I third.

WHERE THIS PICTURE BREAKS. The scores in this list are one person's judgements on made-up notes. Another scorer could give E a 2 on item 3. E would then tie B at 9, and on items 4 and 5 as well, so you would read the items and decide. When two totals are one point apart, read the items before you trust the order.

Illustration 2. Now write the nine lines. Each one names the item that decided it, in words your guide can check.

Candidate	One line
A	Item 5: the programme officer's school plan is the same whatever the share.
C	Items 2 and 5: a value question; what the district ought to do is not something a study can settle.
D	Item 1: a topic, not a question, so nothing else on the sheet can be scored.
F	Items 4 and 5: nobody is waiting; "future researchers" was the only answer.
G	Items 2 to 5: too large for one postgraduate, a national figure exists, and nobody is named to act on a new one.
H	Items 4 and 5: "the municipal corporation" is a body I cannot name and reach, and its actions are my guess.
J	Items 4 and 5: "policy makers" is nobody I can name and reach, and what they would do is my guess.
E	Rank: 8 against 9; lost a point on item 2 (a trial's approvals may not fit in time) and on item 3.
I	Rank: 8, tied with E; lost points on items 4 and 5, because the medical officer's plan is second-hand.

Count the lines: 7 rejected by the rule and 2 on rank.

```
7 plus 2 = 9
```

File all nine with today's date. Two of them are worth a note to yourself. A can come back when the officer plans next year's school visits, because her answer may change. I can come back as soon as you have asked the medical officer yourself. If she names the decision and two different actions, I scores 2 on items 4 and 5. Its total becomes 10, and it goes ahead of B.

WHERE THIS PICTURE BREAKS. A one-line reason is a summary, not the whole case. If your guide disagrees with a line, go back to the scores and the notes behind it, not to the line.

MUST KNOW POINTS FOR YOU.

- The error is to keep the question with the highest total. Apply the rule first, then rank what survives.

- Write one line for every rejection, naming the item that decided it. “Not good enough” is not a reason your guide can check. “Item 5: the officer’s plan is the same whatever the answer” is.
- Do not score item 3 until you have looked for an existing answer.
- File the rejected questions with the date and the reason.
- A 9 against a 7 is not “about 29 per cent better”. A percentage change between them measures nothing, because a point on one item is not the same amount of anything as a point on another. Do not quote one.
- The sheet is this course’s working tool, and nobody has tested it. When two totals are a point apart, read the items and decide from them, not from the totals.

EXERCISE 1 (build). Write your own list of ten candidate research questions on obesity. Use the setting you are actually in, not the one in this book.

For each question, produce four things.

- The question as one sentence, with the population and its boundary, the exposure if there is one, and the outcome.
- Its five scores on the sheet, and the total.
- For items 4 and 5, the role you spoke to and the date. Add their words for what they would do with each answer.
- Your verdict: kept, rejected by the rule, or rejected on rank.

Then write one line for each of the nine you rejected, naming the item that decided it.

EXERCISE 2 (critique). A colleague shows you the rejection lines from their own list. The lines are made up for this exercise.

1. “Too broad.”
2. “Not interesting.”
3. “Scored 5, lower than my top question’s 8.”
4. “Nobody would use it.”

Say what is wrong with each line, and what it would need to say to pass.

PRACTICE. Nine problems on this technique, easiest first. Work them on paper before turning to the answers, which are in the appendix at the back under this section’s name.

1. Score item 1, the one-sentence form, for each of these.

1. Childhood obesity in Durg.
2. What share of adults have obesity?
3. Among adults aged 30 to 60 at the Korba district hospital NCD clinic in 2027, what share have obesity as the clinic protocol defines it?
4. Among college students aged 18 to 22 in Raipur in 2027, is skipping breakfast associated with measured body mass index and with poor sleep?

2. Score items 4 and 5 for each of these made-up notes.

1. Who is waiting: future researchers.
2. Who is waiting: the NCD clinic's medical officer. She said: "If most patients' weights are missing from the register, I add weighing at registration. If few are missing, I change nothing."
3. Who is waiting: the state health department. You think they might start a campaign if the share is high.
4. Who is waiting: the college hostel warden. She said: "Dinner stays at 9 pm whatever you find."
5. Who is waiting: the district NCD programme officer. A colleague tells you she will add a school weighing day if the share is high, and not if it is low. You have not asked her.

3. Score this made-up candidate on all five items, total it, and give your verdict.

"Among children aged 6 to 10 at two private schools in Bhilai in 2027, is more than two hours a day of screen time associated with measured body mass index?"

Notes: the schools will let you in, you can ask about screen time and measure weight and height, it fits your time and budget, and ethics approval looks likely. Your look found studies from other Indian cities, none from Chhattisgarh. The principal of one school is the waiting party. She said: "I send the same letter about screens to parents every year, whatever anyone finds."

4. Here are the scores for a made-up short list of five candidates, P to T, in the setting of this book.

Candidate	Item 1	Item 2	Item 3	Item 4	Item 5
P	2	2	1	2	2
Q	2	2	2	2	0
R	2	1	2	2	1
S	1	2	1	1	1
T	2	2	2	1	1

Total each one. Apply the rule, rank the survivors, and say which you keep. Write one line for each rejection. What percentage of the list did the rule reject by itself?

5. Part of a colleague's made-up scoring sheet has been smudged. For each candidate, one item cannot be read. Find the missing score, and say whether the candidate survives the rule.

Candidate	Item 1	Item 2	Item 3	Item 4	Item 5	Total
U	2	2	1	2	smudged	7
V	1	2	1	smudged	1	6
W	smudged	1	2	2	1	7

6. Here is a worked answer. Find the step that broke.

```
K: 2 plus 2 plus 2 plus 2 plus 0 = 8
L: 1 plus 2 plus 1 plus 2 plus 1 = 7
M: 2 plus 1 plus 1 plus 1 plus 1 = 6
rank by total: K first, L second, M third
keep K
```

7. Here is a worked answer for a made-up candidate. The next-best candidate on the same list scored 8. Find the step that broke.

```
candidate: Among adults aged 18 to 60 in urban slum households in Bilaspur in 2027,
what share have obesity as the survey protocol defines it?
item 1: population with boundary, outcome, a how-common question = 2
item 2: reachable, measurable, fits in time = 2
item 3: studies from other cities, none from Bilaspur = 1
item 4: who is waiting: policy makers in India = 2
item 5: they would start a campaign if the share is high = 2
total: 2 plus 2 plus 1 plus 2 plus 2 = 9
rank: first, ahead of the 8
```

8. In a made-up department meeting, a senior colleague says: “Let’s just do a survey of obesity among our nursing students. It’s quick, the data are easy to get, and the head of department wants a paper this year.”

Your current top question scores 9. Score the proposal, rank it against your top question, and give a one-line reason if you reject it. Then say what your score does not establish.

9. Your guide looks at your sheet and says: “Your top question scored 9 and the second scored 7. So the first is about 29 per cent better. Drop the second without a second thought.”

Check the arithmetic. Then say what the claim does not establish.

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Appendix · Worked answers

1 · A research question is a choice

EXERCISE 1. Premise: the data for the screening camp question are already in the department. Conclusion: it is a good question.

Test the inference first, as Book 0's section on argument taught. Grant the premise: the records exist. What follows from that? That the question can be answered quickly and cheaply. It does not follow that anyone needs the answer, or that the answer is not already known. "Good" has quietly come to mean "quick".

Then look at what the argument skips. The records were collected for a camp, not for this question. So the data decided the question, rather than the question deciding what data to collect. That is one of the routes by which a question arrives without being chosen.

What survives: data already in hand are a real advantage when you come to ask whether a question can be answered at all. That makes the camp question a strong candidate for the list. It does not make it the choice before it has been compared with others.

EXERCISE 2. One possible set. Yours will differ; check that each of yours asks one thing.

1. Among students aged 18 to 25 at your college, do those who usually eat dinner late gain more weight over one year than those who eat early? This could arrive from a paper's line on future research.
2. What share of students aged 18 to 25 living in your college hostel usually eat their last meal after 10 at night? This could arrive from what is at hand: you live among them.
3. Among hostel students aged 18 to 25, do those who skip breakfast on class days eat more at night than those who do not? This could be named by a guide who has noticed empty breakfast tables.

Each is a single question. None has been chosen yet. Writing three is what makes choosing possible.

EXERCISE 3. Draw two columns on the board. Head the left one "the question" and the right one "the methods". Under the methods write sample, measurement, analysis.

Then say what each method does. A good sample means the answer is true of the group the question names. A good measurement means you measured what the question asks about. A good analysis means you read the numbers correctly. Every one of them serves the question in the left column. None of them can reach back and change it.

So a study can be done properly and still answer a question nobody needed. How you got the question matters for one reason. A question that arrived and was kept has never been set against a better one.

End with the move. Write the question you have, then write two others on the same topic. If yours still looks best beside them, you have chosen it. If not, you have found out in ten minutes rather than two years.

2 · Population, exposure, outcome: a question in one sentence

EXERCISE 1. One possible set of rewrites. Yours will differ in the details. Check that each of yours has a fenced population and one outcome.

1. “What share of children aged 10 to 14 in government schools in Raipur district, in the 2027–28 school year, have obesity, judged from measured weight and height?”

   Population: children aged 10 to 14 in government schools in Raipur district, 2027–28. Exposure: none. Comparison: none. Outcome: obesity from measured weight and height. A how-common question.

2. “Among adults aged 18 and over screened at the district screening camp in 2026, did those living in the town, compared with those living in villages, have obesity more often?”

   Population: adults aged 18 and over screened at that camp in 2026. Exposure: living in the town. Comparison: living in a village. Outcome: obesity. PECO.

3. “Among first-year students aged 17 to 20 at your medical college in 2027, do those who usually eat dinner after 10 pm, compared with those who eat before 8 pm, gain more weight, in kilograms, over one academic year?”

   Population: first-year students aged 17 to 20 at your college, 2027. Exposure: dinner after 10 pm. Comparison: dinner before 8 pm. Outcome: weight gained over the year, in kilograms. PECO.

4. “Among adults aged 18 and over attending the NCD clinic of the district hospital between January and March 2027, what share can state their own weight to within 2 kilograms of the clinic’s reading?”

   Population: adults aged 18 and over at that clinic, January to March 2027. Exposure: none. Comparison: none. Outcome: stating one’s own weight to within 2 kilograms. A how-common question. The rewrite had to turn “know their weight” into something you can measure.

EXERCISE 2. Write the four labels down the left of the board: population, exposure, comparison, outcome. Ask the resident to fill each from their title.

They will write “college students” for the population. Ask: which college, which ages, which academic year? Add the fence.

They will write “risk factors” for the exposure. Ask them to name one. They may name five: sleep, screen time, meals, hostel food, stress. Point out that each one gives a different pair of groups to compare. Five exposures means five questions, and one study is built round one.

Ask which of the five they would keep if they could only keep one. Say it forms the exposure. The comparison follows from it: students who sleep less than six hours, say, against those who sleep more.

The outcome is obesity. Ask how it will be judged, and write that in.

Then read the finished sentence aloud together. The other four risk factors are not lost. Each one is now a candidate question of its own.

1. +————+————————————————-+ | Part | In the question | +===========+===+ | population | adults aged 40 to 60 living in one town in 2025 | +————+————————————————-+ | exposure | working night shifts | +————+

———————————————-+ | comparison | working day shifts | +————+————————————————-+ | outcome | average weight | +————+————————————————-+

The population is fenced by person (aged 40 to 60), place (one town) and time (2025). The study does not give anyone a night shift; the workers already have one. So this is an exposure, and the question is PECO.

2. +———-+———————————————————+———————————————-+————+———————-+ | Question | Population | Exposure or intervention | Comparison | Outcome |
+==========+===+==+============+======================+
| a | children aged 6 to 10 in the schools of one block, 2026 | none | none | obesity | +———-+
———————————————————+———————————————-+————+———————-+ | b | patients aged 30 to 60 at one clinic, 2026 | a weekly phone call from a nurse (intervention) | no call | coming to the next visit | +———-+
———————————————————+———————————————-+————+———————-+ | c | missing | sleeping less | not stated | weight | +———-+———————————————————+———————————————-+————+———————-+

1. No exposure and no comparison. It is a how-common question, and nothing is wrong with that.
2. All four parts are there. The clinic gives the call on purpose, so it is an intervention and the question is PICO.
3. Two parts are missing. The population has no fence at all: which people, where, when? And "less" has nothing to be less than. Sleeping less than how many hours, compared with whom? It needs both before it can be planned.

3. +————+————————————————————-+ | Part | In the question |
+============+===+ | population | first-year students aged 17 to 20 of one college in 2027 | +————+————————————————————-+ | exposure | living in the hostel | +————+————————————————————-+ | comparison | living at home | +————+————————————————————-+ | outcome | weight gained over one year | +————+————————————————————-+

The outcome comes first in this sentence, and the exposure comes last. Word order does not decide the parts.

Ask two things instead. What differs between the two groups? Where they live. What is measured to answer? Weight gained. The college does not assign students to the hostel for the study, so the question is PECO.

4. One answer: "What share of children aged 6 to 10 in government primary schools in Raipur city, in the 2027–28 school year, have obesity, judged from weight and height measured at school?"

Part	In the question
population	children aged 6 to 10 in government primary schools in Raipur city, 2027–28
exposure	none
comparison	none
outcome	obesity, judged from weight and height measured at school

Check the fence. Place: government primary schools in Raipur city. Person: aged 6 to 10. Time: the 2027–28 school year. There is no exposure and no comparison, as a how-common question should have none.

5. One answer: "Among children aged 8 to 12 in Korba town's private schools in 2027–28, do those who bring lunch from home, compared with those who buy it at school, have obesity less often?"

Part	In the question
population	children aged 8 to 12 in private schools in Korba town, 2027–28
exposure	bringing lunch from home

Part	In the question
comparison	buying lunch at school
outcome	obesity

It is PECO. Where the children get their lunch is part of their lives. The study does not give it to them. The comparison comes straight from the exposure: the same children, split by where their lunch comes from. A protocol would add how obesity is judged, from measured weight and height.

6. The question: "Among adults screened at the district camp, did those living within 2 km of the camp site, compared with those living further away, come back for a second check more often?"

Part	In the question
population	adults screened at the district camp
exposure	living within 2 km of the camp site
comparison	living more than 2 km away
outcome	coming back for a second check

Work backwards from the sentence. The two groups set against each other give the exposure and the comparison. What was counted in each group gives the outcome. Who was counted gives the population.

The population is unfenced in time and in person. The sentence names no year of camp and no age range. You cannot tell whom the answer is about until the report says both.

7. The exposure and outcome lines broke. They are swapped.

The groups being compared are adults with obesity and adults without it. So having obesity is the exposure. What is counted in each group, to answer the question, is missed follow-up visits. So that is the outcome.

Part	Correct label
population	adults aged 30 to 60 attending the NCD clinic in 2026
exposure	having obesity
comparison	not having obesity
outcome	missing follow-up visits

The worked answer's own comparison line gives it away. The comparison is "adults without obesity", so the exposure must be having obesity.

Why the wrong answer looks reasonable: in a course about obesity, obesity is usually the thing being measured. So the word gets put in the outcome slot by habit. The test is not the word. It is which thing splits the groups and which thing is measured.

8. Two lines broke, and the verdict rests on both.

The outcome line holds two outcomes. A games period could lower obesity and leave exam marks where they were. Then the question has no single answer. It is two questions in one sentence.

The population line has a place and nothing else. It names no ages and no year.

The verdict counted whether each slot had something in it. It did not check that the outcome was one thing, or that the population was fenced on all three sides.

A repaired question: “Among children aged 11 to 13 in government schools in Durg district in the 2027–28 school year, does a daily games period, compared with none, change the share with obesity by the end of the year, judged from measured weight and height?” Exam marks become a separate candidate question of their own.

Why the wrong answer looks reasonable: every slot is filled, and a filled checklist feels finished. The check is not whether each part is there. It is whether each part is one thing, fenced.

9. First take the line apart.

Part	In the line	Problem
population	adolescents in the district	no ages, no year, and no way to find them (schools? homes?)
exposure	its determinants	names none
comparison	none	follows from having no exposure
outcome	nutritional status	several outcomes: being underweight, having obesity, and more

Pick one of each. One answer: “Among adolescents aged 13 to 17 in government schools of Bilaspur district in the 2027–28 school year, do those who walk or cycle to school, compared with those who come by motor vehicle, have obesity less often, judged from measured weight and height?”

What this question still cannot answer:

- Anything about the other determinants, or about being underweight. Each is a separate question. The protocol line asked all of them at once, and so could have answered none well.
- Anything about adolescents who are not in government schools, or who live in other districts. The fence you chose sets whom the answer is about.
- Whether walking to school is what makes the difference. The question asks whether two groups differ. Why they differ is a separate question, which needs its own kind of study.

10. “Working” is not an outcome. Nobody can measure it until someone says what it means. List what it might mean:

- adults found to have obesity at a camp go on to attend the NCD clinic;
- their weight changes over the following year;
- more adults with obesity are found than would have been found without the camps.

Each is a different outcome, and so a different question. Pick the first, because the clinic’s register can count it. One answer:

“Among adults aged 18 and over found to have obesity at the district’s screening camps between January and June 2027, what share attended the NCD clinic within three months of their camp?”

Part	In the question
population	adults aged 18 and over found to have obesity at the district’s camps, January to June 2027
exposure	none
comparison	none
outcome	attending the NCD clinic within three months

What this question still cannot answer:

- Whether the camps made any difference. Some of these adults would have gone to the clinic anyway. There is no comparison group, so the question only counts. It cannot show a change.
- Whether attending the clinic changed anyone's weight. That is the second meaning of "working", and a different question.
- Whether this is what the officer meant. Go back and ask which decision the answer is for, before you start.

3 · Three kinds of question, and the study each needs

EXERCISE 1. 1. Describe. It asks how common, and names no exposure. A cross-sectional study: count from the camp's records, or from a sample of them. 2. Relate. It asks whether an exposure (after-school sport) goes with an outcome (developing obesity), with time in it: "over two years". A cohort study. Record who plays sport now, weigh the children at the start, leave out children who already have obesity at the start, and weigh the rest again in two years. 3. Cause. It asks whether changing something changes the outcome, and the class is something you can assign. A randomised controlled trial: chance decides which households get the class. 4. Relate. It starts from the outcome (obesity or not) and looks back at a past exposure (night shifts). A case-control study: adults with obesity as cases, adults without it as controls, and compare their past work. 5. Describe. "In which age groups" asks in whom the outcome is commoner. There is still no exposure you are testing. A cross-sectional study of the clinic's women patients, counted by age group.

Question 4 is the one to notice. It reads like a cause question about night shifts. As written it only asks whether the two go together, and a case-control study is the right answer to that.

EXERCISE 2. What it could show: in these 400 students, on that day, short sleep and obesity went together. That is an association, and a one-day survey can show it.

What it could not show, twice over.

First, which came first. Sleep and weight were measured on the same day. So the survey cannot tell short sleep leading to weight gain apart from the weight coming first and changing the sleep. Both orders leave the same pattern on the day of the survey.

Second, a third thing. Long study hours, or a noisy shared room, could cut sleep and shape eating and movement too. The survey cannot rule that out.

So "causes" is not supported. The hostel rule goes further still: it is a decision about what ought to be done, built on a cause the study did not show.

A conclusion the study supports: "In a one-day survey of 400 first-year students at our college, students who reported sleeping less than six hours more often had obesity. The survey cannot say which came first, or whether a third factor explains both. A cohort study would be the next step."

Note that 400 is the poster's own made-up number. Surveying 4,000 students on one day would not change any of this.

EXERCISE 3. Start with what "linked" means. The survey found that students who eat late and students with obesity overlap more than you would expect. That is worth knowing.

Then say what a one-day survey cannot do. It asked about dinner and weighed people on the same day. So it cannot say which came first. Some students may have changed their dinner time because of their weight, not the other way round. And something else, like long study hours, could shape both.

Give them a calibrated line, not a dismissal. The finding is a reason to study the question properly, not a reason to tell anyone to change their dinner time.

A quotable sentence: “The survey shows late dinners and obesity turn up together; it cannot show that one causes the other.”

4 · A question you can answer

EXERCISE 1. 1. Value. “Ought” asks what should be done, and the answer depends on what people value: time, the patient’s comfort, the use of the number. An empirical rewrite: “Among adults attending the NCD clinic in 2027, what share say they would prefer not to be weighed at every visit?” 2. Empirical. It asks for a share of households in a stated place. Oil used can be measured. 3. Value. “Is it right” asks for a moral judgement. An empirical rewrite: “Among first-year students living in the hostels of one college, what share eat the mess dinner on most days?” Another would ask what students think of a fixed time. 4. Empirical. It is a relate question: an exposure (being told) and an outcome (returning). It can be answered if the camp’s records show who was told and who came back, which you would check first.

Note what the rewrites do not do. None of them settles the value question. They give the person deciding something to decide with.

EXERCISE 2. Too broad in three ways.

- Four exposures: diet, physical activity, sleep and screen time. Each needs its own measurement, and each could need its own study.
- A population nobody can reach in one study: every college student in the state.
- “Relationship” names no direction and no time. It does not say whether you are counting, comparing or testing a change.

One narrowed version, as a relate question: “Among first-year students at our medical college in 2027, is sleeping less than six hours on most nights associated with having obesity?”

It has one population you can reach, one exposure and one outcome. It is now a relate question, and a one-visit survey could not say which came first. The conclusion must stay within that.

A line still to check: a way to measure the exposure. Asking students how long they sleep gives their report of it, not a measurement. You would need to choose and try out the questions before the study.

EXERCISE 3. Answer first: no study can tell you whether to stop the sales. That is a decision about what ought to be done. It weighs children’s health, vendors’ earnings and families’ choice against each other, and no measurement does that weighing.

What a study can do is give you facts to decide with. Three are within reach:

- what share of children in classes 6 to 8 buy packaged snacks outside school on most days;
- whether those children have obesity more often than children who do not buy them;
- what parents think about stopping the sales.

Be clear about the second. A one-time survey can show that snack buying and obesity go together. It cannot show that stopping the sales would change children’s weight.

If you want a study, tell me which of the three facts you would use first. That is the one to design.

5 · A question whose answer would change something

EXERCISE 1. 1. In doubt: yes. The hostel mess may serve dinner at a fixed early hour. Students at home may eat when the family eats, which may be late. There are reasons for either answer.

Already answered: you do not know until you look for earlier studies of students' meal timing.

Would the answer change anything? Write the two lines. If hostel students eat later, what would the college do? If they eat earlier, what would it do? Unless someone would change a mess timing or a canteen rule, both lines say "nothing".

So as it stands the question fails test three. Keep it only if you can name who would act on the answer. Otherwise drop it.

1. Drop it. When height is the same for everyone compared, body mass index goes up only when weight goes up. So among adults of the same height, the cut-off sorts people by weight. The group above it is heavier by the way it was made. The answer is fixed before you start and fails test one, like Q1 in the section.
2. In doubt: yes. A reason for few: this clinic may not check blood pressure in everyone it sees for weight. A reason for many: it may check everyone it sees for both.

   Already answered: it may be. The clinic's own register may already hold both registrations. Then a count from the register would answer it in an afternoon, without a study.

   Would the answer change anything? Only if someone would run the clinic differently with the count in hand, for instance by booking both visits on one day.

   So check the register first. If the count is there, the question is answered. Change the question to what the register cannot tell you, for example what happens to patients who are booked for two separate visits.

EXERCISE 2. Premise: the question has never been studied in Chhattisgarh. Conclusion: it is worth doing.

Test the inference first, as Book 0's section on argument taught. Grant the premise. It shows only that the question passes part of test two: nobody has answered it here. It says nothing about test one or test three. An answer that is not in doubt anywhere is not in doubt in Chhattisgarh either. And a question whose answer would change nothing is not rescued by being new to the state.

There is a second gap inside test two itself. Suppose the question has been answered well elsewhere. Then a new study here adds something only if there is a reason to expect a different answer here. Without that reason, it is a repeat in a new place.

To make the argument hold, your classmate needs three more premises. There is a reason to expect a different answer here from the one found elsewhere. There are reasons to expect more than one answer. And someone would act differently depending on which answer comes back.

EXERCISE 3. Draw a two-by-two on the whiteboard. One side reads "can I answer it?", yes and no. The other reads "is it worth answering?", yes and no. Say that these are two different questions about the research question. The first is about your means. The second is about the question.

Then give the three tests for the second one, and let the resident apply each to their own question.

- Is the answer in doubt? Can you give a reason for two different answers?
- Is it already answered, here or somewhere that would carry over to here? Did you look before you planned?

- Would the answer change anything? Write each possible answer on a line, and beside it what someone would do. Do the lines differ?

Put the resident's question in its cell. If it is quick and answerable but fails a test, it sits in the "yes, no" cell. That cell is where many easy questions sit. Being quick is the reason it tempts people, and it is no reason to keep it.

End with the repair, not the rejection. Ask what the register cannot tell you. That is often where a question worth answering starts.

6 · What happens to studies once published: citation, uncitedness and use

EXERCISE 1. Premise 1: half of all research is never cited. Premise 2: a thesis that only counts how common something is will never be cited. Conclusion: such a thesis is a waste of two years.

Premise 1 does not survive its labels. The "half" goes back to a 1990 report. It counted letters, corrections and meeting abstracts, over 5 years. Counting research articles and reviews in Web of Science, 4% of biomedical papers published in 2006 were uncited by December 2017. For medical sciences, a count reported by Golosovsky and Larivière gives 12% of papers from 1990 uncited after 27 years.

Premise 2 has no measurement behind it. The one count in this section that sorts papers by design, Patsopoulos and colleagues' count in Web of Science, has no cross-sectional category. The lowest design in it is the case report. So nobody can tell you from these figures how often a descriptive study goes uncited.

Now grant both premises, as Book 0's section on argument taught you to. The conclusion still does not follow. Being uncited does not mean being useless. A public-health paper in Van Noorden's feature was never cited and was viewed more than 1,500 times.

Whether a thesis is worth two years depends on the tests from the last section. Is the answer in doubt? Is it already known? Would it change what someone does? A descriptive question can pass all three.

What survives of the colleague's worry is fair: a study that nobody needs is a waste, cited or not. That is a reason to test the question before starting, not a reason to avoid descriptive work.

EXERCISE 2. Check the reference as Book 0 taught: find the source, confirm it, find the passage, read it.

The paper's title is "Uncited papers are not useless". Its body fits a statistical model of how papers gather citations. It finds that the model accounts for the share of uncited papers fairly well. It concludes that uncited papers follow the same process as cited ones, and that most have some chance of being cited given enough time.

It does not measure whether anyone read or used an uncited paper. So it does not support "our study will be useful". The draft cites a title for a claim the body does not make.

Better: drop the citation from that sentence. Say who will use the study's answer and what they will do with it. Do you want a source for the point that uncited work can still be used? Van Noorden's 2017 feature gives examples. It quotes a Clarivate analyst: "Lack of citation cannot be interpreted as meaning articles are useless or valueless."

EXERCISE 3. No, not as usually stated. The "most" or "half" figure comes from an old count that included letters and corrections, which almost nobody cites, and it waited only five years.

Counts of real research papers give much smaller shares. In one large database, Web of Science, about 4% of biomedical papers published in 2006 had no citation by the end of 2017. In another, Scopus, about 18 in every 100 medical research articles published from 1996 to 2015 had none by December 2018.

Say how sure you are. Each is a count in one database, and every database misses some citations. So the true shares are probably lower. Several of the figures come from a magazine feature, not a peer-reviewed study.

Then the part that matters more. Being cited does not mean a study was useful, and being uncited does not mean it was useless. One paper written to improve public-health practice was never cited, and it was viewed more than 1,500 times.

A quotable sentence: “Very little medical research goes completely uncited; the harder question is how much of it anyone actually needed.”

7 · Who is waiting for this answer, and what will they do differently

EXERCISE 1. Premise: policy makers will find the study useful. Premise: it adds to the literature. Conclusion: the study is worth doing.

Run Part 1. “Policy makers” names no one you could go and talk to. “The literature” can be said of any question. So Part 1 fails as written.

Part 2 cannot be run at all. No person is named, so no one has said what they would do with either answer.

Check the premises. The first is a guess, not something anyone said. The inference also fails. “Adds to the literature” is true of every published study, so it cannot pick out this one as worth doing.

To rewrite the line, find out three things.

1. Which person decides something about students’ health at this college: for example, the college’s student health officer, or the hostel warden who sets meal times.
2. What that person would do if the answer came out one way.
3. What they would do if it came out the other way.

The rewritten line names the role and both actions. Here is a made-up example. “The hostel warden will move dinner earlier if late meals go with larger waists. She will leave the timing as it is if they do not.”

EXERCISE 2. Two possible waiting parties, with the questions for each.

1. The clinic’s medical officer, who decides how the staff spend their time.
   - “If the calls bring more patients back, what would you do?”
   - “If they make no difference, what would you do?”
   - Passes if she says, for example: “If they work, I give one staff member an hour a day for calls. If not, I keep that hour for the queue.”
   - Fails if she says: “We cannot spare anyone for calls whatever you find.” Then the action is the same either way.
2. Patients who attend the clinic, and their families.
   - “If calls helped people come back, would you want one?”
   - “If they made no difference, would you still want one?”
   - Passes if, for example, patients would give a phone number only if the calls help.
   - Fails if everyone wants a call either way, or no one does.

The medical officer is the stronger party here. She controls the action. The patients’ answers still matter, because a call nobody wants is not answered.

EXERCISE 3. Start by writing the test on the board as two parts. Part 1: name the person who needs the answer for a decision. Part 2: say what they will do for each answer.

Then show where the resident's claim goes wrong. "Useful to someone" is only Part 1, and a loose version of it. The test also needs Part 2: two answers that lead to two different actions.

The failing example. A made-up school survey of obesity among children aged 11 to 14. The district programme officer says the school visits are planned and paid for whatever the number. Same action for every answer. So the question fails, even though she is a real person and the topic matters.

The passing example. A made-up question on adults at a screening camp whom the body mass index check does not flag, but who have central obesity as her protocol defines it, from a waist measured for the study. The officer says she will buy tape measures if more than about one in ten are missed, and not if fewer are. Different actions. So the question passes.

End with the point on the board: the test does not ask whether a question is useful to someone somewhere. It asks whether a named person will act differently depending on the answer. Many questions fail that.

8 · Ten candidates, one score each, nine rejections

EXERCISE 1. There is no single right list. Check yours against this list.

1. Ten questions, each one sentence. No topic phrases. Each names a population with a boundary of place, age and time, and an outcome. An exposure is named, or the question is plainly about how common something is.
2. Five scores for each question, and totals that add up. Check each total by adding the five scores again.
3. For every question with a 2 on item 5, a named role, a date, and that person's words for two different actions. An item 5 that rests on your own guess scores 0.
4. Item 3 scored only after a look for an existing answer, with a note of what you found.
5. Every question with a 0 on item 4 or item 5 marked "rejected by the rule", whatever its total.
6. The kept question is the survivor with the highest total. A tie is broken by items 4 and 5 together. If it has a 1 on item 4 or item 5, you ask the person before you write up.
7. Nine lines, each naming an item. None says only "weak" or "not good enough".

If fewer than two questions survive the rule, do not lower the bar. Go back to the people around you and ask what decisions they face. Write new candidates from their answers, and score again.

EXERCISE 2. 1. "Too broad" names no item. It probably means item 1 (no boundary on the population) or item 2 (cannot be done as it stands). The line should say which, and what is missing: "Item 1: no age or time boundary on the population." 2. "Not interesting" is a feeling, not an item. If it means nobody is waiting, say so, with the evidence: "Item 4: nobody named; the only answer was 'the literature'." 3. The totals are right to mention, but a rank line should name the items where the points were lost. Otherwise nobody can check it. For example: "Rank: 5 against 8; lost 2 on item 2, 2 on item 3 and 1 on item 1." 4. "Nobody would use it" sounds like item 4 or 5, but it does not say which. Say whether no one was named (item 4), or the named person would do the same whatever the answer (item 5), and who.

1. +———-+———+————————————————————————————+ | Question | Item 1 | Because | +———-+———+ ————————————————————————————+ | a | 0 | a topic, not a question | +———-+———+ ————————————————————————————+ | b | 1 | a question, but the population has no boundary of place, age or time | +———-+———+————————————————————————————+ | c | 2 | population with its boundary

and an outcome; it asks how common, so it needs no exposure | +———-+———+
———————————————————————+ | d | 1 | it has two outcomes, body mass index and poor sleep;
split it into two questions | +———-+———+———————————————————————+

2. +——+———+———+————————————————————————+ | Note | Item 4 | Item 5 | Because | +——+———+
———+————————————————————————+ | a | 0 | 0 | nobody named; with nobody named there is nobody
to act differently | +——+———+———+————————————————————————+ | b | 2 | 2 | a named role you can
reach, and two different actions in her own words | +——+———+———+————————————————————————
+ | c | 0 | 0 | a body, not a role you can name and reach; the campaign is your guess | +——+———+———+
————————————————————————+ | d | 2 | 0 | a named role, but the same action for every answer | +——
+———+———+————————————————————————+ | e | 1 | 1 | a named role you can reach, but her decision
and actions are second-hand; ask her | +——+———+———+————————————————————————+

3. +———————————+———+————————————————————————————————————+ | Item | Score | Be-
cause |
+=================================+=======+==
| 1. One sentence | 2 | population with its boundary, exposure and outcome | +———————————+———+
————————————————————————————————————+ | 2. Answerable | 2 | you can reach the children,
measure screen time and body mass index, pay for it, finish in time, and get approval | +———————————+———+
————————————————————————————————————+ | 3. Not already answered | 1 | answered else-
where, not for this population | +———————————+———+
————————————————————————————————————+ | 4. Who is waiting | 2 | a named role you can
reach, who told you her decision | +———————————+———+
————————————————————————————————————+ | 5. What they would do differently | 0 | the same
letter for every answer | +———————————+———+
————————————————————————————————————+

```
2 plus 2 plus 1 plus 2 plus 0 = 7
```

Verdict: rejected by the rule. Item 5 is 0, so the total of 7 does not matter.

One line: “Item 5: the principal sends the same letter whatever the answer.”

4. Total each candidate.

```
P: 2 plus 2 plus 1 plus 2 plus 2 = 9
Q: 2 plus 2 plus 2 plus 2 plus 0 = 8
R: 2 plus 1 plus 2 plus 2 plus 1 = 8
S: 1 plus 2 plus 1 plus 1 plus 1 = 6
T: 2 plus 2 plus 2 plus 1 plus 1 = 8
```

Apply the rule. Q has a 0 on item 5, so Q is rejected, even though its 8 ties for second.

Rank the survivors: P 9, then R and T at 8, then S 6. Break the tie between R and T on items 4 and 5 together.

```
R: 2 plus 1 = 3
T: 1 plus 1 = 2
```

The order is P, R, T, S. Keep P.

Candidate	One line
Q	Item 5: the same action for every answer.
R	Rank: 8 against 9; lost points on items 2 and 5.
T	Rank: 8 against 9, and behind R on items 4 and 5; lost points on items 4 and 5.

Candidate	One line
S	Rank: 6; lost points on items 1, 3, 4 and 5.

The rule rejected 1 of the 5 by itself.

```
1 divided by 5 = 0.2
0.2 times 100 = 20
```

That is 20 per cent of the list.

5. The missing score is the total minus the four scores you can read.

```
U: 2 plus 2 plus 1 plus 2 = 7, and 7 minus 7 = 0
V: 1 plus 2 plus 1 plus 1 = 5, and 6 minus 5 = 1
W: 1 plus 2 plus 2 plus 1 = 6, and 7 minus 6 = 1
```

Candidate	Missing item	Score	Survives the rule?
U	Item 5	0	no: a zero on item 5 rejects it, whatever its total of 7
V	Item 4	1	yes: no zero on item 4 or item 5
W	Item 1	1	yes: the rule looks only at items 4 and 5

U and W have the same total, 7. Only W survives.

6. The last two lines broke. The totals are right, but the rule was never applied. K has a 0 on item 5, so K is rejected whatever its total.

```
K: 2 plus 2 plus 2 plus 2 plus 0 = 8, with a 0 on item 5, so rejected
L: 1 plus 2 plus 1 plus 2 plus 1 = 7
M: 2 plus 1 plus 1 plus 1 plus 1 = 6
rank the survivors: L first, M second
keep L
```

L's 1 on item 5 means you ask the waiting party before you write up.

Why the wrong answer looks reasonable: K beats L on three items and has the highest total. The total is the most visible number on the sheet. The zero sits in one small column.

7. Items 4 and 5 broke.

Item 4: "policy makers in India" is not a role you can name and reach. That scores 0, not 2.

Item 5: the campaign is the scorer's own guess. Nobody said it. That scores 0, not 2.

```
total: 2 plus 2 plus 1 plus 0 plus 0 = 5
```

A zero on item 4 or item 5 rejects it, so it does not rank at all, behind the 8 or ahead of it. Items 1 to 3 were scored right.

Why the wrong answer looks reasonable: "policy makers" sounds like someone with power to act, and a campaign sounds like what they would do. But neither was checked with a person. The sheet gives 2 only for a named role and for that person's own words, and 0 for a body you cannot reach or an action you guessed.

8. First make the proposal a question. As said, it is a topic, which would score 0 on item 1. Written as one sentence it becomes: “Among nursing students aged 17 to 25 at the medical college in 2027, what share have obesity as the protocol defines it, from measured body mass index?”

Score that sentence. Suppose your look finds surveys from other nursing colleges but not this one.

Item	Score	Because
1. One sentence	2	population with its boundary and an outcome; a how-common question
1. Answerable	2	quick, and the students can be reached and measured
1. Not already answered	1	answered elsewhere, not here
1. Who is waiting	0	the head of department is waiting for a paper, not for this answer
1. What they would do differently	0	nobody is named who would act on it

```
2 plus 2 plus 1 plus 0 plus 0 = 5
```

Rejected by the rule, whatever the total. It would rank below your 9 in any case.

One line: “Items 4 and 5: the department is waiting for a paper, not for this answer.”

What the score does not establish:

- That nobody could be waiting. The nursing college’s principal may face a decision this answer would change. Ask before you file it.
- That the survey would be poor work. It could be done well. The sheet says only that, today, no one would act on it.
- That your 9 is better on every item. Compare items, not only totals.

9. The arithmetic is a percentage change from 7 to 9.

```
9 minus 7 = 2
2 divided by 7 is about 0.2857
0.2857 times 100 = 28.57
```

So “about 29 per cent” is the right arithmetic.

What it does not establish:

- That the first question is 29 per cent better at anything. The scores are judgements put in order, 0, 1 or 2 on each item. A point on item 3 and a point on item 5 are not the same amount of anything. A percentage change between two totals measures nothing.
- That the gap is real. Another scorer could move one or two items by a point. Two points out of ten is within that.

- Which items made the gap. If the second lost its points on items 4 and 5 because you have not yet asked the waiting party, asking may close the gap.

So do not drop the second without a thought. Write its one line naming the items where it lost points, and file it.

Glossary

Every term of art this book teaches, in the plain words it gets where it is first used, and the section that teaches it.

Term	Plain words	Section
answerable (research question)	passes two tests: it is an empirical question, and it is feasible for the person asking	4
case report	a report that describes one patient, or a few	6
case-control study	a study that starts from the outcome: it enrols people who have the outcome (cases) and people who do not (controls), then compares what each group was exposed to in the past	3
cause question	a question that asks whether changing the exposure would change the outcome; an association is needed for this and is not enough	3
citation	an entry in the reference list of a later published work that points to an earlier one; it records that one work referred to another, not that the earlier work was used	6
citation database	a database that records the reference lists of the journals it indexes and, for each paper it holds, counts how many of those later works cite it	6
citation window	how long after publication the counting of citations runs	6
cohort study	a study that starts from the exposure: it starts with people who do not yet have the outcome, records who is exposed and who is not, follows both groups over time and counts who develops the outcome	3
comparison (in a research question)	the group, or the level of exposure, that the exposed group is set against	2
comparison group	(1) in a study built to answer a relate question, the people without the exposure, or without the outcome (3); (2) in a test of a teaching method, the group that gets the usual way (S57-R1-C02)	3
conflict of interest	what a party has when it gains from one answer of a study	7
context placement	Ioannidis's second feature of useful clinical research: earlier evidence has been systematically assessed before a new study	5
cross-sectional study	a study that enrols a sample of a population and measures exposure and outcome at the same time: one visit, one count	3
describe question	a question that asks how common an outcome is, or how much of it there is, in a stated population at a stated place and time, and in which people it is commoner; it names no exposure (the how-common question of (2)	3
empirical question	a question that can be answered by observing the world	4
exposure	what differs between the people being compared: something they have, do or meet	2

Term	Plain words	Section
feasible (question)	the person asking can actually get the answer with what they have: people to reach, a way to measure, time, money, equipment and skill, and ethics committee approval	4
FINER	one published checklist for a research question: feasible, interesting, novel, ethical and relevant; a published guide, not a rule	4
how-common question	a question with a population and an outcome and nothing else; it asks how common something is	2
implementation money	money that pays to carry a programme out	7
information gain	Ioannidis's third feature of useful clinical research: the study is large enough to inform	5
intervention	an exposure a researcher or a programme gives on purpose, as the thing being tested	2
meta-analysis	a study that combines the results of earlier studies of the same question into one answer	6
open window (of a citation count)	citations counted up to one fixed date for papers of many years, so an older paper has had longer to be cited than a younger one	6
PECO	population, exposure, comparison, outcome: the four parts of a question about an exposure people meet in their ordinary lives	2
peer-reviewed (paper)	checked by other researchers before the journal accepts it	6
PICO	population, intervention, comparison, outcome: the four parts of a question about something given on purpose	2
protocol	the written plan of a study	2
relate question	a question that asks whether an exposure is associated with an outcome: whether the two go together	3
research money	money that pays to find out an answer	7
research question	a sentence that asks one thing a study will find out about a topic	1
research topic	an area of interest, such as obesity in adolescents; not yet a question	1
scoring sheet (five-item sheet)	this course's working tool for putting candidate questions in order: five items, 0, 1 or 2 points each, total out of 10; a zero on item 4 or 5 rejects the question whatever its total; the totals put judgements in order and measure nothing	8
self-citation	a paper citing its own authors' earlier work	6
systematic review	a study of studies: it collects and combines the results of the studies already done on one question, in a planned and careful way	3
uncited	(of a paper) its count of citations in a given database is zero; read it as no citation found in this database by this date	6
uncitedness ratio	the share of papers uncited, written as a fraction of 1, so 0.23 means 23 in every 100	6
value question	a question about what ought to be done, which people answer from their values (Blackstone's textbook calls it an ethical question)	4

Term	Plain words	Section
who-is-waiting test	name the person, or named role in a body, that needs the answer for a decision they actually face; then, for each answer the study could give, state what they will do, in their own words; it passes only when at least two answers lead to different actions	7
worth answering	(of a research question) the answer is in doubt, is not already known, and has practical consequences: at least one possible answer would lead someone to decide or act differently from another	5

The series: all 196 books

In build order: Book 0 first, then every Introductory rung, then every Intermediate rung, and so on; within a level, a subject comes after the subjects it depends on. "done" means that book's version 1 is finished. This is Book 7.

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6	R, reproducibility engineering and data management · Rung 1	
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OBESITY EXPERTISE · BOOK 7

Question selection and research strategy · Rung 1

A short book on the choice that comes before any method: which question to study. It covers the research question as a deliberate choice, stating it in one sentence with a population, an exposure and an outcome, the difference between a question that can be answered and one whose answer matters, what the record shows about how often published studies are used, and a simple test for any candidate question: who is waiting for this answer, and what will they do differently once they have it.

Book 7 of the series' 196 books, free to read at drharshmaheshwari.com.



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