OBESITY EXPERTISE

A first-principles curriculum in 196 books

BOOK 11 12th of 196 in the series

Adjacent specialist domains: recognise and route · Rung 1

Knowing where your competence ends, and who to ask beyond it

RECOGNISE THE EDGE, NAME THE OWNER, ASK A QUESTION THEY CAN ANSWER, AND SAY SO IN PUBLIC

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SERIES	Obesity Expertise: A first-principles curriculum in 196 books
BOOK	Book 11, Adjacent specialist domains: recognise and route · Rung 1 (12th of 196 in the series)
VERSION	1.0
LAST UPDATED	16 October 2026
AUTHOR	Dr. Harsh Maheshwari, MD Community Medicine Resident, AIIMS Raipur
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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

An obesity specialist works next to a dozen fields that are real and hard: brain and cell science, genetics, causal methods, trade law, town planning, Ayush, procurement, media buying. You will be asked questions in all of them. The danger is not only that you do not know; it is that you may answer anyway, with a confidence your reasoning cannot support. This book teaches the one competence you need at that edge: notice it, say so, name the person who owns the question, ask it so their answer is usable, and judge whether the answer you got is an answer.

How to read it

Read the first five chapters in order: they are the method. The field chapters after them can be read in any order, and each ends on the question you would ask that field's owner. Start a contact list on the first day, one row per field, and add a name each time a chapter gives you somewhere to look. The last chapter runs one realistic ward-committee case through the whole method.

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

Book 0, in particular reading a figure (F2), checking a reference (F3), the shape of an argument (F4) and how government makes rules (F5); the biology sections E5, E7 and E8 help with the chapter on cell and brain science. There is no mathematics in this book beyond reading a percentage. It helps to have read Book 5 (who decides a policy) and Book 8 (explaining as a test of understanding), which this book points to rather than repeats. You need a notebook or a spreadsheet for the contact list you build as you read.

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 11, 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 11 of the series' 196 books (Book 0 and 195 rung books). Before it: Book 10, Epistemics: philosophy of science and calibration · Rung 1. After it: Book 12, Probability and statistical inference · 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
SIGNS			
$\geq$	greater than or equal to	An inequality that includes its boundary	8 · Endoscopic and device therapies
MARKS ON LETTERS			
x^2, 10^{-3}	superscript	Small raised characters are powers: $x^2 = x \times x$, 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
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- Book 0, D6 · Sampling: how a part can tell you about a whole
- Book 0, D7 · Random error and systematic error as different things
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- Book 0, F3 · Checking a reference
- Book 0, F4 · Argument: premise, inference, conclusion
- Book 0, F5 · How government works, in the shape you need to read a regulation

Rung 1 — Introductory

1 · The edge of your competence: four depths, and where routing sits

DEFINITION. To route a question is to notice that it has left what you can assess, name its owner, and send it to them as a question they can answer. The owner is the person or office whose job it is to answer it.

Knowing a field has four depths, each defined by what you can do. At the route depth you recognise a question as the field's and name its owner. At the read depth you follow a paper in the field and say what it claims. At the critique depth you judge whether the paper's methods support its claims. At the do depth you produce the field's work yourself. The depths are always named in that order.

The edge of your competence is set one question at a time. A question is inside your edge when you can say what result would show your answer wrong, and can check that result yourself. When you cannot do both, the question is past your edge, whatever your depth in the field as a whole. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13]

IN PLAIN TERMS. You will be asked questions that belong to someone else. A reporter asks whether a gene test can say which children will develop obesity.

You can answer part of some such questions and none of others. The person asking is waiting while you decide.

Knowing a field is not one thing. It has depths — how far you can go in a field, judged by what you can do. There are four.

Depth	What you can do
route	Recognise a question as this field's, and name its owner
read	Follow a paper in the field and say what it claims
critique	Judge whether the paper's methods support its claims
do	Produce the field's work yourself

You already stand at the do depth in parts of your own field, and the guidelines you trained under say so. The National Medical Commission's postgraduate guidelines for MD Community Medicine, an undated document on its website, say the student "should be able to perform independently" a list of tasks. The list opens with "Conduct community surveys for assessment of health & morbidity profile". So a survey's prevalence is a question you can usually take at the do depth.

In most of the fields this book names, you start at the route depth. Statistical genetics, trade law and town planning are three.

Routing is a competence of its own, and it is not the absence of the others. To route a question is to notice that it has left what you can assess, name the person or office whose job it is to answer it, and send it to them as a question they can answer.

That person or office is the owner of the question — the one whose job it is to answer it. Routing has four skills, in this order. You notice the edge, you name the owner, you write a question the owner can answer, and you judge the reply.

Whether a question is inside your edge is decided by two questions you ask yourself. First, can you say what result would show your answer wrong? Second, can you check that result yourself?

Together they give the edge of your competence — for one question, the point past which you cannot say what would show your answer wrong and check it yourself.

The edge moves from question to question, even inside your own field and even inside one conversation. Take two questions that arrive in the same epidemiological words. "What share of adults in this survey have a waist above the survey's cut-off?" is inside your edge. "Does this paper's genetic method hold for people in India?" is past it.

Routing ends in words you say and a list you keep. The words are a sentence you will say in every setting — a meeting, a lecture, an interview, a reporter's call, and with a patient: "That is outside what I can assess, and here is who can." This book calls it the public sentence. Each time you say it, you also say the part you can answer, name the owner and say the next step. With a patient, also say what they should keep doing meanwhile.

The list is a contact list — your own list of owners, one row per field. Start it today, with one row for each field this book names. The last section but one builds it properly, with a column for how you know each person.

Illustration 1. A made-up exchange: A colleague stops you in the corridor with a printout. "You did epidemiology. This paper says a gene score predicts obesity in children. Is it sound?" The paper is made up, and so is everything in it. You read the abstract. It names a cohort, children followed for years, and odds ratios (a way of comparing how common an outcome is in two groups; Book 9 teaches them). You use those words every week. You say: "Yes, it's a solid cohort study."

Now run the edge test on what you said. Ask the first question: what result would show your answer wrong? For the cohort, you can name some. Children may have been lost to follow-up — dropped out before the end, so their outcome is unknown. An outcome may have been measured differently at the end. For the gene score, you can name none. You do not know how such a score is built or tested, so you cannot say what would show it unsound. The second question fails with it. Your sentence joined two answers, and only one was inside your edge.

Here is the clean version, filled in for five made-up questions.

Question	Depth it needs	What would show your answer wrong?	Can you check that yourself?	Inside or past your edge?
What share of adults in this district survey have a waist above the cut-off the survey used?	do	A recount from the data gives a different share	Yes: recount it	Inside
Was each waist measured the way the survey's own protocol says?	do	The field records and the protocol disagree	Yes: compare them	Inside
What does this paper on a gene variant claim, and in whom?	read	The paper's own text says something else	Yes: reread it	Inside
Do that paper's genetic methods support its claim for people in India?	critique	You cannot name it	No	Past
Can the district buy weighing scales from a local shop without a tender (a formal call for written offers from sellers)?	route	You cannot name it	No	Past: the purchase (stores) officer, who handles buying for the office, owns it (section 14)

In the model table, three of the five questions were inside your edge and two were past it. That is normal. The gene question and the purchase question are the ones you route. You still answer the other three.

Now fill in the same table for five questions you were asked in your own last month. Write the depth each one needs before you decide whether it was inside your edge.

WHERE THIS PICTURE BREAKS. The test runs on your own answers, and your own judgement is the thing in doubt. The next section shows how loosely confidence follows accuracy. The test works only when you answer each part with something specific: a named result and a named check. "I would look into it" is not a check. The test also cannot tell you that a check you named is the wrong one. And the person you route to has an edge of their own. Goldman, Lee and Rudd, in "Ten commandments for effective consultations" (1983), told the doctors who answer such requests to "address the problem for which they were called", and to avoid arguments with other services "especially if the problem lies outside their domain".

Illustration 2. Open the National Medical Commission's Guidelines for Competency Based Medical Education (CBME) Curriculum 2024 at https://nmc.org.in/storage/cms/rules-regulation-nmc/YTW423v3EsCFdtPv3I5qZkaNNhuXfub42UZITDRM.pdf. Search for "identify and refer". Read competency 3.1.14. It asks the graduate to "identify and refer patients who may require specialized or advanced tertiary care". Then search for "objective self-assessment" and read competency 3.4.1.

Now open the Core Competencies of the Interprofessional Education Collaborative (IPEC), version 3 (2023), at https://www.ipecollaborative.org/assets/core-competencies/

IPEC_Core_Competencies_Version_3_2023.pdf. The front matter says the group was made up of 22 professional associations. Find the section on Roles and Responsibilities. Read RR3 and RR4.

Now the trap. Search the same PDF for "limitations in skills". It is there, in Table A7, in the left-hand column headed Version 2 (2016). Look across the row. The 2023 column beside it reads "Practice cultural humility in interprofessional teamwork". So "Recognize one's limitations" is the 2016 wording. If you quote it as a 2023 competency, anyone who opens the table can correct you. Book 0's section on checking a reference made the same point: finding a line is not the same as confirming what it is.

Each document states the duty in one line. None of the lines you have just read says how to notice the edge in the middle of a sentence. Write down the line you would cite if a committee asked why you are routing a question. Competency 3.1.14 is written for the Indian Medical Graduate, so it is the natural one for an Indian room.

Figures quoted in this illustration are from [14].

WHERE THIS PICTURE BREAKS. These are curricula and a competency statement, not evidence that routing improves outcomes, and none of the passages measures anything. The CBME Curriculum 2024 binds the MBBS course. It says what a graduate should be able to do, not what an MD resident must do in a committee. Competency 3.1.14 speaks of referring patients for tertiary care, so it is the same duty at a different step: it is not a rule about routing a question. IPEC is a United States body. Its statement shows how one group of professions words the duty, not what Indian bodies require.

MUST KNOW POINTS FOR YOU.

- Do not treat routing as what you do when you are not good enough. Routing is a competence with four skills: noticing the edge, naming the owner, writing a question the owner can answer, and judging the reply.
- Before you answer a question someone will act on, run the edge test in your head. Name the result that would show your answer wrong, and name how you would check it.
- Depth in a field does not put a question inside your edge. Test the question, not the vocabulary.
- Do not quote "Recognize one's limitations" as a 2023 IPEC competency.
- When you route part of a question, say the part you can answer as well.
- The edge test runs on your own judgement, and your own judgement is the thing in doubt. It catches the question where you cannot name a check. It does not catch the one where you name a check that is wrong.

COMMON MISREADING. "The four depths are a ladder, and I stand on one step for each field." You stand on different steps for different questions in the same field, sometimes in the same conversation. The depth tells you where to start looking. The edge test settles each question.

EXERCISE 1 (retrieval). From memory, name the four depths of knowing a field, in order, and say what you can do at each. Then state the two parts of the edge test.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (critique). A made-up line from a meeting. A resident says: "I'm trained in community medicine, so I can tell you this genetic risk score is valid for our district." Find the flaw, and rewrite the line so it says what the resident can and cannot answer.

EXERCISE 3 (teaching). Audience: a first-year resident. A first-year resident tells you: "I've read three papers on the gut microbiome, so I can answer the patient's question about probiotics." You have ten minutes and a whiteboard. Explain the difference between the read depth and the edge for one question, using the two-part test.

2 · Improvising, not ignorance: confidence that does not follow accuracy

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Improvising is giving a confident answer to a question past your edge, where you cannot check your own reasoning. It is possible because confidence does not reliably follow accuracy. Three findings show this, each in its own sample and setting.

In 2013 Meyer and colleagues gave 118 general internists — doctors of adult internal medicine — in the United States four written patient cases to diagnose online, two easier and two more difficult. The physicians diagnosed 55.3% of the easier cases correctly and 5.8% of the more difficult ones. Their mean confidence, on a scale from 0 to 10, was 7.2 for the easier cases and 6.4 for the more difficult ones.

In 2006 Davis and colleagues reviewed 17 studies, limited to five English-speaking countries, that compared doctors' judgements of their own competence with an outside measure. Of 20 such comparisons, 13 found little, no or an inverse relationship (the higher the self-rating, the lower the measured skill), and 7 found a positive one (the two rose together).

In 1999 Kruger and Dunning ran four studies, on tests of humour, grammar and logic; the first was of 65 Cornell University undergraduates. Those who scored in the bottom quarter scored, on average, at the 12th percentile (above 12 in every 100 people tested) and placed themselves at the 62nd.

The curriculum this book follows says "the commonest failure at this boundary is not ignorance but improvisation". No study we hold measures this. None of these counts which failure is commonest. Each shows confidence that does not follow accuracy, which is what makes improvising possible. [15, 15, 16, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 25, 25, 26, 27, 28, 29, 30, 26, 31, 31, 32, 33, 33, 34, 34, 34, 35, 34, 34, 36, 35]

IN PLAIN TERMS. At the edge of what you know, you can fail in two ways. You can say "I don't know". Or you can answer anyway.

Answering anyway is improvising — giving a confident answer to a question past your edge, where you cannot check your own reasoning. It sounds like an answer. So the listener cannot see the gap.

Why not just feel for the gap? Because the feeling of being sure moves much less than accuracy does. Meyer and colleagues gave United States physicians written cases to diagnose. The physicians were right about half the time on the easier cases (55.3%) and fewer than one time in ten on the harder ones (5.8%). Their confidence moved only from 7.2 to 6.4 out of 10.

If your sense of certainty barely drops when you are mostly wrong, it cannot be the alarm that tells you to stop.

Davis and colleagues made a systematic review of this in 2006 — a study of studies. In 13 of 20 comparisons, doctors' own ratings of their skill had little, no or an inverse relationship with an outside measure — an inverse relationship meaning the higher the self-rating, the lower the measured skill.

The curriculum this book follows — the written plan this course is built from — says "the commonest failure at this boundary is not ignorance but improvisation". No study we hold measures this. What is measured is three findings: Meyer's and Davis's above, and one by Kruger and Dunning below.

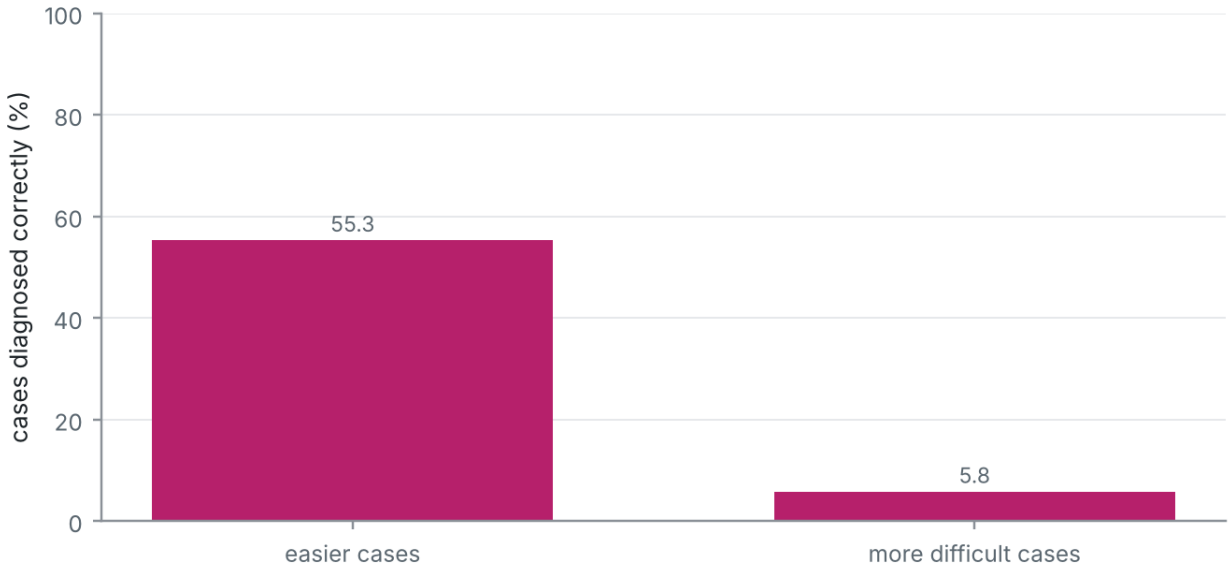
None of these counts which failure is commonest. Each shows confidence that does not follow accuracy, which is what makes improvising possible.

Kruger and Dunning argue that the danger zone is the field you know a little of. They say their "data do not speak to this issue directly", so this is their reasoning, not a result. They write that "most people have no trouble identifying their inability to translate Slovenian proverbs, reconstruct an 8-cylinder engine, or diagnose acute disseminated encephalomyelitis". In such fields, "without even an intuition of how to respond, people do not overestimate their ability". To overestimate, "they must satisfy a minimal threshold of knowledge, theory, or experience".

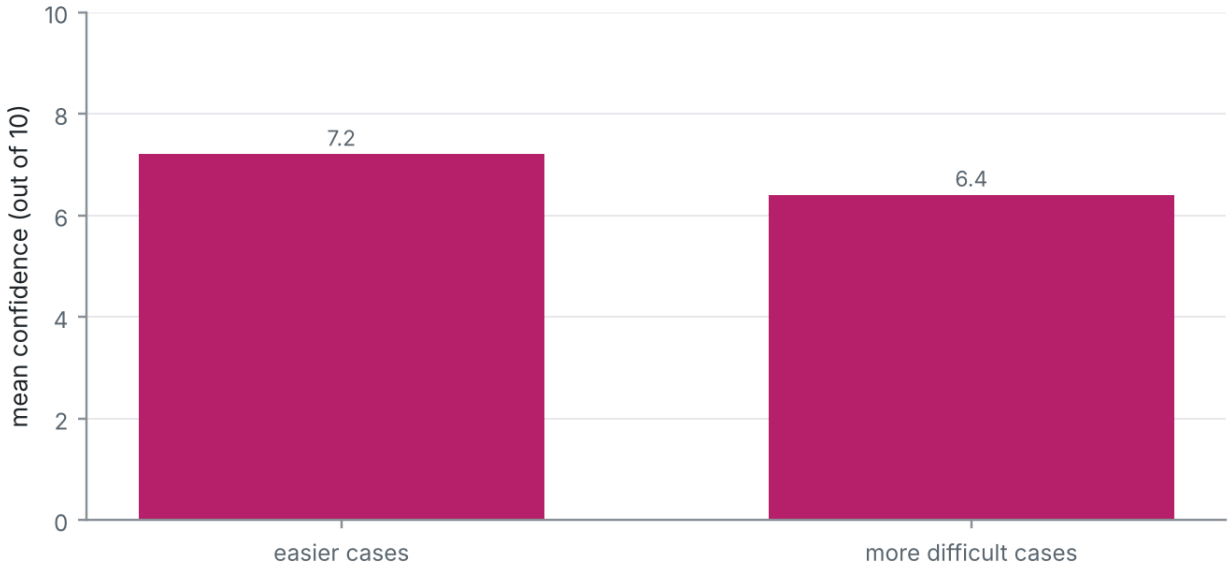
The fields this book routes are ones a community medicine doctor knows a little of. If Kruger and Dunning are right, that is the zone where improvising happens.

Since the feeling will not warn you, use rules. Run the edge test on any question someone will act on.

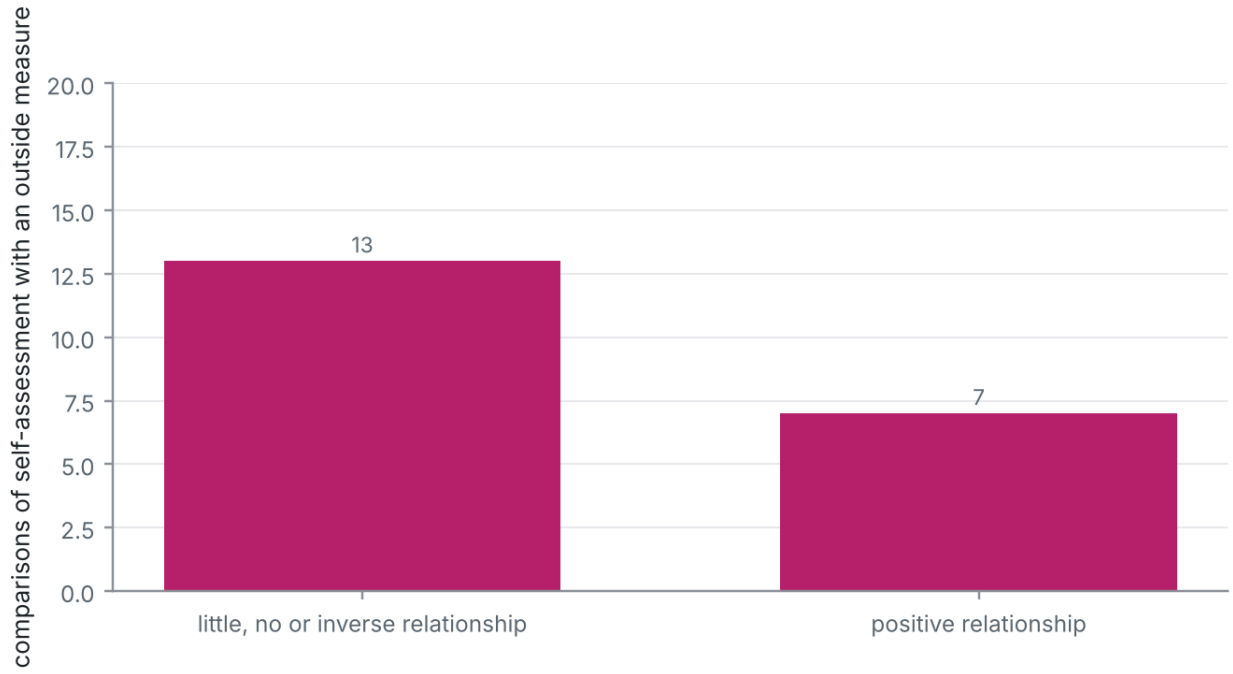
Kruger and Dunning's own result points the same way. Skill in a field is what lets you judge answers in it. In their fourth study, the lowest-scoring quarter, after a short training packet, graded their own answers far more accurately than those who were not given it; Illustration 2 below gives the numbers. You will not gain that skill in every field this book names. So for most of them you route.



Cases diagnosed correctly by 118 general internists in the United States, who each diagnosed four written cases (vignettes) online, two easier and two more difficult: 55.3% of the easier cases and 5.8% of the more difficult. These were written cases, not real patients.



The same 118 physicians' mean confidence in their diagnosis, on a scale of 0 to 10: 7.2 for the easier cases and 6.4 for the more difficult, while accuracy fell from 55.3% to 5.8%.



Davis and colleagues' systematic review of 17 studies limited to five English-speaking countries: of 20 comparisons between doctors' self-assessment and an outside measure, 13 found little, no or an inverse relationship and 7 found a positive one.

Illustration 1. Before you read on, write down two guesses. A group of practising general internists is given hard written cases and gets almost all of them wrong. On a scale of 0 to 10, how confident do you think they say they are? And when the cases get harder, do you think they ask colleagues for more help?

Now open Meyer and colleagues, "Physicians' diagnostic accuracy, confidence, and resource requests: a vignette study", *JAMA Internal Medicine* 2013, at https://doi.org/10.1001/jamainternmed.2013.10081. Read the abstract. The study used case vignettes — written patient cases given to doctors to diagnose, standing in for real patients. The authors "recruited general internists from an online physician community". The 118 physicians each diagnosed four cases, two easier and two more difficult. They rated their confidence in each diagnosis on a scale of 0 to 10.

Here are the results.

Cases	Diagnosed correctly (%)	Mean confidence (out of 10)
easier	55.3	7.2
more difficult	5.8	6.4

Work out how far each column moved. Use percentage points for the first column, because it is a difference between two percentages. Book 0's section on percentages explains the difference between a percentage point and a per cent.

```
55.3 minus 5.8 = 49.5 percentage points fewer cases right
7.2 minus 6.4 = 0.8 points less confident, on a scale of 10
```

Compare with your guesses. Accuracy fell from about half to fewer than one in ten. Confidence fell by less than one point out of ten.

Now the second guess. Search the article for "second opinions". Confidence went with fewer requests for one thing only: "additional diagnostic tests". When confidence or accuracy was lower, or the case was harder, "physicians did not request more second opinions, curbside consultations, or referrals". A curbside consultation is informal advice asked of a colleague in passing. Fewer second opinions went with more years of experience, not with confidence: the authors write that "increased experience was associated with decreased likelihood to request second opinions". Read that sentence twice, because it is easy to misquote.

Why this matters for routing. The authors' own line is that "This mismatch might prevent physicians from reexamining difficult cases where their diagnosis may be incorrect". At the edge of your competence, the hard case is the question from another field.

Figures quoted in this illustration are from [37].

WHERE THIS PICTURE BREAKS. These were written cases on a website, not patients. The authors say their "methods of case delivery limit real-world validity of the study". The physicians were United States general internists who chose to take part: 118 of the 658 who viewed the invitation, a recruitment rate of 17.9%. They answered inside their own field. Nobody tested doctors answering questions from another field, which is this book's case, and nobody tested Indian doctors. What would overturn the finding is a study in real clinical settings in which confidence fell as far as accuracy did. The authors themselves write "If confirmed in real clinical settings".

Illustration 2. Open Davis and colleagues, "Accuracy of physician self-assessment compared with observed measures of competence: a systematic review", *JAMA* 2006, at https://doi.org/10.1001/jama.296.9.1094. The search found 725 articles, and 17 met all the inclusion criteria. Each compared physicians' "self-rated assessments with external observations", in studies from the United Kingdom, Canada, the United States, Australia and New Zealand. Of 20 comparisons, 13 showed little, no or an inverse relationship, and 7 showed a positive one. Some studies made more than one comparison, so 17 studies gave 20. That is 13 and 7 out of 20.

Here is one example of an inverse relationship from the review: "physicians who believed themselves to be better at detecting hidden emotions were in fact less accurate than their colleagues".

Who was worst? "A number of studies found" it was "the least skilled and those who were the most confident". In the studies that found poor self-assessment, the finding did not depend on "level of training, specialty".

Now open Kruger and Dunning, "Unskilled and unaware of it", *Journal of Personality and Social Psychology* 1999, at https://doi.org/10.1037/0022-3514.77.6.1121. They ran four studies, on tests of humour, grammar and logic. Study 1 had 65 Cornell University undergraduates. The abstract reports percentiles. A percentile is where a score stands among others: the 12th percentile is above 12 in every 100. The participants in the bottom quarter — the lowest-scoring quarter of the group — scored at the 12th percentile on average and placed themselves at the 62nd.

Then read the passage that matters most for this book. It is an argument, not a result: the authors say their "data do not speak to this issue directly". In fields where people have no idea at all, they argue, people do not overestimate themselves. To overestimate, "they must satisfy a

minimal threshold of knowledge, theory, or experience". Ask yourself which of the fields in this book's contents you know a little of. Those are your danger zone.

Last, what fixed it in their experiment. After a short training packet in logic, the bottom group graded their own answers far better. They identified 9.3 of the 10 problems accurately as right or wrong, on average, against 3.5 for bottom-quarter participants who were not given the packet. Skill in the field gave them the means to judge themselves in it. You will not gain that skill in every field this book names, which is why you route.

Figures quoted in this illustration are from [38, 39].

WHERE THIS PICTURE BREAKS. Davis and colleagues call their evidence "suboptimal in quality", and the studies were too varied to pool — to combine into one estimate, which is what a meta-analysis does — "precluding a meta-analytic approach". Seven of the 20 comparisons did find a positive relationship, so self-assessment is poor, not worthless. Kruger and Dunning tested people on jokes, grammar and logic (Study 1's were undergraduates), not doctors on medicine. They raise themselves that part of the bottom group's overestimate is a statistical artefact: scoring near the bottom, "it was nearly impossible for them to underestimate their performance". They judge the rest "more psychological than artifactual". They also say they do not mean to imply that people are "always unaware of their incompetence". Neither paper studied anyone answering a question from another field.

MUST KNOW POINTS FOR YOU.

- Do not expect to feel unsure when you are wrong. Use the edge test, not the feeling.
- Never say that confident physicians asked for fewer second opinions. In Meyer and colleagues' study, higher confidence went with fewer requests for additional diagnostic tests.
- Expect to improvise in the field you know a little of. Kruger and Dunning argue, without having tested it, that people with no idea of a field do not overestimate themselves in it.
- Do not assume seniority fixes this. In Davis and colleagues' review, where self-assessment was poor, it was poor at every level of training and in every specialty studied.
- Do not state that improvising is the commonest failure at the edge. The curriculum this book follows says so, and no study this book holds measures it. A study would settle it. It would take errors made at the edge of professionals' competence and classify each by cause. It would count answers given anyway against gaps the person knew and said. Until then, cite the three findings, not the claim.
- Do not quote these findings as a measured error rate for yourself or for doctors in India. None studied Indian doctors, and none studied anyone answering outside their own field.

COMMON MISREADING. "These studies show that confident people are usually wrong." They do not. Meyer and colleagues' physicians were right about half the time on the easier cases, at a

confidence of 7.2 out of 10. The finding is that confidence barely moved when accuracy fell a long way. Confidence is a poor guide to accuracy, not a reverse one.

EXERCISE 1 (retrieval). From memory: what is improvising, and why is it possible? Name the three findings, each with its sample and setting and the one number or result you would quote.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (interpretation). A colleague shows you Meyer and colleagues' table of accuracy and confidence. It is the table with two rows in this section. The colleague says: "So doctors are overconfident about everything." Say what the table shows, and three things it does not show.

EXERCISE 3 (critique). A made-up line from a trainee's seminar slide: "Meyer et al. (2013) showed that confident doctors do not seek second opinions." Find the error and rewrite the line.

EXERCISE 4 (teaching). Audience: a journalist, three minutes. A reporter from a Hindi daily asks: "Why do experts sound so sure even when they turn out to be wrong?" Answer without jargon, give one sentence they can quote, and say how strong the evidence is.

3 · Recognising, mid-conversation, that the question has left you

DEFINITION. Recognising that a question has left you is noticing, while the conversation is still going, one of five signals.

Four of them say the question is past your edge. **No test**: you cannot say what result would show your answer wrong. **Loose word**: you are using a word you could not define if asked. **Unknown standard**: you do not know the field's standard reference or standard method. **One source**: your answer rests on one source you cannot judge.

The fifth, **About to act**, says the person asking is about to act on what you say. It does not show that you are past your edge. It turns the other four from a private doubt into a duty to stop. [1, 40, 41, 42, 43, 44, 13]

IN PLAIN TERMS. The first section gave you a test to run on a question: can you say what result would show your answer wrong, and check it yourself? The point where you can no longer do that is your edge.

The first of the five signals below, No test, is that test noticed in conversation.

Here are the five signals, in a fixed order.

No.	Signal	What you notice	A moment when it fires
1	**No test**	You cannot say what result would show your answer wrong	A reporter asks whether a gene test can say which children will develop obesity. You start to say "not yet" and cannot name what would show that wrong.
2	**Loose word**	You are using a word you could not define if asked	In the outpatient department (OPD) a patient asks whether a product will "detox" her body. You answer using her word.
3	**Unknown standard**	You do not know the field's standard reference or standard method	A committee member asks about a herbal tea sold at the market. You do not know how such products are tested, or what reference their own practitioners use.
4	**One source**	Your answer rests on one source you cannot judge	At the district non-communicable disease (NCD) meeting, everything you know about a vendor's risk tool comes from its brochure.
5	**About to act**	The person asking is about to act on what you say	The district NCD officer says: "I'll sign the order this afternoon unless you see a problem."

Signal 5 is different from the other four. About to act tells you nothing about your knowledge. It tells you that the cost of improvising is about to be paid.

So when signal 5 fires together with any of signals 1 to 4, you stop. When signal 5 fires alone, run signal 1 on purpose.

Silence from all five is not proof that you are inside your edge.

When any of signals 1 to 4 fires, make four moves, in this order.

1. **Stop**, even mid-sentence.
2. **Say the part you can answer.**
3. **Say the public sentence**, in its exact words: **"That is outside what I can assess, and here is who can."**
4. **Name the owner and offer to send the question.**

You make these moves in every setting: a meeting, a lecture, an interview, a reporter's call, and with a patient. With a patient, also say what they should keep doing meanwhile.

Why now, and not later? Stopping before anyone acts costs one sentence. This is reasoning, not a measured fact.

The last point is the other half of the skill. Routing a question that is inside your edge is also a failure: it leaves the asker without what you could have given. Every time a signal fires, look for the part that did not fire, and answer that part.

ILLUSTRATION. A made-up meeting: you are the community medicine resident that a municipal corporation asked for health advice. The corporation has a Wards Committee. Article 243S of the Constitution of India says: "There shall be constituted Wards Committees, consisting of one or more wards, within the territorial area of a Municipality having a population of three lakhs or more." So a Wards Committee is set up for one ward or several, in a municipality of 3,00,000 (three lakh) people or more. For a committee of one ward, the Constitution names "the member representing that ward in the Municipality", the councillor, and says this member "shall be the Chairperson of that Committee."

Below is the transcript as it went. Read it, then cover the table that follows. Mark each line inside your edge or past it, and say which signals fire.

Line	Who	What is said
1	Councillor	"The corporation has money for an open-air gym in the park. Will it bring obesity down in this ward?"
2	You	"Yes. Once people start using it, you will see weights come down within a year."
3	A member	"And the fat-cutter tea they sell at the market? The shop says it is Ayurvedic. My neighbour drinks it."
4	You	"I don't know anything about that tea."
5	Councillor	"Then we put up the gym, and people can decide about the tea. Minute it: health department to examine benefit of park gym."

Here is the marking.

Line	Inside or past your edge?	Signals	Why
1	Mixed	—	One part is yours: how many people use the park now, and whether that changes. One part is not: whether a gym brings obesity down.
2	Past	No test; About to act	You cannot say what result would show "weights come down within a year" wrong, and the committee is about to spend the money on your word. This is improvising.
3	Past	Loose word; Unknown standard	"Fat-cutter" is the shop's word, not one you could define. You do not know how such products are tested, or what reference their practitioners use.
4	Past, said, but not routed	Unknown standard	Honest, and it stops there. It names no owner and no question, so the committee hears "nothing to worry about".
5	—	About to act	The committee acts on lines 2 and 4.

Line 2 is improvising. Line 4 is ignorance, said aloud but not routed.

Now rewrite your two lines. Line 2, rewritten:

> *"Part of that I can answer. I can count how many people use the park now, mornings and evenings, and count again after the gym opens. Whether the gym will bring obesity down here, I cannot say. That is outside what I can assess, and here is who can: people who study physical activity in communities. I will write the question for them before the money is spent."*

Line 4, rewritten:

> *"I cannot tell you what is in that tea, or whether it has any effect, alone or with tablets people already take. That is outside what I can assess, and here is who can: a qualified Ayush practitioner. I will bring the committee a written question for one."*

Ayush is the Ministry of Ayush's word for a group of systems of medicine. In the Ministry's words: "Ayush includes Ayurveda, Yoga, Naturopathy, Unani, Siddha, Sowa Rigpa and Homoeopathy."

Figures quoted in this illustration are from [45].

WHERE THIS PICTURE BREAKS. The public sentence does not stop a committee from deciding. It puts on record which part was answered and which was sent on.

MUST KNOW POINTS FOR YOU.

- The error is to wait until you feel unsure. Listen for the five signals instead, and on any question someone will act on, run No test on purpose.

- When any of signals 1 to 4 fires: stop, say the part you can answer, say "That is outside what I can assess, and here is who can", name the kind of owner, and offer to send the question.
- About to act does not mean you are past your edge. It means the cost of improvising is about to be paid.
- Repeating the asker's word makes it your claim. Say whose word it is.
- Saying "I don't know" is not routing. It names no owner and no question, and the listener often hears "nothing to worry about".
- Routing a question that is inside your edge is also a failure.
- The signals tell you a question has left you. They do not tell you who owns it, or whether the answer you nearly gave was wrong.

COMMON MISREADING. "Saying the sentence ends my usefulness to the person asking." It does the opposite. You still say the part you can answer, and you name who can answer the rest. An improvised answer gives them less: a claim nobody can check. This is reasoning, not a measured fact.

EXERCISE 1 (retrieval). From memory, list the five signals in order, by their labels, with what you notice for each. Which one does not mean you are past your edge, and what does it mean instead? Write the public sentence word for word.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (teaching). Audience: a first-year resident, ten minutes, whiteboard. The resident says: "If I'm not sure, I just say I don't know. Isn't that enough?" Use line 4 of the Wards Committee transcript to explain why it is not, and what to add.

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. Here are five thoughts you might have in the middle of a conversation. Name the signal each one is, by its label.

1. "I've said 'polygenic' twice now, and I could not define it if she asked."
2. "The officer said he will sign the order this afternoon."
3. "Everything I know about this comes from one review I skimmed last year."
4. "I don't know which document planners use to decide how wide a footpath should be."
5. "If I'm wrong about this, I can't think what would show it."

2. For each case, say whether it means you are past your edge, and what you do next.

1. About to act fires, and no other signal does.
2. Loose word fires, and no other signal does.
3. None of the five fires.

3. Made up: write what you would say, in four sentences or fewer, using these parts. The question: "Will the new bus route help people in the colony walk more?" The part you can answer: how you would count people walking to the stop before and after the route opens. The owner: a transport planner.

4. A made-up exchange in the OPD of an urban primary health centre. Your patient is a woman of 52 who teaches at a government school. She has obesity and takes tablets for diabetes from the centre.

1. Patient: "My sister's doctor told her obesity is in the genes, so tablets won't help. Is it the same for me?"
2. You: "Your weight and your sugar are things we measure here, and we can see how they change on your tablets."
3. You: "As for genes, I'd say they don't matter much."
4. Patient: "Then if it's in my genes, I'll stop the tablets. Why waste them?"

Mark each of your lines inside or past your edge, name the signals, and rewrite line 3.

5. A made-up call. A reporter from a Hindi daily phones you about a story due tonight.

1. Reporter: "A company is selling a saliva test that it says tells parents whether their child will develop obesity. Does it work?"
2. You: "What I can tell you is what a test like this would have to show: that children it flags really do develop obesity more often than children it does not, in a study others can check."
3. You: "These tests read a polygenic score, and the science behind them is solid."
4. Reporter: "Can I quote you on that? We go to print at nine."

Mark lines 2 to 4, name the signals, and rewrite line 3 as something you would be content to see in print.

6. A made-up exchange at the district NCD meeting, chaired by the district NCD officer.

1. Officer: "We need weighing scales for every screening team. The local shop can supply them this week. Can we just buy them?"
2. You: "For screening, each scale should be checked against a known weight, so we know its readings are right."
3. You: "Buying from the local shop is fine if the amount is under the limit."
4. Officer: "Good. I'll sign the order today."

Mark lines 2 to 4, name the signals, and rewrite line 3.

7. Here is a made-up marking by a resident of a district NCD meeting. Find the line the resident marked wrongly, say what it should have been, and say why the wrong mark looked right.

Transcript:

1. Officer: "A vendor is offering a tool that picks out people at high risk of obesity from our screening data. Is it any good?"

2. Resident: “It’s validated. The brochure shows how accurate it is.”
3. Officer: “Then let’s take it.”

The resident’s marking:

Line	Inside or past?	Signals
2	Inside	none
3	—	About to act

8. Here is a made-up marking by a resident at the Wards Committee. The resident marked only the member’s question, line 1. Say whether that mark is right, what it should have been, and why the wrong mark looked right.

Transcript:

1. Member: “Last year’s ward survey measured people’s waists. How many adults were above the survey’s cut-off?”
2. Resident: “I’d want a statistician to answer that.”

The resident’s marking:

Line	Inside or past?	Signals
1	Past	Unknown standard

9. A made-up newspaper item reads: “A community medicine doctor told this paper that the new zumba classes in the community hall will definitely reduce obesity in the area by next year.” Say which signals should have fired for the doctor, write what the doctor could have said instead, and say what your rewrite does not establish.

10. A senior colleague says in a staff meeting: “A good doctor should be able to answer any health question a patient asks.” Decide what the edge test and the five signals say about this claim, and say what your answer does not establish.

4 · Writing the question so the answer is usable

DEFINITION. A routed question is a question written for its owner in five parts, always in this order. The decision: the decision the answer serves, and who is waiting for it. The context: what the owner needs to know to answer, such as the population, the setting and the data already in hand. The question: the question itself, narrow enough that the owner can answer it from their own field. The form: the form of answer you can use (yes or no, a range, a recommendation, a reference), with the limit of your own judgement stated. The deadline: when you need the answer, and what happens if it comes later. A routed question is ready to send when every part is filled from what you actually know. [46, 47, 48, 49, 50, 51, 51, 51, 51, 52, 52, 46, 53, 54, 54, 55, 56, 57]

IN PLAIN TERMS. What you write decides what comes back. A loose question gets a loose answer, or an answer to a different question.

A consultation — asking a colleague in another field for an opinion on one question, and their answer — is the hospital version of routing. In 1983, Goldman, Lee and Rudd published "Ten commandments for effective consultations", ten rules for the doctor who answers. Their paper calls the person who answers the "consultant", which is the owner in the consultation papers' word. It calls the person who asks the "requesting physician", which is the asker in their words.

As Goldman and colleagues report from one hospital's series, at the Brigham and Women's Hospital in Boston, the asker and the owner had totally different ideas of why the consultation was asked for in 15% of cases. On another academic consultative service, among consultations before surgery for people with diabetes, no specific question was asked in 24% of cases. The owner ignored the question in another 12%.

Do not add these percentages together. They come from two different series. The numbers come from hospital consultation services, one of them in Boston, reported in 1983. They show that questions go astray in practice. They do not show how often questions go astray in a ward committee or a district meeting in India, and no study we hold counts that.

So the work of the question is yours. A routed question — a question written in five parts so that its owner can answer it in a form you can use — has these parts, in this order.

Part	What goes in it
Decision	The decision the answer serves, and who is waiting for it
Context	What the owner needs to know: population, setting, data already in hand
Question	The question itself, narrow and answerable
Form	The form of answer you can use (yes or no, a range, a recommendation, a reference), and your own limit

Deadline	When you need it, and what happens if it comes later

Decision. Name the decision and the person waiting for it: a councillor, the district NCD officer, a patient. “To learn more about obesity” is not a decision, because nobody acts on it. If you cannot name the decision, stop. Either find out who is waiting, or do not send the question.

Context. Give only what changes the owner’s answer. Do not send your whole file.

Question. Ask one narrow question that the owner can answer from their own field. Do not hand the owner your decision (“Should we build more gyms?”). Ask the part only they can answer.

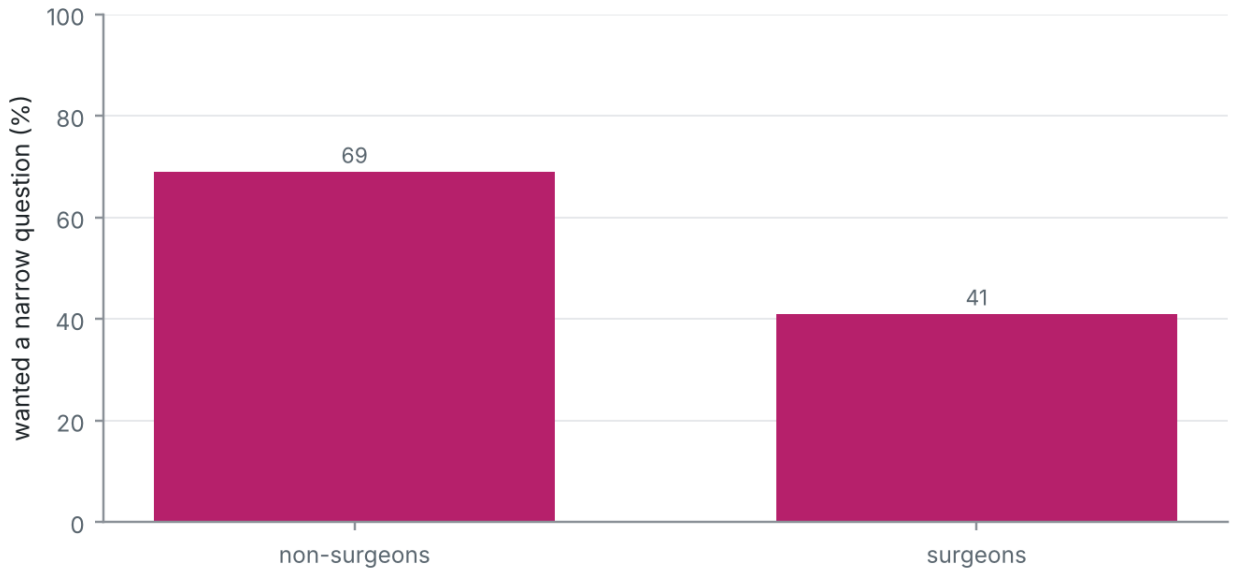
Askers differ on this. In a 2007 survey by Salerno and colleagues of 323 doctors who refer patients, at 3 academic medical centres in the United States, 69% of the non-surgeons wanted the owner to focus on a narrow question, against 41% of the surgeons. The survey measured what these doctors said they preferred. It did not measure whether narrow questions got better results.

Form. Say what shape of answer you can use: yes or no, a range, a recommendation, or a reference you can read. Then say plainly what you cannot judge, in these words: “I cannot judge the method; tell me how sure you are and on what.”

Deadline. Give a date, and what happens if the answer comes later (“the committee decides without it”).

The five parts assume you know enough to narrow the question. Sometimes you do not know the field well enough to know what to ask, and then a narrow question is a guess. When that happens, fill Decision, Context, Form and Deadline as usual, and make the Question row: “What would you need to know, and what would you ask us, to help us decide this?”

The five parts also work on the phone, in the same order. They are an order of saying things, not a form to print.



What askers said they prefer: in Salerno and colleagues’ 2007 survey of 323 doctors who refer patients, at 3 academic medical centres in the United States, 69% of the non-surgeons wanted the owner to focus on a narrow question, against 41% of the surgeons. The survey measured stated preference, not whether narrow questions got better results.

Illustration 1. A made-up minute: at an earlier meeting of the ward's Wards Committee, the councillor asked about the open-air gym in the park. That is the meeting in the last section's transcript. The minute reads, exactly: **"Health dept to examine benefit of park gym."**

You are the community medicine resident the corporation asked for health advice. Part of this you can answer yourself, and you say so. You can find out who uses the gym, by counting users on a few mornings and evenings and asking them two or three questions. That is your own field.

The rest is past your edge: whether the machines are safe for the people who use them. The signal that fires is **Unknown standard**. You do not know the standard for safe outdoor exercise equipment. You pick the owner: a sports-medicine doctor at a medical college. That is a kind of person, as advice. No one is named.

A made-up email. You forward the minute as it stands:

> *"Dear Doctor, the Wards Committee has asked us to examine the benefit of the park gym. Could you advise?"*

A made-up answer:

> *"Thank you for writing. Open-air gyms are a good idea for any ward, and I would support more of them. Do let me know if I can help further."*

Now mark what the email was missing, part by part.

Part	In the email
Decision	missing: no decision named, and no one named as waiting
Context	missing: which park, which machines, who uses them
Question	"examine the benefit": of what, for whom, compared with what?
Form	missing
Deadline	missing

The answer is friendly and useless to you. It answers a question nobody asked: "is a park gym a good idea?" The owner was not careless. You sent them the work of guessing your question, and they guessed. This is the 24% that Goldman and colleagues report from another service (no specific question asked), happening in a ward.

WHERE THIS PICTURE BREAKS. The made-up answer fails in an obvious way. Real answers to a loose question are often long, careful and well referenced, and still answer a neighbouring question. That is harder to spot, and the next section gives the checks for it. The minute is also not always the asker's fault. A committee writes minutes for its own record, not for an owner, so the rewrite is always your job.

Illustration 2. Here is the same request, rewritten. All the details are made up.

Part	Your question
Decision	At its meeting on 13 Nov 2026, the Wards Committee decides whether to ask the corporation to put the same machines in two more parks in the ward. The councillor is waiting for my advice.
Context	The park has had these machines for about a year; the list and photographs are attached. Most of the people I saw using them on three mornings were women over fifty, and several told me they have knee pain. Some have obesity. No one supervises the machines.
Question	Which of these machines are safe for adults over fifty with knee pain or obesity to use without anyone supervising, and which should carry a sign or be replaced?
Form	A list: each machine marked safe, safe with a sign (and the sign's words), or replace. I cannot judge the machines' design; tell me how sure you are on each, and on what: a standard, a study, or your own clinical experience.
Deadline	By 6 Nov 2026, a week before the meeting. If it comes later, the committee decides without it.

Three points about the table.

1. The Question row asks only what the owner can answer. It does not ask "Should the corporation build more gyms?" That decision stays with the committee.
2. The rewrite did not route "Will a park gym bring obesity down in this ward?" That is a separate question, and the last section named its owner: people who study physical activity in communities. What the evidence on activity shows is taught in Book 24, *Physical activity and sedentary behaviour science*, not here. The count of who uses the gym is yours, and you bring it to the meeting.
3. Read the table as the owner will. They can start work without writing back to you.

WHERE THIS PICTURE BREAKS. The rewrite worked because you knew enough to narrow the question to safety. If you had not known what could go wrong with outdoor machines, the Question row would have been a guess. Then you would ask the owner what they would need to know to help, and keep the other four parts as they are. The rewrite also cannot make the answer right. It makes the answer usable, and the next section shows how to judge that.

MUST KNOW POINTS FOR YOU.

- If you forward a minute as it stands, you send the owner the work of guessing your question. Write the five parts before anything leaves your desk.
- If you cannot fill the Decision row with a decision and a person waiting for it, do not send the question yet.
- The error is to put your decision in the Question row ("Should we build two more gyms?"). Ask the part only the owner can answer.
- Put your limit in the Form row, in words: "I cannot judge the method; tell me how sure you are and on what."
- The five parts work only when you know enough to narrow the question. When you do not, a narrow question is a guess. Then keep Decision, Context, Form and Deadline, and

make the Question row: "What would you need to know, and what would you ask us, to help us decide this?"

- In one hospital series Goldman and colleagues report, the asker and the owner had different ideas of why a consultation was asked for in 15% of cases. That figure comes from one Boston hospital's series, reported in 1983. It shows questions go astray in practice. It does not tell you how often they go astray in an Indian committee room, which no study we hold measures.

COMMON MISREADING. "Every row is filled, so the question is ready." A row can be filled and still not do its job. "To learn more about obesity" fills the Decision row and names no decision. "Your recommendation" fills the Form row and states no limit. The test for each row is whether it was filled from what you actually know: a decision someone is waiting on, a context that changes the answer, one question the owner can answer, a shape you can use with your limit, and a date with its consequence.

REPORTING IT. We must decide [the decision] by [date]; [who] is waiting. [The context, in two lines.] My question is: [one question]. A [yes or no / range / recommendation / reference] would let us act. I cannot judge [the method]; please tell me how sure you are and on what. If your answer comes after [date], [what happens].

EXERCISE 1 (retrieval). From memory, name the five parts of a routed question in order, and say in a few words what goes in each.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (design). A made-up request. At the district NCD meeting, the district NCD officer says: "The new screening camp form is too long. Ask someone who designs forms whether we can cut it to one page." You decide the owner is a survey methodologist at a university statistics department. The camps restart on 1 Dec 2026, and the forms go to print on 20 Nov 2026. Write the question you would ask, in five parts.

EXERCISE 3 (interpretation). A colleague says: "Goldman showed that one consultation in six goes wrong because the question was unclear." Read Goldman's figures as this section gives them and say what is wrong with the sentence.

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. Made up: these five lines come from one routed question, in the wrong order. Label each line with its part and put them in order.

1. "By 30 Nov 2026; after that the order is placed as it stands."
2. "Is this model of weighing scale accurate to within half a kilogram for adults up to 150 kg?"
3. "The district NCD officer decides next month which scale the screening camps will order."
4. "A yes or no, with the test it rests on. I cannot judge how scales are tested; tell me how sure you are and on what."
5. "The camps weigh adults in village halls, on uneven floors; the maker's leaflet is attached."

2. Made up: each question below is missing exactly one part. Name it.

1. "The councillor must decide by Friday whether to support the tender. The tender document is attached. Is the price for the equipment within the usual range? Please answer by Thursday; after that the councillor decides without it."
2. "Our committee decides on 1 Dec whether to fund a second walking group. Can you tell us whether the first group's attendance register is complete enough to judge it? A yes or no with your reasons would help; I cannot judge your method of checking, so tell me how sure you are. By 25 Nov, please; after that we decide without it."
3. "The tank behind the community hall supplies about two hundred homes; last month's test report is attached. Is the water safe to drink? We need a yes or no, and the test you used; I cannot judge testing methods. By Monday, as the committee meets on Tuesday."
4. "The district NCD officer is deciding whether to translate the camp leaflet into Chhattisgarhi. The leaflet is attached; it is read by adults at camps. Would a translation need to be checked by a second translator? A yes or no would help; I cannot judge translation, so tell me how sure you are and on what."

3. Goldman and colleagues advise the owner to begin their note by stating the specific problem they were called about, for example: "Called to see this 56-year-old woman with breast cancer for opinion on cause of leg weakness." Read the line as if it were the whole question the asker sent. Which of the five parts does it carry, and which does it leave out?

4. Made up: at the Wards Committee's earlier meeting, a member says: "Women in the ward say the path round the park is too dark to walk after six. Ask the corporation's lighting people if it can be lit." You decide the owner is the corporation's street-lighting engineer. The committee meets again on 20 Nov 2026 and is drawing up its list of requests for the next year's ward works. Write the question you would ask, in five parts.

5. Made up: the minutes of the district NCD meeting say: "MO (NCD) to consult dietitian re: diet chart for camps." You are the medical officer (MO) given the task. The camps restart on 1 Dec 2026. The district NCD officer tells you he will decide by 20 Nov 2026 whether the camps hand out a printed diet sheet to adults found to have obesity. Camp staff have about five minutes with each person, and camp leaflets are printed in Hindi. Turn the minute into the question you would ask the dietitian at the district hospital.

6. Made up: the councillor asks you, "The corporation wants a car-free street on Sunday mornings so people can walk and cycle. Ask the traffic police what we need to do." You do not know what the traffic police would need, so you cannot write a narrow Question row. Write the routed question anyway.

7. Made up: here is a worked rewrite. Find what broke.

Part	Question sent
Decision	To learn more about obesity in the ward.
Context	The ward has about forty thousand people; many have obesity.
Question	What are the main causes of obesity in a ward like ours?

Form	A summary with references.
Deadline	When convenient.

8. Made up: here is a second worked rewrite of the park-gym minute. Find what broke.

Part	Question sent
Decision	The Wards Committee decides on 13 Nov 2026 whether to put the same machines in two more parks. The councillor is waiting.
Context	List and photographs of the machines attached; users are mostly women over fifty, some with knee pain or obesity.
Question	Should the corporation put these machines in two more parks, and will they help people in the ward lose weight?
Form	Your recommendation.
Deadline	By 6 Nov 2026; after that the committee decides without it.

9. Made up: at a Wards Committee meeting a member says: "We have written to the medical college for their views on obesity in our ward. They are the experts; we will do what they say." Is this a routed question? Write the question the committee could send instead, and say what even a good answer to it would not settle.

10. Made up: an email from the district NCD officer at 6 pm: "The non-governmental organisation (NGO) wants us to sign the memorandum of understanding (MoU) tomorrow at noon. Please get the legal cell's opinion by then." You will route it to a lawyer through the institution's legal cell. Write the question you would ask, and say what the deadline changes and what an answer by noon would not establish.

5 · Judging whether a reply is responsive, without being able to give it

DEFINITION. A reply is responsive when it passes five checks, run in this order by the person who asked. Asked: it answers the question that was asked, not a neighbouring one. How sure: it says how sure the owner is, and on what. Own field: it stays inside the owner's field, and names what lies outside it. References: the references it gives are real, and say what the reply says they say. Decision: it changes, or firmly confirms, the decision the question served. The asker runs these checks without judging the owner's method, which is the one part of a reply the asker cannot assess. [51, 1, 58, 59, 60, 61, 51, 51, 51, 60, 62, 63, 64, 51, 65, 65, 66, 67, 68, 69, 70, 49, 71, 50]

IN PLAIN TERMS. Now a reply comes back — what the owner sends back. You routed the question because you could not answer it yourself, so you cannot check the answer by working it out.

You can check something else: whether you can use the reply for your decision. Five checks do that, and none of them needs the owner's skill. A reply that passes all five is responsive — a reply you can use for the decision the question served. A reply that fails one is not responsive.

Run them in this order.

No.	Check	What you ask
1	**Asked**	Does it answer the question asked, or a neighbouring one?
2	**How sure**	Does it say how sure the owner is, and on what?
3	**Own field**	Does it stay inside the owner's field, and name what lies outside it?
4	**References**	Are its references real, and do they say what the reply says they say?
5	**Decision**	Does it change, or firmly confirm, your decision? If neither, why did you ask?

Asked comes first. A sure, well-referenced reply to a different question leaves your decision where it was.

Goldman and colleagues report one hospital's series, in Boston. In it, the asker and the owner had totally different impressions of why the consultation was asked for in 15% of cases. In another service, among consultations before surgery for people with diabetes, no specific question was asked in 24% of cases, and the owner ignored the question in another 12%. They show that the question and the reply often fail to meet. They do not show how often it happens in India, and no study we hold counts that.

Put your Question row next to the reply. Try to write the answer to your question in one sentence, using only the reply. If you can only write an answer to a different question, the reply fails **Asked**.

How sure: on what, not how it sounds. Check 2 asks for two things. One is how sure: a word, a range, or "not known". The other is on what: a trial, a guideline, a study of people like yours, a series of the owner's own patients, or the owner's experience. Experience is an allowed answer. It has to be named as the basis.

The trap is to read a confident tone as the answer to check 2. In Meyer and colleagues' study, 118 general internists in the United States diagnosed written cases. They diagnosed 55.3% of the easier cases correctly and 5.8% of the more difficult ones. Their confidence moved only from 7.2 to 6.4 out of 10.

What this does not mean: the cases were written, not real patients, and the authors say their method of delivering cases limits real-world validity. It shows that how sure someone sounds tells you little about whether they are right on a hard question.

Own field. A good reply stays in the owner's field and says where it ends. If the question or the reply reaches past that field, the reply names what lies outside and, where it can, who owns it. A reply that touches nothing outside its field passes by staying inside.

References. Check 4 is Book 0's reference check, and you can run it without the owner's skill. You are not checking whether the study is good, because that would be judging the method. A reply with no references passes check 4 only if check 2 has told you what it rests on instead. When check 4 fails only because the reply cites nothing and names no basis, the ask-back for check 2 covers it; a second owner is for references that are given and do not hold.

Decision. If it moves nothing, either the reply hedged everything, or your question did not serve the decision. Go back to your Decision row.

When a check fails: ask back, or ask a second owner. Two moves, chosen by which check failed, and one rule for when owners still disagree.

When	Do
Asked, **How sure** or **Own field** fails	Ask back: write to the same owner, quote your Question row, and name what is missing.
References fails, or two replies disagree	Ask a second owner in the same field, and send them the same routed question.
Decision fails	Go back to your own Decision row before you write to anyone.
Two owners in the same field still disagree	Say, in these words, that the field is not settled on that question. Decide with the asker what to do meanwhile. Never pick the method you prefer.

These moves are this book's.

The one thing you never judge: the method. You can see what a reply rests on. You cannot see whether the method behind it was right. If you catch yourself deciding that the owner used the wrong method, run the edge test from the first section. Can you say what result would show their method wrong, and check it yourself? If not, you are improvising. Write to a second owner, not a verdict.

The other direction: a question routed to you. Sooner or later the question comes to you. Answering well is passing the checks someone else will run on you. So the answering side has four items, and three of them carry the same labels as the checks, on purpose.

No.	Item	When a question is routed to you
1	**Asked**	Answer the question asked. If it is unclear, ask what decision it serves.
2	**How sure**	Say how sure you are, and on what evidence.
3	**Own field**	Stay inside your field, and name what lies outside it and who owns that.
4	**Next step**	Say what you would do next.

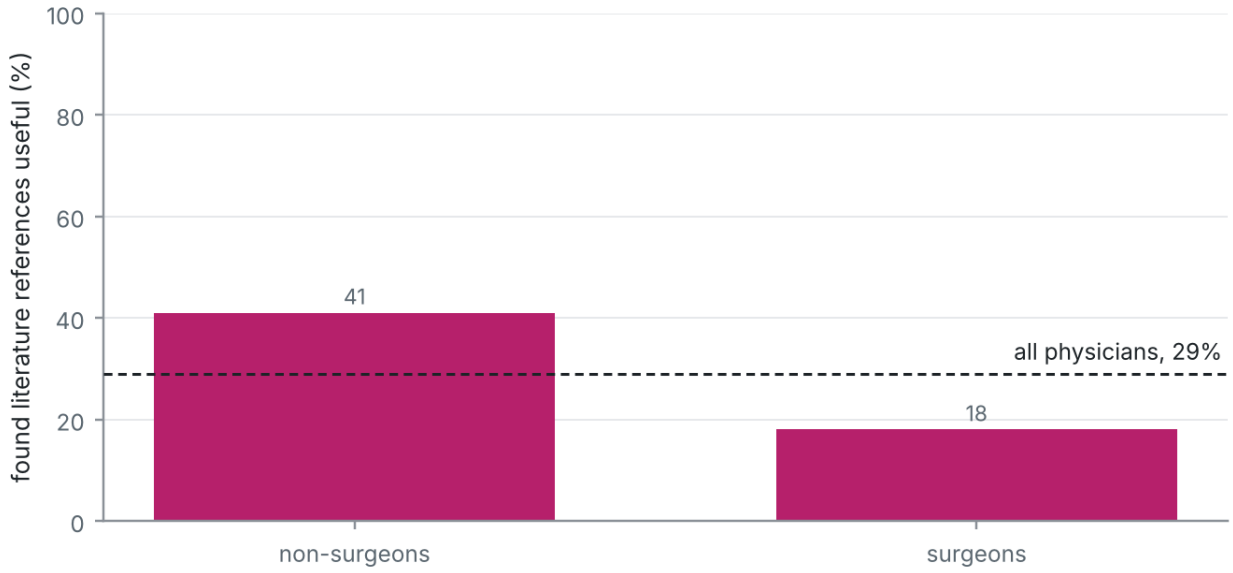
Asked, from the answering side. Confirm the question before you answer it.

In Goldman and colleagues' own series, owners thought their recommendations were crucial to patient management in about 35% of consultations. The askers thought so "only about half as often". Where the two disagreed on why the consultation was asked for, the owner rated their own impact higher in "more than three fourths of the cases". This is one Boston hospital's series, reported in 1983. It shows that people answering can misjudge their own usefulness. It does not show how often you will.

How sure, from the answering side. Say how sure you are and on what, because the asker cannot check your method. This item is the book's own.

Own field, from the answering side. Answer your part, and name the rest and its owner.

Next step. End with what you would do next, including what to do if things change. Goldman and colleagues' sixth commandment is "Provide contingency plans": "A brief description of therapeutic options to be employed should these problems arise may save valuable time later". In your own reply, in one line: name the next step, who takes it, and what to do if the answer turns out not to hold.



What a real survey found (Salerno and colleagues, 2007, 323 referring physicians at three US academic centres): 29% of physicians thought literature references useful in a consultation; 41% of non-surgeons and 18% of surgeons. Practice problem 5 runs check 4 on this survey.

Illustration 1. A made-up meeting: at the district NCD meeting, the district NCD officer asks whether the screening camps should add a body-fat reading. The camps would use the two handheld body-fat machines the district hospital already has. Part of this is yours: what the camp form records, and how the readings would be used in the district's reports. Whether the machines' readings can be trusted for these adults is past your edge. You route it to a nutrition scientist who studies body composition, at a university nutrition department. That is a kind of person, as advice. No one is named. In the meeting you say: "That is outside what I can assess, and here is who can: a nutrition scientist who studies body composition. I will send the question this week."

Here is the question you send, in the five parts. All the details are made up.

Part	Your question
Decision	The district NCD officer decides at the review meeting on 27 Nov 2026 whether the camp form gets a body-fat line, read from the hospital's handheld machines. He is waiting.
Context	Adults screened at village camps, many with obesity. The machines are a handheld model; the maker's leaflet is attached. We have no comparison of its readings with any other measure.
Question	Do this model's readings agree closely enough with an accepted reference measure, in Indian adults with obesity, to be recorded on the camp form?
Form	Yes, no, or not known, with the study or standard it rests on. I cannot judge how such machines are tested; tell me how sure you are and on what.
Deadline	By 20 Nov 2026. If it comes later, the form is printed without the line.

A made-up reply:

> *"Yes, these machines are very reliable. We use them in our clinic every day and I am fully confident in them. Go ahead."*

Here is the judgement you wrote, and sent on to the district NCD officer.

Check	Your mark	Your reason
Asked	passes	It says yes
How sure	passes	"Fully confident"
Own field	passes	Body composition is the owner's field
References	passes	None needed; the owner is sure
Decision	passes	Confirms: add the line

Find what broke before you read on. Here it is, check by check.

How sure broke first. The reply says how sure ("fully confident") and not on what. "We use them every day" could have been a basis, the owner's experience, if the reply had said what that experience showed about agreement with a reference measure. It says only how often the machines are used. The mark was given for tone. Recall the section on improvising: Meyer's 118 physicians moved from 7.2 to 6.4 out of 10 in confidence, while their accuracy fell from 55.3% to 5.8%. A confident tone tells you little on a hard question.

Asked passed too easily. The question asked about agreement with a reference measure, in Indian adults with obesity. The reply answered a neighbouring question: are the machines reliable in the owner's clinic.

References: "none needed" wrote a pass for something that was not there. With no references, check 4 passes only if check 2 has said what the reply rests on, and it had not.

Own field genuinely passes. **Decision** passed only because the checks before it did.

Here is the repaired judgement.

Check	Mark	Reason
Asked	fails	Answers "are they reliable", not "do readings agree with a reference measure in these adults"
How sure	fails	Sure, but not on what
Own field	passes	Stays in body composition
References	fails	None, and nothing else named as the basis
Decision	fails	It neither changes nor firmly confirms the decision, because it answered a neighbouring question; your Decision row is clear, so the ask-back the first failures call for covers it

The move for these failures is to ask back. Here is the message.

> *"Thank you. Our question was whether this model's readings agree with an accepted reference measure in Indian adults with obesity. Could you say whether any study has tested that, and which one? If none has, 'not known' is a useful answer for us, and we will leave the line off the form."*

Why the wrong judgement looked reasonable: the owner really is an expert in the field. The reply was quick, kind and certain. And it said what the meeting hoped to hear.

WHERE THIS PICTURE BREAKS. Meyer's study was of doctors diagnosing written cases. It does not show that this owner is wrong, and the machines may well be fine. The checks say whether you can use the reply, not whether it is true. And if the owner's real basis is long clinical experience and no study exists, a reply that says exactly that passes How sure.

Illustration 2. Here is a reply to the same question that passes. It is made up.

A made-up reply:

> *"Thank you for the clear question. I know of no study that has compared this handheld model with a reference measure in Indian adults with obesity. I checked the maker's leaflet you sent: it describes how to use the machine and cites no such comparison. So my answer is 'not known'. I am fairly sure of that, on those two grounds, though a study I have not seen could exist. Whether a body-fat reading would change what the camps do for each person is a question for your programme, not for me. If you want a reading anyway, I would record it as a trial, alongside waist, for one round of camps, and not use it in reports until a comparison has been done."*

Mark it against the five checks.

Check	Mark	Reason
Asked	passes	Answers the question asked: "not known" is an answer to it
How sure	passes	"Fairly sure", on two named grounds, with the limit stated
Own field	passes	Names what lies outside it (what the camps do) and leaves it to the programme
References	passes	Cites one document, the leaflet you sent, and says what it does and does not contain, which you can check yourself in a minute
Decision	passes	Changes the decision: the line is left off the form, or kept as a trial and out of the reports

A responsive reply can say "not known". What makes it usable is that you can act on it.

Notice that this reply also does the four things the answering side asks of you. It answers the question asked. It says how sure it is and on what. It names what is outside its field. And it gives a next step.

WHERE THIS PICTURE BREAKS. A responsive reply is usable, not proven. If the owner missed a study, the reply is still responsive and still wrong on that point. The five checks cannot find that. Only a second owner in the field could.

Illustration 3. A made-up email: the district NCD officer writes to you.

> *"The camp registers show more people with obesity this year than last year. Is obesity rising in the district? I have to report to the State by the end of the month."*

This one is inside your field. Book 0's section on sampling is enough to answer it. Work through the four items.

Item	What you do
Asked	Restate it: he asks whether obesity is rising in the district, judged from the camp registers. The decision is what to tell the State this month.
How sure	Sure, on one ground: the people in a camp register are whoever came to a camp, a convenience sample. More people with obesity in the register can mean more people came, or different people came. A bigger register does not fix this.
Own field	Why more people came this year (new camp sites, more publicity, a different month) is known to the officers who ran the camps, not to you. Name them as the people to ask.
Next step	For the report: say the registers show more people with obesity screened, not more obesity in the district. To know whether obesity is rising, measure a random sample of adults, drawn the same way, twice, a year apart. Offer to draft that sampling plan for the next review meeting.

Here is the reply you send, in full. It is made up.

> *"You asked whether the camp registers show obesity rising in the district, for this month's report to the State. They cannot show that. The people in the registers are those who came to a camp, so a rise in the count can mean that more people, or different people, came. I am sure of this; it follows from how the people in the registers were found. Why more people came this year is something the officers who ran the camps will know, and I would ask them. For the report, I suggest this sentence: 'More adults with obesity were screened at camps this year than last; the registers cannot show whether obesity in the district has changed.' If you need to know whether it is rising, the next step is to measure a random sample of adults twice, a year apart, drawn the same way both times. I can draft that plan for the next review meeting."*

Before you send it, run the asker's five checks on your own reply. It passes Asked, How sure, Own field and Decision, because it changes what goes in the report. It cites nothing, and check 2 says what it rests on, so it passes References too.

WHERE THIS PICTURE BREAKS. This question was inside your field, which is why you could answer it. When only part of a question routed to you is yours, answer that part and route the rest,

naming its owner. The four items still hold. And a reply that passes your own checks can still be wrong: the checks make it usable, not right.

MUST KNOW POINTS FOR YOU.

- Run Asked first. If the reply answers a neighbouring question, stop and ask back.
- The error is to pass How sure on tone. In Meyer's study, doctors' confidence moved from 7.2 to 6.4 out of 10 while their accuracy fell from 55.3% to 5.8%. Ask for the basis.
- When two replies disagree, do not settle it by deciding whose method is better. Send the same routed question to a second owner in the field. If two owners in the field still disagree, say the field is not settled on that question, and decide with the asker what to do meanwhile.
- Check a reply's references as Book 0 taught: find it, confirm it, find the passage, read it.
- If a reply neither changes nor firmly confirms your decision, look at your own Decision row before you blame the owner.
- The five checks tell you whether you can use a reply, never whether it is true.
- When a question is routed to you, restate it and the decision it serves before you answer.
- In Goldman and colleagues' series, owners thought their advice was crucial in about 35% of consultations; the doctors who asked thought so only about half as often. These are one Boston hospital's figures, reported in 1983. They show the misjudgement happens, not how often it will happen to you.

COMMON MISREADING. "Responsive means right." A responsive reply is one you can use: it answers your question, says how sure and on what, stays in its field, cites what it says it cites, and moves your decision. It can still be wrong, inside the owner's method, where you cannot see. That is why a large or final decision may need a second owner even when the first reply passes every check.

REPORTING IT. Thank you. Our question was: [the Question row, word for word]. Your reply [answers a different question / says how sure but not on what / goes beyond your field on X]. Could you [answer the question as asked / say what your answer rests on / leave X to its owner]? We decide on [date].

EXERCISE 1 (retrieval). From memory: name the five checks on a reply in order, the two moves when a check fails and when you use each, and the one thing you never judge.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (retrieval). From memory: the four items for answering a question routed to you, and which three share their labels with the checks on a reply, and why.

EXERCISE 3 (critique). Made up: the medical officer of the urban primary health centre referred the woman of 52 who teaches at a government school, has obesity and takes tablets for diabetes from the centre, to the district hospital's diabetes clinic. The routed question was: "She wants to start walking 30 minutes a day. Before she does, is any change to her diabetes tablets

needed? A yes or no, with what you would change and why. By her next visit on 10 Nov 2026." The clinic's reply: "Patient seen. Weight loss is essential. Advised diet and exercise. Review in three months." Mark the reply against the five checks and write the message you would send back.

EXERCISE 4 (teaching). A first-year resident says: "The specialist was very sure, so the reply passes How sure." Explain in ten minutes, with a whiteboard, why that is not what the check asks.

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. Made up: the question was: "Can the camp's handheld scales weigh adults up to 150 kg, yes or no?" Mark each first line of a reply as answering the question asked, or a neighbouring one. The figures in the lines are made up.

1. "Yes: the maker states a 180 kg limit, on page 2 of the leaflet you sent."
2. "Scales of this type are widely used in camps across the country."
3. "No: the limit printed on the base is 120 kg."
4. "Weighing is only one part of a good screening programme."

2. Made up: name the check each fragment of a reply bears on, and say whether it passes or fails it.

1. "I am fairly sure, on the basis of two trials in adults like yours."
2. "As for the cost of running the programme, I would cut the budget by half." (from a nutrition scientist)
3. "See Smith 2015" — and no paper of that name can be found.
4. "This does not change my view that you should go ahead as planned."
5. "Whether the corporation will fund it is outside my field; the finance office would know."

3. Made up: a question was routed to you: "Can the ward's anganwadi (childcare centre) weight records be used to see whether children's weight changed after the new snack began?" Here is your draft reply. Label each sentence with the answering item it serves, and name the items that are missing.

1. "You asked whether the anganwadi weight records can show a change after the new snack began."
2. "They can show whether the children weighed changed, if the same children were weighed the same way before and after."
3. "Whether the snack itself is a good one is for a nutritionist, not me."

4. Made up: at the district NCD meeting, the question routed to a survey methodologist was: "Which items on the camp form can be cut without losing what the district's reports need? A marked copy, keep, merge or drop against each item. I cannot judge form design; tell me how

sure you are and on what. By 18 Nov 2026; the form prints on 20 Nov." The reply: "I have marked the attached copy. Keep items 1 to 9; merge 10 and 11 (both ask about tobacco); drop 14, which no report uses — I checked the three report templates you sent. I am sure of the merges and the drop, on those templates; I am not sure whether item 12 (occupation) is used by the State, which only the State cell can tell you. If the form grows again, the same check against the templates applies." Mark the reply against the five checks.

5. A made-up reply from a colleague says: "Doctors like references in a consultation: a 2007 survey of over 300 referring physicians found most of them wanted literature references in the consult (Salerno and colleagues, Archives of Internal Medicine, 2007)." The survey is real. Its abstract says: "Only 29% of physicians thought literature references were useful in consultations." Its results say that nonsurgeons were "significantly more likely than surgeons to find references of value (41% vs 18%), most providers of all specialties did not think they were a useful part of the consult." Run check 4.

6. Made up: you sent the same routed question about the handheld body-fat machines to two owners. One replies: "Not known: no study of this model in Indian adults that I can find." The other replies: "Yes: a 2021 study (made up for this problem) tested this model against a reference measure in Indian adults and found close agreement; the paper is attached." What do you do, and what do you not do?

7. Made up: here is a worked judgement. Find the step that broke.

The question (at the district NCD meeting): "Should the screening camps record waist as well as weight? Yes or no, and on what. By 20 Nov 2026."

The reply: three pages on why body fat around the waist matters for health, with eleven references.

The judgement: "Asked: passes (long and thorough). How sure: passes (eleven references). Own field: passes. References: passes (all eleven found). Decision: confirms (record waist)."

8. Made up: here is a worked judgement. Find the step that broke.

The reply (from a survey methodologist, about the camp form): "Merge items 10 and 11; drop 14. I am sure, on the three report templates you sent."

The judgement: "Asked: passes. How sure: passes. Own field: passes. References: passes. Decision: fails, because the owner should have used a pilot test of the form with camp staff instead of reading the templates, so I am not going to act on it."

9. Made up: at the district NCD meeting, a member says: "The professor was absolutely certain the new leaflet will work, so we can go ahead and print ten thousand." Decide which checks you can run on what the member reports, run them, and say what even a full pass would not establish.

10. Made up: last month a colleague in the OPD routed you this question: "Our OPD weighs every adult. Can we use the weights to tell whether the centre's diet counselling is working?" Here is the reply you sent: "Diet counselling is very important for weight. Most patients lose weight when they follow the advice, and I strongly recommend continuing it. You should also start a yoga class." This reply is the deliberately wrong material of the problem; the book does not as-

sert any of it. Run the asker's five checks on your own reply, rewrite it with the four answering items, and say what your rewrite still does not establish.

6 · Below the clinic: circuit neuroscience, cell and molecular biology, statistical genetics

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Circuit neuroscience of appetite studies which groups of nerve cells, connected to which, make up the network that governs appetite and weight. A systems neuroscientist owns it.

The cell and molecular biology of fat studies the kinds of cells that make up fat tissue and what each does. One of its products is a single-cell atlas, which sorts the cells of a tissue into types by the genes each one is using, read one cell or one cell nucleus at a time. A 2022 atlas of human and mouse white fat found that human fat cells, generally considered one uniform kind, fall into seven subtypes, each with its own markers: genes whose use sets it apart from the others. A metabolic biologist owns it.

Statistical genetics finds, from the DNA of many people, which variants go with a trait and works toward the gene through which they act. A statistical geneticist owns it. [72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 82, 84, 85, 86, 87, 88, 89, 90, 91, 91, 92, 82, 82, 93, 81, 94, 95, 96, 97, 98, 99, 100, 101, 100, 102, 103, 99, 104]

IN PLAIN TERMS. You now have the edge, the five signals and the five parts of a routed question. This section uses them on three fields that sit below the clinic, in the laboratory. The three share one lesson. You can read about their mechanisms, and you cannot judge them.

The first field is **circuit neuroscience** — the study of which groups of nerve cells, connected to which, produce a behaviour such as eating. Eating is not run from one spot. Nerve cells in the hypothalamus and the brainstem — two parts of the brain — trade signals with the gut, the pancreas and fat tissue. Fat tissue and the gut report to the brain, and the brain answers through the nerves that run the organs.

One of those signals is leptin — a hormone made mainly in fat tissue. One group of nerve cells in the hypothalamus senses how much leptin there is, and that amount reflects how much fat the body holds. The owner of this field is a systems neuroscientist.

The second field is the cell and molecular biology of fat. One of its products is a **single-cell atlas** — a map of a tissue's kinds of cell, made by reading which genes each cell, or its nucleus, is using. A cell uses only some of its genes, and in differing amounts; the atlas reads which, cell by cell.

The atlas sorted human fat cells into seven subtypes, where they had generally been considered one uniform kind. The owner of this field is a metabolic biologist.

The curriculum this book follows lists this field as "molecular and cell biology including mitochondrial bioenergetics, autophagy and single-cell adipose atlases (metabolic biologist)". This

book does not define autophagy, and it does not define what mitochondrial bioenergetics covers. (Mitochondria, the parts of a cell that make its energy, were met in Book 0's section E5.) If a paper you are reading turns on one of them, do not guess. Ask: "What does autophagy mean in this paper, what did the authors measure to show it, and does the result change anything I would tell a patient or a committee?"

The third field is **statistical genetics** — finding, with statistics on many people's DNA, which variants go with a trait and which gene they act through.

A **variant** — a place where people's DNA differs, often by one letter — can go with a trait. A **genome-wide association study (GWAS)** — a scan of the whole of many people's DNA for variants that go with a trait — finds common variants with small effects. A **rare-variant burden test** adds up the rare changes in one gene across people, and so catches rare variants with large effects.

Four more methods are named in the field. Each does one thing.

Method	What it does, in one line
Genotype imputation	fills in DNA letters a test did not read, using a reference panel of fully read genomes
Fine-mapping	narrows a stretch of DNA linked to a trait down to the variant most likely to cause the signal, because a GWAS signal points at a region and rarely at the variant itself
Colocalisation	tests whether a trait and a gene's activity are driven by the same variant
Transcriptome-wide association study (TWAS)	tests whether a gene's predicted activity goes with the trait

The curriculum this book follows names the field "statistical genetics beyond MR — imputation, fine-mapping, colocalisation, transcriptome-wide association, rare variant and exome work". MR is Mendelian randomisation — a way of using genes to test whether an exposure (in a study, the thing whose effect is being tested, such as a habit or a level in the blood) causes an outcome. This book does not teach it; it belongs to the methods subject. The owner of this field is a statistical geneticist.

Here is who owns each field, and where in India to start looking.

Field	Owner	Where to look
Circuit neuroscience of appetite	a systems neuroscientist	a university physiology or neuroscience department; the Indian authors of papers in the field that you have read
Cell and molecular biology of fat, including single-cell atlases	a metabolic biologist	a university biochemistry or cell-biology department
Statistical genetics beyond Mendelian randomisation	a statistical geneticist	a university genetics or biostatistics department

Illustration 1. Open the 2024 review by Gan, Cerbone and Dattani in *Endocrine Reviews*, at https://pmc.ncbi.nlm.nih.gov/articles/PMC11074800/. It is a review of the brain circuits that govern appetite and weight. Search the page for *In mice, acute activation*.

> *In mice, acute activation of NTS POMC neurons causes a short-term reduction in food intake with no change in body weight, while chronic activation of ARC POMC neurons is required to lead to the same effect, but additionally results in a reduction in weight.*

NTS and ARC are two small groups of brain cells. The NTS, the nucleus tractus solitarius, is in the brainstem, and ARC, the arcuate nucleus, is in the hypothalamus. POMC neurons are nerve cells that make a signalling protein called POMC (pro-opiomelanocortin). In plain words: switching on one group of cells in the brainstem cut eating for a short time and did not change weight. The same effect, with weight loss, needed a group in the hypothalamus to be switched on for a long time.

This is the field's kind of answer: which cells, where, and what happens to eating and weight when they are switched on, in mice. Now search for *often redundant*.

> *the complex and often redundant network*

The network has spare routes.

Now see what the review does not tell you. It does not tell you whether any of this holds in people, whether a medicine could do it, or how much weight a person would lose. The review itself says that understanding of these circuits "remains incomplete".

A made-up call. A reporter from a Hindi daily phones you at six in the evening. Her story is due tonight. "A new study has found the hunger switch in the brain. Can a pill switch it off? I need one line from a doctor."

The first signal to fire is **Loose word**. You are about to repeat "hunger switch". Could you define it if she asked? "Switch" says one place turns eating on and off. The review you could open describes a network with spare routes.

Here is what you **can** answer, so you are not left with nothing. You can tell her what the study measured and in whom, mice or people, if you read its summary. That is reading, and it is yours.

The tempting line is: "Yes, the hypothalamus is the brain's hunger centre." That line is improvising. "Hunger centre" is the same loose word in other clothes.

What you say to her: "That is outside what I can assess, and here is who can: a systems neuroscientist. I will send one the question now and call you back before eight." Here is the question you would ask a systems neuroscientist.

Part	What you write
Decision	Whether I give the reporter a line on the "hunger switch" tonight, and what it says. The reporter is waiting; the story runs tomorrow.
Context	A news report of a new study on brain cells and eating. I have the study's summary only. Readers are the general public, in Hindi.
Question	Does this study show one group of brain cells that controls eating on its own, or one part of a larger circuit, and would the finding be expected to hold in people?

Form	Two short answers, one to each part, and one plain sentence I may quote. I cannot judge the method; tell me how sure you are and on what.
Deadline	Today, 8 pm, before the reporter files. If later, I tell her I have no comment on the mechanism.

WHERE THIS PICTURE BREAKS. The finding is in mice, and the review says our understanding of these circuits remains incomplete. It does not tell you that people have the same circuit, that a medicine could act on it, or how much weight anyone would lose. A network with spare routes may not respond the way one group of cells does when it is switched on alone.

Do not route the part you can read yourself. Whether the study was in mice or in people, and what it measured, is in its summary. Route only the part that needs the field's method: whether the cells it found control eating on their own.

Illustration 2. Open the 2022 atlas by Emont and colleagues in *Nature*, at https://pmc.ncbi.nlm.nih.gov/articles/PMC9504827/. Search for *seven subpopulations*.

> *human white adipocytes cluster into seven subpopulations with distinct markers*

Now search for *generally considered to be monotypic*.

> *White adipocytes are generally considered to be monotypic and essentially uniform in function, although some recent studies have begun to challenge this assumption*

In plain words: fat cells had been treated as one kind, and the atlas splits them into seven.

Who was in it? Search for *9 women*.

> *we collected subcutaneous WAT from 9 women*

WAT is white adipose tissue, white fat. Subcutaneous means under the skin. White adipocytes are white fat cells.

Then search for *10 women*, in the same paragraph. It gives the second human group as "(10 women, 3 men)". So the human samples came from nine women in one group, and from ten women and three men in another. Mice were studied too.

This is the field's kind of answer: which kinds of cells a tissue holds, and which genes each kind is using.

Now see what it does not tell you. Search for *limited cohort*.

> *In our limited cohort, we could not detect major effects of BMI on cell type proportions.*

Then search for *after a fast*.

> *the human samples were collected after a fast, while the mice were harvested after ad libitum feeding*

Human and mouse samples were taken in different states, humans after a fast and mice after feeding freely, so differences between them are not all differences between species. Last, the paper reports one subtype as "a rare subpopulation associated with T2DM", which is type 2 diabetes. The atlas shows a link, not a cause.

Figures quoted in this illustration are from [105].

WHERE THIS PICTURE BREAKS. Nine women in one group, and ten women and three men in the other, are enough to find kinds of cells. They are not enough to say how body size changes the mix, and the authors say they could not detect that. A subtype "associated with" diabetes is a link, not a cause. The paper does not say that any of the people sampled was Indian, and it says nothing about Indian fat tissue.

Illustration 3. A made-up call. The same reporter rings a week later. "Scientists say there are seven kinds of fat cell, and one kind causes diabetes. Is that right? I need it by eight."

The first signal is **Unknown standard**. You do not know how this field tells one kind of cell from another, or which atlas it treats as its reference.

Here is what you **can** answer. You can read her the paper's own verb. The paper says the subtype is "associated with" type 2 diabetes. "Causes" is her word, not theirs.

The tempting line is: "Yes, that is the bad fat cell behind diabetes." That line improvises. It turns a link into a cause, it borrows a standard you do not know, and it puts a moral word on a kind of cell.

What you say to her: "That is outside what I can assess, and here is who can: a metabolic biologist. Until I hear back, the paper's own words are 'associated with'." Here is the question you would ask a metabolic biologist.

Part	What you write
Decision	Whether the newspaper prints "one kind of fat cell causes diabetes". The reporter files tonight.
Context	A 2022 study in Nature that mapped the cells of human and mouse white fat. Its human samples came from nine women in one group and ten women and three men in another. It reports one rare subtype of fat cell as "associated with" type 2 diabetes.
Question	Does this atlas show that this subtype causes diabetes, or only that it goes with it, and is this atlas the field's usual reference for human fat?
Form	Yes or no to "causes", one sentence on what the finding does show, and whether you would call this atlas the reference. Tell me how sure you are and on what; I cannot judge the sequencing method (how the atlas read the genetic material of each cell or nucleus, letter by letter).
Deadline	Today, 8 pm. If later, the story uses the paper's own words, "associated with".

WHERE THIS PICTURE BREAKS. If the reporter only wants to know what the paper says, read it to her; that is yours. Route the question only when she wants to know what the finding means for people with diabetes, which needs the field's judgement.

Illustration 4. Open the 2022 review by Loos and Yeo in *Nature Reviews Genetics*, at https://pmc.ncbi.nlm.nih.gov/articles/PMC8459824/. Go to its glossary and search for *Monogenic obesity*.

> *A severe, early-onset form of obesity, caused by a single-gene mutation, with little or no influence of the environment.*

Then search for *Polygenic obesity*.

> *A common multifactorial form of obesity, resulting from an interaction between the obesogenic environment and hundreds of genetic variants.*

"Mutation" is the review's word; this book says variant. Here it means a rare variant in one gene with a large effect. In plain words: one rare form of obesity comes from a change in a single gene. The common form comes from hundreds of variants acting together with the surroundings people live in.

Now meet a **polygenic score** — a number that adds up a person's risk variants, each weighted by its effect in a GWAS: how much the trait differs, on average, with each copy of the variant. The review asks how well such a score predicts obesity. Search for *only 43%*. In its own analysis the review used UK Biobank data. UK Biobank is one of the "large-scale cohorts and biobanks" the review names: a large British collection of people's health records and DNA.

> *of those who were predicted to develop obesity, only 43% actually developed obesity*

The "prediction" was a score at or above the 90th percentile, the top tenth. Of the people it picked out, 43% had obesity. The review does not say how common obesity was in the whole group, so you cannot tell from this line how much better than chance that is; the review's own verdict follows. Now search for *does not reliably predict*.

> *does not reliably predict who is at risk of developing obesity and who is not*

The authors also write that a score will not manage this alone, calling it unlikely that it "will ever be able to accurately predict obesity on its own".

Here is a second kind of answer, from the methods side. Open the 2024 review by Naito and Okada in the *Journal of Human Genetics*, at https://doi.org/10.1038/s10038-023-01213-6. Search for *same ancestral groups*.

> *It is necessary to employ reference panels consisting of individuals from the same ancestral groups as the target samples due to the inter-ancestry variations in haplotype structures.*

A genome is all of a person's DNA. A haplotype is a run of DNA letters passed down together. In plain words: imputation borrows patterns from reference genomes, and the reference must come from people of the same ancestry as the people being studied. Caballero and Mahjani's 2026 review, at https://doi.org/10.1016/j.xhgg.2026.100599, makes a related point about colocalisation. It says the method's usefulness is limited by "ancestry bias in reference cohorts".

This is the field's kind of answer: whether a score predicts, how well, in whom, and whether the reference data fit the people you care about.

Figures quoted in this illustration are from [106].

WHERE THIS PICTURE BREAKS. The 43% comes from one score tested in UK Biobank data. It does not tell you how any score performs in Indian children, or how a particular lab's test was built. The ancestry point is made for imputation and for reference panels; it tells you a question to ask, not the answer for Indian samples.

Illustration 5. A made-up call. The reporter again, a month on. "A private lab is selling a gene test that tells parents whether their child will have obesity. Should parents buy it?"

The first signal is **No test**. You cannot say what result would show your answer wrong. You do not know which variants the test reads, how its score was built, or on whom it was checked.

Here is what you **can** answer. You can tell her what a 2022 review found: the latest genetic score for body mass index, tested in UK Biobank data, did not reliably predict who developed obesity. That is reading, and it is yours. Whether this lab's test does better is not.

The tempting lines are two, and both improvise: "These tests are useless; obesity is not genetic." and "Genes decide it, so the test is worth doing." The review says the common form comes from hundreds of variants acting with the surroundings people live in, so neither line holds.

What you say to her: "That is outside what I can assess, and here is who can: a statistical geneticist. I will send one the question tonight and tell you by eight what they say." Here is the question you would ask a statistical geneticist.

Part	What you write
Decision	What I tell the reporter about whether parents should pay for this test. Parents may act on the story.
Context	A private lab advertises a gene test it says predicts obesity in children. I have the advertisement, not the method. The buyers would be Indian parents. A 2022 review reports that the latest genetic score for body mass index did not reliably predict obesity in UK Biobank data.
Question	Can a gene test of this kind predict which Indian children will develop obesity well enough for parents to act on it, and what would the lab have to show for us to know?
Form	Yes, no, or "cannot tell without these", with the two or three things the lab would have to show. Tell me how sure you are and on what. I cannot judge how a score is built.
Deadline	Today, 8 pm. If later, the story says the evidence was not checked.

Now start three rows of your contact list. The columns are the ones you will keep for every field. *Name and institution* is the person you find. *How you know them* takes one word: "worked with", "met" or "found", where found means located, not yet contacted. *Last question asked* is the **Question** row, shortened to one line. *Asked on* and *Checked on* are dates, and the second is the last day you confirmed the person is still there and still does this work.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Circuit neuroscience of appetite	a systems neuroscientist	(yours to fill)		One brain-cell group controlling eating, or part of a circuit; would it hold in people?		
Cell and molecular biology of fat	a metabolic biologist	(yours to fill)		Does the atlas show the subtype causes diabetes, or goes with it?		
Statistical genetics	a statistical geneticist	(yours to fill)		Can a child gene test predict obesity in Indian children well enough to act on?		

WHERE THIS PICTURE BREAKS. If the question is what the review says, you can answer it at the read depth. Route the question only when it needs the field's own method: how a score was built, and whether it works for the children in question.

MUST KNOW POINTS FOR YOU.

- Do not call any one part of the brain the "hunger centre" or a "switch". Say what the study measured and in whom, and route the rest: "that is a question for a systems neuroscientist".
- Do not say a kind of cell "causes" a disease because an atlas links them. Repeat the paper's own verb, and ask a metabolic biologist whether anything more is known.
- Do not tell anyone that obesity "is not genetic", or that a gene test "works". Whether a particular test predicts in Indian children is a statistical geneticist's question.
- A result in mice is not yet a result in people. When a story says "scientists found", ask first: in mice or in people?
- When a genetic result for Indian people rests on imputed data, ask which reference panel was used. If nobody can tell you, treat the result as untested in Indian people.
- Routing is the wrong move when the question is what a paper says. Send the owner only the part that needs their method, or you spend their time on your reading.
- Autophagy and mitochondrial bioenergetics are on the curriculum's list for this field and are not defined in this book. If your argument needs either word, you are past your edge by definition. Write the routed question before you use the word in a lecture or a note.

COMMON MISREADING. "Scientists have found the gene, the cell or the switch for obesity." Each of the three fields in this section produces a map of one part: one group of cells, one kind of fat

cell, one variant. A map of a part is read as the cause of the whole. The reviews you can open say the opposite. The appetite network is often redundant. An atlas subtype is "associated with" a disease. The common form of obesity comes from hundreds of variants acting with the surroundings people live in.

EXERCISE 1 (retrieval). Name the owner of each of the three fields in this section, and one kind of answer each can give that you cannot.

EXERCISE 2 (retrieval). In one line each, what do genotype imputation, fine-mapping, colocalisation and a transcriptome-wide association study do?

EXERCISE 3 (design). A made-up request. The district NCD officer forwards you an email from a postgraduate student. The student wants the district's obesity screening records and blood samples from 200 people "to do a GWAS of obesity in our district". The number 200 is made up. The officer asks whether to agree, and wants an answer before the next review meeting in a fortnight. Write the question you would send to a statistical geneticist, in the five parts.

EXERCISE 4 (critique). A made-up line from a continuing-education talk: "The hypothalamus is the body's hunger switch, so a pill that turns it off will end obesity." Name the first signal that should fire in the speaker, and rewrite the line so it says only what the speaker can check.

7 · Methods you consult before you design: causal discovery, interference, deep learning

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Causal discovery algorithms are computer methods that try to work out, from data, which variables cause which, and in what direction, and draw the result as a causal graph. A 2026 scoping review of their use in medical research found a critical gap in systematic assessments of how well they perform there. A causal inference methodologist owns this field.

Interference is present when one person's treatment changes another person's outcome. A methodologist owns this field, and is asked before the design is fixed.

Deep learning models learn complex patterns from very large amounts of data. A 2019 systematic review found that, where comparisons were at low risk of bias, machine learning and logistic regression predicted clinical outcomes about equally well. Building and running these systems is the job of a machine-learning engineer or data scientist, whom you work with as a collaborator. [107, 108, 109, 109, 110, 111, 112, 112, 113, 114, 115, 116, 117, 118, 119, 120, 120, 120, 121, 121, 122, 121, 122, 123, 124, 117, 125, 126, 127, 127, 128, 128, 129, 129, 128, 130, 131, 132, 133, 134, 135, 132, 136, 137, 138, 139]

IN PLAIN TERMS. The last section's fields were in the laboratory. This section's three are methods: the kind of thing a committee is offered, or needs, before it designs a study or buys a tool. Two of them, causal discovery and interference, must be raised before the purchase or the design is fixed. The third owner you work with throughout. Afterwards the owner can only tell you what your data cannot show.

The first field is **causal discovery** — a computer method that tries to work out, from data, which variables cause which. You give the algorithm a table of variables, and it returns arrows: this causes that. The arrows make up a **causal graph** — a drawing of variables joined by arrows from cause to effect. The owner of this field is a causal inference methodologist.

The second field is **interference** — also called spillover: one person's treatment changes another person's outcome. The owner of this field is a methodologist, and you ask them before the design is fixed. Often it is the same causal inference methodologist, because the paper that names the problem treats it as part of causal inference.

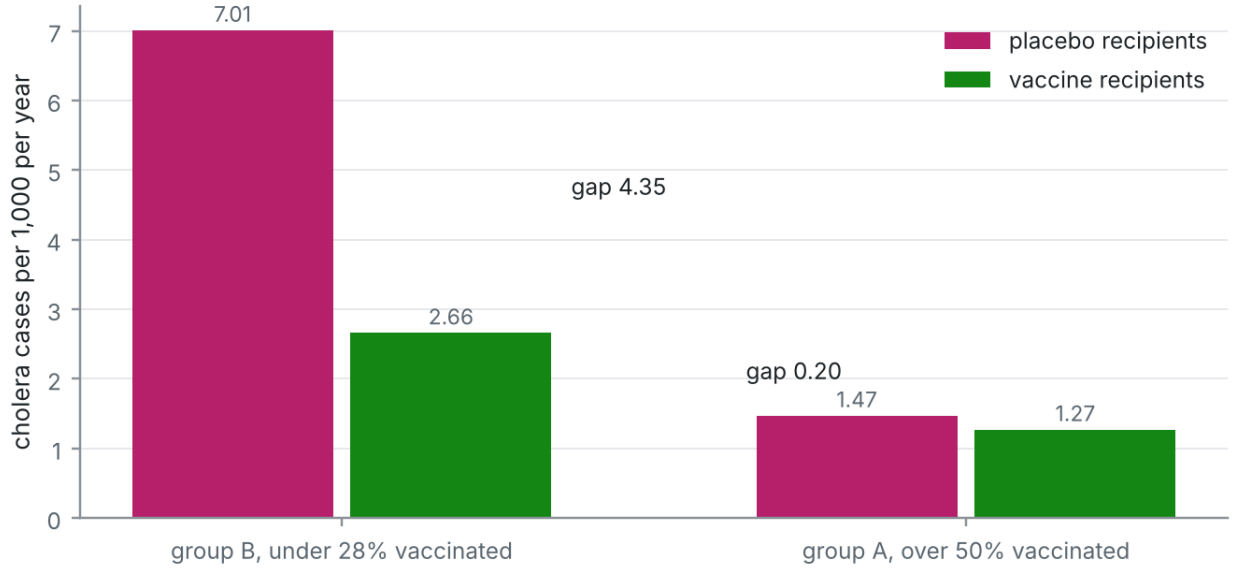
The third field starts with a baseline. **Logistic regression** — the ordinary statistical way to predict whether a person has, or will get, a condition — is the usual method. **Machine learning** covers other methods, such as artificial neural networks, support vector machines and random forests, offered as alternatives to it.

Two more words come with it. **Deep learning** — newer machine-learning models that learn complex patterns from very large amounts of data. Naito and Okada set them apart from "conventional machine learning" methods, meaning the older ones. **The cloud** — running an analysis on

remote computers, which you reach by uploading your data. The owner of this field is a machine-learning engineer or data scientist, and you work with them as a collaborator.

Here is who owns each field, and where to look.

Field	Owner	Where to look
Causal discovery algorithms	a causal inference methodologist	a biostatistics department; the authors of methods papers you have read
Interference and spillover	a methodologist, asked before the design is fixed	a biostatistics department; the authors of methods papers you have read
Deep learning and cloud infrastructure	a machine-learning engineer or data scientist, as a collaborator	a computer-science or data-science department; your institution's IT office



Cholera cases per 1,000 people per year in an individually randomised, placebo-controlled trial of killed oral cholera vaccines, by the vaccine coverage of the residential area (bari), as Hudgens and Halloran report. Where under 28% were vaccinated, vaccine recipients had 4.35 fewer cases per 1,000 than placebo recipients (7.01 against 2.66); where over 50% were vaccinated, the gap was 0.20 (1.47 against 1.27). Read group A alone and the vaccine would look as if it had little effect.

Illustration 1. Open the 2026 scoping review by Liu and colleagues in *JMIR Medical Informatics*, at https://pmc.ncbi.nlm.nih.gov/articles/PMC13032097/. A scoping review is a map of what has been studied on a question, not a pooled analysis. Search the page for *met the inclusion criteria*.

> *Out of 2296 identified publications, 72 (3.1%) met the inclusion criteria.*

So 72 studies out of 2,296 records made it into the review.

Now the claim the curriculum makes about this field. The curriculum this book follows says that causal discovery algorithms "underperform on real epidemiological data". No study we hold measures this. What is measured is narrower. Liu and colleagues report "a critical gap in systematic assessments of performance in medical research settings". Zhu, Benos and Chikina say that evaluation "is typically performed on synthetic datasets", and on their own benchmark of real

biological data an algorithm called PC (the Peter-Clark algorithm, one of the commonest causal discovery methods) was "particularly accurate". So performance on real health data is largely unmeasured, and the one real-data benchmark whose results we hold, Zhu's on gene measurements in cells, does not show underperformance.

Check the second paper for yourself, so you can see what "real" meant there. Open Zhu, Benos and Chikina's 2024 paper in *Bioinformatics*, at https://pmc.ncbi.nlm.nih.gov/articles/PMC11373380/. Search for *direct genetic manipulation*.

> *we compile a series of biological benchmarks consisting of causal graphs inferred from direct genetic manipulation experiments and context-matched, large-scale datasets*

In plain words: their real data were measurements of genes in cells, and the true causes were taken from experiments in which genes were changed on purpose. They are careful about this. They write that the "ground truth", the answer they treat as known, "is not absolute". Now search for *do not meet such requirements*.

> *biological datasets, frequently, do not meet such requirements*

Synthetic data are made to meet the requirements the methods need. Real biological data often do not.

Last, ask what would settle the curriculum's claim. Liu and colleagues say they "strongly recommend the curation of medical benchmark datasets derived from gold-standard sources, such as large-scale RCTs or well-validated longitudinal cohorts". RCTs are randomised controlled trials: chance decides who gets the treatment, and a comparison group does not get it.

This is the field's kind of answer: whether an algorithm has been tested on data whose true causes were known, and what it assumes.

Figures quoted in this illustration are from [140].

WHERE THIS PICTURE BREAKS. Zhu and colleagues tested gene measurements in cells, not records of people. Liu and colleagues found that systematic tests in medical research are missing. Neither tells you how an algorithm would do on a district's screening records. Neither shows that the algorithms fail there, and neither shows that they work.

Illustration 2. A made-up meeting. At the district NCD programme review, the district NCD officer reads out a vendor's offer. "Their AI reads our screening records and finds the causes of obesity in the district. They want an answer by Friday."

The first signal is **No test**. You cannot say what result would show the vendor's arrows wrong. Nobody has told you whether the software was ever run on data where the true causes were known.

Here is what you **can** answer. You can say what the records hold: one visit per person, and which measurements were taken. You can say that nothing in them came from an experiment. That is your own field.

The tempting line is: "If the software finds it in our own data, that is real evidence." That line improvises. It treats the software's arrows as evidence before anyone has said what result would show them wrong.

What you say to the meeting: "That is outside what I can assess, and here is who can: a causal inference methodologist. I will send one the question today and report by Thursday." Here is the question you would ask a causal inference methodologist.

Part	What you write
Decision	Whether the district signs the vendor's offer. The district NCD officer decides on Friday.
Context	The district's NCD screening records: one visit per person, with age, sex, weight, height, waist, blood pressure and blood sugar. No data from any experiment or trial. The vendor says its software "finds the causes" from these records.
Question	Can a causal discovery algorithm find causes of obesity in one-visit screening records like ours, and has the vendor's algorithm been tested on data where the true causes were known?
Form	Yes, no, or "only if these assumptions hold", with the assumptions in plain words and the test result you would want the vendor to show. Tell me how sure you are and on what; I cannot judge the algorithm.
Deadline	Thursday, so the officer has it before Friday. If later, the district defers the offer.

WHERE THIS PICTURE BREAKS. If the vendor only wants to describe the records (how many people, how many with obesity), that is ordinary counting and yours to check. Route the question when the claim is about causes.

Illustration 3. Open Hudgens and Halloran's 2008 paper in the *Journal of the American Statistical Association*, at https://pmc.ncbi.nlm.nih.gov/articles/PMC2600548/. Search for *bari*.

> *we consider data from an individually randomized, placebo-controlled trial of killed oral cholera vaccines*

> *whether the level of vaccine coverage in a residential area, called a bari, was related to the incidence of cholera in individual vaccine recipients or placebo recipients residing in the bari*

In plain words (incidence is the rate of new cases): it was an individually randomised trial of a cholera vaccine, and the authors looked again at its results by how many people in each residential area, called a bari, had been vaccinated. That share is the area's coverage. Now search for *groups A and B*.

> *For illustration, we consider the groups with more than 50% and less than 28% coverage, which we denote as groups A and B.*

So group A had high coverage, and group B had low coverage.

The paper counts cases of cholera per 1,000 people per year. It compares vaccine recipients with placebo recipients inside each group (the paper calls the second group "unvaccinated"), and calls the gap the direct effect. A placebo is a dummy dose with no vaccine in it; placebo-controlled means the comparison group got one. In each line below, the first figure is the placebo recipients' rate and the second the vaccine recipients'. Work out what the paper reports, one group at a time.

```
Group B, low coverage: 7.01 minus 2.66 = 4.35 fewer cases per 1,000 among the vac-
cinated
Group A, high coverage: 1.47 minus 1.27 = 0.20 fewer cases per 1,000 among the vac-
cinated
```

Check each line against the paper. Search for *estimated direct effect*. The paper prints the second figure as .20.

> *the estimated direct effect in group B is 7.01-2.66 = 4.35*

> *The estimated direct effect in group A is 1.47-1.27 = .20, considerably lower than in group B.*

The gap is 4.35 fewer cases per 1,000 where under 28% were vaccinated, and 0.20 where over 50% were. Now read what the authors make of it.

> *If an analysis were limited to group A only, the evidence would suggest that the vaccine has little effect.*

In group A alone, the vaccine would look as if it had little effect. Search for *indirect protection*. The authors cite another analysis that concluded the vaccines "provide significant indirect protection to nonvaccinated individuals". Where most neighbours are vaccinated, the people who are not vaccinated are protected too, so the gap between the two shrinks.

In trials of whole groups, this leak across groups has its own name. Search for *contamination*.

> *In the literature of group-randomized studies, violation of no interference across groups is called contamination.*

Why must you ask before the design is fixed? Search for *two-stage randomization*.

> *Using an experimental design with a two-stage randomization procedure (first at the group level, then at the individual level within groups)*

The paper's methods give unbiased answers only under this design: groups randomised first, then people within groups. It calls that Assumption 1. The cholera trial was randomised person by person, so the paper uses it only to illustrate. Of Assumption 1 it says:

> *Assumption 1 is determined by the experimental design and, thus, should be under control of the investigator.*

So the choice is the investigator's, and it is made when the study is designed.

This is the field's kind of answer: whether people's outcomes depend on each other's treatment, and which design can still separate the effects.

A made-up meeting. At the Wards Committee, the councillor proposes a nutrition programme. Families in half the lanes of the ward, chosen by lottery, get cooking sessions and counselling for a year. The other half wait and are the comparison.

The first signal is **Unknown standard**. You know the standard way to test a programme: chance decides who gets it, then you compare. You do not know the standard method when families in the two halves share a market, a school and recipes.

Here is what you **can** answer. You can say how the ward would measure change: weight and waist in both halves at the start and after a year. That part is yours.

The tempting line is: "The lottery takes care of it; any difference will be the programme's." That line improvises. It assumes the families in the comparison lanes are untouched by the programme, and you do not know that they are.

What you say to the committee: "That is outside what I can assess, and here is who can: a methodologist. I will ask one before we fix the lanes." Here is the question you would ask a methodologist.

Part	What you write
Decision	Whether the committee approves this design for the ward's nutrition programme. The councillor and the committee decide at their next meeting.
Context	Families in neighbouring lanes share a market, a school and recipes. The programme gives cooking sessions and counselling to families in half the lanes, chosen by lottery. We would measure weight and waist in both halves at the start and after a year.
Question	If families in programme lanes share what they learn with families in comparison lanes, what design would still let us tell whether the programme worked, and is this design one?
Form	A recommendation: keep this design, change it (and how), or do not compare lane against lane. Tell me how sure you are and on what. I cannot judge the statistics of the design.
Deadline	Before the committee meets in three weeks. After that the lanes are fixed and the design cannot change.

Figures quoted in this illustration are from [141].

WHERE THIS PICTURE BREAKS. Cholera spreads from person to person, so a vaccine protects neighbours by biology. A nutrition programme can spread only if people share food, recipes or

advice. The trial shows that spillover can hide a real effect; it does not tell you whether, or how much, a ward nutrition programme would spill over.

If the programme reached every family in the ward and nobody was compared, there would be no comparison for spillover to blur. Then the methodologist's question changes, and so does the design.

Illustration 4. Open the 2019 systematic review by Christodoulou and colleagues in the *Journal of Clinical Epidemiology*, at https://doi.org/10.1016/j.jclinepi.2019.02.004. It is behind a paywall, so your library may hold it. A systematic review is a study of studies. Search for *71 of 927*.

> *We included 71 of 927 studies.*

Then search for *282 comparisons*.

> *We identified 282 comparisons between an LR and ML model*

LR is logistic regression, and ML is machine learning. The review compared the two in 282 pairs.

Risk of bias, met in Book 10, means flaws in how the studies were run that push the estimate one way. The authors scored five warning signs in each comparison: unclear or biased checking of how well the models performed; variables picked by the data for one method and not the other; continuous measurements handled differently for the two; different predictors given to each; and a correction for rare outcomes used for only one. A comparison counted as at low risk of bias only if all five were scored absent; "unclear" on any one counted as high risk.

Search for *similar when comparisons were at low risk of bias*.

> *The AUC of logistic regression and machine learning models for clinical risk prediction were similar when comparisons were at low risk of bias; machine learning (ML) performance was higher in comparisons that were at high risk of bias.*

In plain words: where the comparison was done carefully, the two methods did about equally well. Machine learning came out ahead only where the comparison was done less carefully. AUC, the area under the receiver operating characteristic curve, is the measure 64 of the 71 studies used to assess discrimination: how well a model separates people who have the outcome from people who do not. It runs from 0.50, no better than tossing a coin, to 1.0, perfect prediction. Now search for *do not automatically lead*.

> *ML models do not automatically lead to improved performance over traditional methods.*

Why might that be? The review says machine learning "tends to work well for problems with a strong signal-to-noise ratio", for example "handwriting recognition, gaming, or electric load forecasting". A strong signal means the pattern stands out clearly from the random scatter.

Now deep learning, from a second source. Open Naito and Okada's 2024 review, at https://doi.org/10.1038/s10038-023-01213-6. It is about filling in missing DNA letters, which you met in the last section. Search for *modest accuracy improvement*.

> *the current deep learning-based genotype imputation methods do have certain limitations and have not yet become standard. These limitations include the modest accuracy improvement over statistical and conventional machine learning-based methods.*

In that field, so far, deep-learning methods give a modest gain over older ones. The review says nothing about deep learning in other fields. Now search for *by uploading genotype data*.

> *Genotype imputation servers enable users to perform genotype imputation remotely solely by uploading genotype data of target samples.*

That is what the cloud means in practice: you do the analysis remotely, by uploading your data. The review describes one such server as "a secure cloud-based imputation platform".

This is the field's kind of answer: whether a newer method beats an older one on your kind of problem, measured fairly.

Figures quoted in this illustration are from [142].

WHERE THIS PICTURE BREAKS. The review searched studies from January 2016 to August 2017, and its authors say new studies will have appeared since. Its machine learning includes neural networks but is not deep learning in particular. It compares predictions, not tools in use: it says nothing about cost, privacy, or what happens to data uploaded to someone else's computers.

Illustration 5. A made-up meeting. The same vendor has a second offer for the district NCD officer: a deep-learning tool that predicts who will develop diabetes. The district uploads its records to the vendor's cloud and gets back a risk score for each person.

The first signal is **One source**. Your only evidence is the vendor's brochure, with one accuracy figure from one hospital. You cannot judge it.

Here is what you **can** answer. You can say what the district would do with a score: who gets called back, by whom, and what they are offered. That decision is yours and the officer's.

The tempting line is: "Deep learning beats old statistics, so this will be better than anything we have." That line improvises. The 2019 review found machine learning no better than logistic regression where comparisons were at low risk of bias, and a brochure figure from one hospital does not say how the tool would do on your records.

What you say to the meeting: "That is outside what I can assess, and here is who can: a data scientist. I will ask one before Friday." Here is the question you would ask a machine-learning engineer or data scientist.

Part	What you write
Decision	Whether the district pays for the tool and uploads its records to it. The district NCD officer decides on Friday.

Context	The vendor's brochure gives one accuracy figure from one hospital's data. The tool runs on the vendor's remote computers, and the records hold patients' personal details. A 2019 review found machine learning no better than logistic regression where comparisons were at low risk of bias.
Question	Would this tool predict diabetes among our district's people better than a simple regression model built on the same records, and what test would show it?
Form	Yes, no, or "cannot tell without this test", with who should run the test with us. Tell me how sure you are and on what. I cannot judge the model.
Deadline	Thursday, before the officer decides on Friday. If later, the district defers the offer.

Uploading patients' records raises questions of privacy and permission. They belong to other owners, the institution's IT office first, and this question does not answer them.

Now add three rows to your contact list, in the columns you met in the last section.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Causal discovery algorithms	a causal inference methodologist	(yours to fill)		Can causal discovery find causes in one-visit records, and was the tool tested where causes were known?		
Interference and spillover	a methodologist, before the design is fixed	(yours to fill)		What design still works if programme lanes share with comparison lanes?		
Deep learning and cloud infrastructure	a machine-learning engineer or data scientist	(yours to fill)		Does this tool beat a simple regression on our records, and what test shows it?		

WHERE THIS PICTURE BREAKS. If the district only needs to sort its records or draw a chart, no data scientist is needed. Route the question when someone claims a model will predict better than what you can build and check yourself.

MUST KNOW POINTS FOR YOU.

- The curriculum this book follows says causal discovery algorithms "underperform on real epidemiological data". A benchmark would settle it. The algorithms would be run on real health data whose causes are already known, for example from large randomised trials or well-validated cohorts, as Liu and colleagues recommend. Until one is published, do not say the algorithms fail on such data, and do not say they work. Say that their performance on real health data has not been systematically tested.
- Do not tell a committee that software "finds the causes" in its records. Ask whether it was ever tested on data whose true causes were known, and route that question to a causal inference methodologist before anyone signs.

- Do not say that a lottery "takes care of it" when the people compared live, shop and eat together. Ask a methodologist before the design is fixed.
- Do not tell a committee that machine learning, deep learning included, will predict better than ordinary statistics. A 2019 systematic review found machine learning and logistic regression about equal for clinical prediction where comparisons were at low risk of bias; it did not test deep learning in particular.
- Asking about interference works only before the design is fixed. Whether a study can separate a programme's effect from its spillover is decided by how groups and people are randomised. Once data are collected under a design that ignored it, the methodologist can tell you only what your data cannot show.
- When a vendor quotes one accuracy figure, ask how the model was validated and on whose data.

COMMON MISREADING. "The machine found it in our own data, so it must be true for us." Data from your district make a result local; they do not make it causal or accurate. A causal discovery algorithm returns arrows whether or not its assumptions hold, and a prediction model returns a score whether or not it beats a simple one. Whether either has been tested where the answer was known is the question.

EXERCISE 1 (retrieval). Name the owner of each of this section's three fields. Then say why two of them must be asked before a design or purchase is fixed.

EXERCISE 2 (design). A made-up request. Your medical college's IT office says it can move all OPD records to a cloud service. A university data-science team could then "run AI on them" to predict which patients with diabetes will need admission. The medical superintendent asks you, by next Monday, whether this is worth doing. Write the question you would send to the data scientist, in the five parts.

EXERCISE 3 (critique). A made-up line from a programme review, spoken by a programme officer: "Our school nutrition programme worked. In each of the 20 schools, children in programme classes gained less weight than children in the other classes." The 20 schools are made up. Name the first signal that should fire in you, and rewrite the line so it claims only what the design supports.

8 · Endoscopic and device therapies

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Endoscopic bariatric and metabolic therapies treat obesity through an endoscope passed into the stomach or small bowel, without a surgical operation; one review calls them a bridge between non-surgical care and surgery.

Two act on the stomach. An intragastric balloon is one or more silicone balloons placed in the stomach empty and then filled; it takes up space in the stomach and slows its emptying, is usually left in for up to six months and then removed, and changes nothing in the stomach permanently. Endoscopic sleeve gastroplasty stitches the stomach wall from inside into a narrow tube.

A 2024 joint guideline of the American and European endoscopy societies, as a 2026 review reports it, places them, used as the main treatment, in people with a body mass index of 30 or more, or of 27 to 30 with an obesity-related disease, and says that one small-bowel device, the duodenal-jejunal bypass liner, should be used only within a clinical trial.

The owner of these questions is a bariatric endoscopist. [143, 143, 144, 144, 145, 145, 146, 147, 148, 149, 149, 150, 151, 152, 153, 148, 154]

IN PLAIN TERMS. This section has one field, and it is the one closest to your clinic. You can explain what these procedures are. You cannot judge whether a given person should have one, or which device.

Both procedures use an endoscope — a thin, flexible tube passed down the throat to see and work inside the gut. Bariatric means to do with treating obesity. Matteo and colleagues call these therapies a bridge between non-surgical care and surgery.

Take the intragastric balloon (IGB) first. It is one or more silicone balloons. The endoscopist places them in the stomach empty and then fills them. A balloon is fully reversible and leaves no permanent change in the stomach.

Endoscopic sleeve gastroplasty (ESG) is a different kind of procedure. The endoscopist stitches through the full thickness of the stomach wall, from inside, and so makes a narrow tube.

The same review by Matteo and colleagues reports what a guideline says. This book can give it only in these words: a 2024 joint guideline of the American and European endoscopy societies, as a 2026 review reports it. As the review reports it, the guideline places these therapies, used as the main treatment, in people with a body mass index (BMI) of 30 or more. It also places them at 27 to 30 for people with an obesity-related disease. You have not read the guideline itself, and neither has this book.

So the question of whether either procedure suits a person has an owner: a bariatric endoscopist. Here is where to find that owner.

Field	Owner	Where to look
Endoscopic and device therapies for obesity	a bariatric endoscopist	a gastroenterology department; ask which of its endoscopists has specialised training in bariatric endoscopy

The advice to ask about specialised training comes from a 2025 review by Zhai and colleagues, which says ESG "should only be performed by endoscopists with specialized training in bariatric endoscopy and obesity management". Who in India decides whether a person is eligible is not in any source this book holds. Book 47, *Metabolic and bariatric surgery: selection and co-management*, teaches selection and shared care.

Illustration 1. Start with what the field can answer that you cannot. Open the 2026 review by Matteo and colleagues in the *Journal of Clinical Medicine*, at https://doi.org/10.3390/jcm15082832. Search for *ASGE–ESGE*. The letters name the American and European endoscopy societies. Find the two sentences that report their guideline.

The first sentence says who the therapies are for.

> *according to current ASGE–ESGE guidelines, primary EBMTs are generally indicated for patients with BMI ≥ 30 kg/m2, or BMI 27–30 kg/m2 with obesity-related comorbidities*

Read the signs in it. EBMTs are the review's short name for endoscopic bariatric and metabolic therapies. The sign ≥ reads "or more", so the review's "BMI ≥ 30 kg/m2" is a body mass index of 30 or more, in kilograms per square metre (kg/m^2 in this book). "Primary" is the guideline's word. The same review describes these therapies also as a bridge before surgery, for people with a much higher body mass index, so read "primary" as "used as the main treatment, not as a step before surgery".

The second sentence is about one device, the duodenal-jejunal bypass liner, which works in the duodenum and jejunum, the first parts of the small bowel. The review writes DJBL for it.

> *Reflecting the limited number of patients studied and short-term randomized data, the ASGE–ESGE guideline recommends that DJBL treatment should be performed only within the context of a clinical trial*

Put the two in plain words. As the review reports it, the guideline sets who the therapies are for by body mass index. It keeps one device inside trials because few patients have been studied.

Now see what the review says the field weighs, and you cannot. Search for *Main contraindications*, the conditions that rule a balloon out.

> *Main contraindications to IGB placement include a history of gastrointestinal surgery, clotting or bleeding disorders, peptic ulcer disease, large hiatal hernia, structural abnormalities of the esophagus or pharynx, and pregnancy*

In plain words: earlier surgery on the gut, a tendency to bleed, an ulcer in the stomach or duodenum, part of the stomach pushed up through the diaphragm, a malformed gullet or throat, and pregnancy. Then search for *Severe complications*.

> *Severe complications, although uncommon, include mucosal injury or perforation of the stomach or esophagus, gastric ulceration or bleeding, and gastrointestinal obstruction secondary to balloon migration or spontaneous rupture*

In plain words: damage to the lining of the stomach or gullet, or a hole through it; an ulcer or bleeding; and a blocked gut because the balloon moved or burst. Weighing these against one person's history is the endoscopist's job.

Last, read the review's own caution. Search for *viewed with caution*.

> *given the limited long-term data and modest sample sizes for many technologies, their role should be viewed with caution*

This is the field's kind of answer: who a procedure is for, who should not have it, and what can go wrong.

Figures quoted in this illustration are from [155].

WHERE THIS PICTURE BREAKS. You are reading a review's report of the guideline, not the guideline. You do not have its own words, how strong it judged the evidence, or its full list of positions. Nothing here says who in India performs these procedures or decides who is eligible, and a body mass index in the stated range does not by itself make anyone suitable.

Illustration 2. A made-up visit. The woman of 52 who teaches at a government school comes to the OPD for her diabetes tablets. She has seen a private hospital's hoarding for a "balloon" that takes weight off "without surgery". The offer price ends this month. "Should I book it this week?"

The first signal is **About to act**. She will book on what you say. Behind it sits **No test**: you cannot say what result would show your answer wrong. The fifth signal turns that doubt into a duty to stop.

Start with what you can do in her visit. You can measure her weight and height and work out her body mass index. You can list her tablets and her recent sugar readings. You can tell her, in plain words, what a balloon is: placed in the stomach with an endoscope, filled there, taken out within months, and, as the review puts it, "the effects are temporary". All of that is yours.

Two lines tempt you, and both are improvising. "The balloon is safer than surgery, so go ahead." That compares risks you cannot check. "Those balloons do not work; just keep taking your tablets." That claims a result you cannot show, to a woman who may then give up an option without anyone assessing her.

What you say to her: "That is outside what I can assess, and here is who can: a bariatric endoscopist. I will send one your question this week. Please wait for the reply before you book, and

keep taking your diabetes tablets as before." So write the question you would ask a bariatric endoscopist, in the five parts.

Part	What you write
Decision	Whether she books an intragastric balloon at the private hospital this month, and whether I refer her for an opinion first. She wants to book this week; the offer ends this month.
Context	A woman of 52 with obesity and diabetes, on tablets from this centre. Her body mass index measured today, her tablets and her sugar readings for the last six months are attached. She reports no previous surgery on her stomach or gut.
Question	Is an intragastric balloon a suitable option for her, and if it might be, what would you need to see before deciding, and what happens to her diabetes treatment around the procedure?
Form	A recommendation: suitable, not suitable, or needs assessment, with what the assessment involves. Tell me how sure you are and on what. I cannot judge the procedure or the device.
Deadline	Within two weeks. If later, I will ask her to wait for your reply before she books.

Last, the row for your contact list. Put it in now and leave the name for you to fill.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Endoscopic and device therapies	a bariatric endoscopist	(yours to fill)		Is an intragastric balloon suitable for this patient, and what happens to her diabetes treatment around it?		

WHERE THIS PICTURE BREAKS. If she only asks what a balloon is, tell her; you can. Route the question when she asks whether she should have one, or which kind. And routing does not hand her over: she remains your patient for her diabetes while she waits for the reply.

MUST KNOW POINTS FOR YOU.

- Do not tell a patient which device is better, or that a balloon "works" or "does not work". Explain what the procedure is, and route whether it suits her to a bariatric endoscopist.
- Cite the guideline only as you hold it: "a 2024 joint guideline of the American and European endoscopy societies, as a 2026 review reports it". You have not read the guideline. Do not give its evidence grades or say how strongly it recommends anything.
- A body mass index in the reported range does not make a person suitable. The review lists conditions that rule a balloon out, among them earlier surgery on the gut, bleeding disorders, peptic ulcer and pregnancy. Weighing them for one person is the endoscopist's job.
- A balloon's effect is temporary: it is taken out, usually within six months, and leaves the stomach unchanged.
- Routing ends your answer, not your care. While the endoscopist decides, she is still your patient for her diabetes.

EXERCISE 1 (retrieval). In one line each, what are an intragastric balloon and endoscopic sleeve gastroplasty, and who owns the question of whether a patient should have one?

EXERCISE 2 (design). A made-up request. A private hospital writes to the district NCD officer offering "balloon camps" at a reduced price for people found to have obesity in the district's screening. The officer asks you, before next month's review meeting, whether the district should pass on the offer to the people screened. Write the question you would send to a bariatric endoscopist, in the five parts.

EXERCISE 3 (critique). A made-up line from a health column: "The new stitching procedure done through the mouth is as good as surgery and safer, so everyone with obesity and diabetes should ask for it." Name the first signal that should fire in the writer, and rewrite the line.

9 · Ayush systems and the offices that hold them

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Ayush is the Ministry of Ayush's name for a group of systems of health care: Ayurveda, Yoga and Naturopathy, Unani, Siddha, Sowa-Rigpa and Homoeopathy. The Union government has a Ministry of Ayush, to which the Allocation of Business Rules give the formulation of policy for these systems.

The National Health Policy 2017 (NHP) lists pluralism among its principles: patients who so choose and when appropriate would have access to Ayush care providers. Under the National Ayush Mission (NAM), Ayush facilities are co-located at primary health centres, community health centres and district hospitals.

For a question about what an Ayush system offers a patient, the owner is a qualified Ayush practitioner. For a State's arrangements, it is the State's Ayush directorate. [156, 157, 158, 159, 160, 160, 161, 162, 163, 164, 165, 165, 166, 167, 166, 168, 168, 169, 170]

IN PLAIN TERMS. You now have three tools. The five signals tell you when a question has left what you can assess. The question you would ask, in five parts, lets you send it to its owner. The five checks let you judge the reply. This section is the first field that sits inside India's own public health system. It starts with one word: Ayush — the Ministry of Ayush's name for Ayurveda, Yoga and Naturopathy, Unani, Siddha, Sowa-Rigpa and Homoeopathy. The Ministry's annual report for 2024-25 says the Ministry "has mandate to develop Ayush systems".

The Union's Allocation of Business Rules give the Ministry of Ayush the "Formulation of policy" for these systems. Book 5, *Policy process, framing and advocacy craft*, showed you how to read those rules, so they are not taught again here.

Two statutory commissions — bodies a statute sets up — regulate Ayush education: the National Commission for Indian System of Medicine (NCISM) and the National Commission for Homoeopathy (NCH).

So the field has its own standard references, its own regulators and its own practitioners, and you do not know them.

The report says the Government "has adopted a strategy of" co-location — an Ayush facility placed inside a primary health centre (PHC), community health centre (CHC) or district hospital. Patients then choose in one place. It does not say how far co-location has reached.

A second kind of Ayush place is the Ayush Health and Wellness Centre, now called Ayushman Arogya Mandir (Ayush), or AAM (Ayush) for short: an Ayush dispensary or sub health centre upgraded, in the report's words, "to provide comprehensive primary healthcare at grass roots level with focus on Ayush systems of medicine". In the Ministry's report for January to December 2024, the States and Union Territories reported 12,251 of them "progressively functional". That is a count they reported, for that year, and it says nothing about what any one centre offers.

Now the State. The Chhattisgarh Directorate of Ayush describes itself, on its admissions-counselling website, as “a Government body under department of Medical Education (AYUSH) in Chhattisgarh Government”. The page says the directorate administers “2 Government Ayurveda Medical Colleges and 9 Private AYUSH Colleges”. It calls the directorate’s “primary responsibility” making resources “available to run the Government Colleges/Hospitals”.

That page is about colleges and their hospitals. It does not say who runs Ayush dispensaries or Ayushman Arogya Mandirs (Ayush) in the State, and the directorate’s own website could not be opened for this book.

Add this row to your picture of who owns what.

Field	Owner	Where to look
Ayush systems	a qualified Ayush practitioner; for the State’s arrangements, the State’s Ayush directorate	the Ayush doctor at a PHC, CHC or district hospital where Ayush is co-located; the hospital of a government Ayush college (in Chhattisgarh, the Directorate of Ayush says it equips and staffs these)

Illustration 1. Start with a question you cannot answer, and see where the answer would come from.

Open the Ministry of Ayush’s Annual Report 2024-25 (https://ayush.gov.in/assets/pdf/annualReport/Annual-Report24-25_English.pdf). Go to chapter 3, on the organizational set-up of central Ayush systems. Search for “Pharmacopoeia Commission”. Read what the Pharmacopoeia Commission for Indian Medicine & Homoeopathy does. The report says it is working for development of “Pharmacopoeias and Formularies”, and that it acts as “Central Drug Testing cum Appellate Laboratory for Indian systems of Medicine & Homoeopathy”.

A pharmacopoeia is a standards book that says what a medicine must contain and how it is tested; a formulary lists the approved preparations and their recipes. Now ask yourself one question. Do you know which pharmacopoeia or formulary is the standard reference for a given Ayurvedic preparation, or how its contents are tested? You do not. That is the signal you met as **Unknown standard**, and it fires before you have read a single claim about any remedy.

Next, find who can answer. Open the National Health Policy 2017 (https://nhsrcindia.org/sites/default/files/2021-07/National%20Health%20Policy%202017%20%28English%29%20.pdf) and search for “Pluralism”. Its principle gives patients “who so choose and when appropriate” access to Ayush care providers. Then go back to the annual report, to chapter 7, and search for “Expanding Choices”. The report says Ayush facilities are placed at primary health centres, community health centres and district hospitals, and that the Ministry of Health and Family Welfare supports “Ayush doctors” there. So the person who can answer “what does this system offer, and what is in this product, by its own standards” may be in the next building.

Last, name the kind of answer. It is an answer from inside that system, made on that system’s own references. You get it by asking. You cannot produce it.

WHERE THIS PICTURE BREAKS. The report and the policy describe offices and a principle, not results. Nothing here says whether any Ayush remedy works or is safe for a given patient, and this book makes no such claim in either direction. The policy says “when appropriate” without

saying when. That judgement belongs to the practitioner and the patient, and you check the reply.

The office descriptions are the Ministry's own, as of its report for 2024. The State page describes colleges and hospitals only.

Illustration 2. A made-up exchange: the OPD of an urban primary health centre. A woman of 52 who teaches at a government school comes for her diabetes tablets. She has obesity. She takes a packet from her bag.

> *"My neighbour gave me this weight-loss powder. The shop said it is Ayurvedic. Can I take it with my sugar tablets? I want to start tomorrow."*

Start with what is yours, and do it at once. Weigh her and read her diabetes record, as you would at any visit. Check that she is taking the tablets the centre prescribes. Copy the powder's name and the contents its pack lists into her card. All of this is yours to do.

Now the signal. **About to act** fires first, because she will start tomorrow on what you say. Behind it sit **No test**, because you cannot say what result would show "it is fine with your tablets" wrong, and **Unknown standard**, which the Pharmacopoeia Commission's standards books raised above. The fifth signal turns the other two from a private doubt into a duty to stop.

Suppose the centre has an Ayush unit co-located with it, as the Ministry's strategy describes. You say the public sentence, then the owner, the next step, and what she keeps doing meanwhile: "That is outside what I can assess, and here is who can. There is an Ayush doctor at our centre, and I will send the doctor your question today. Bring the packet next time. Until the reply comes, keep taking your sugar tablets as before, and keep the powder in its packet: we change nothing until we have the answer."

The curriculum this book follows gives the question in these words. Write it in five parts.

Part	Your question
Decision	At her next visit, in two weeks: whether to advise her to go on waiting, or to start with a plan for watching her. She is waiting; so is the centre's doctor who prescribes her tablets.
Context	Woman of 52 with obesity, on diabetes tablets from an urban primary health centre (names and doses attached). She wants to start a powder sold as Ayurvedic for weight loss; its name and the contents printed on its pack are attached. She asked us; she has not started it.
Question	"what does this system offer this patient for weight, on what evidence, and what does it interact with in the treatment they already have?"
Form	For each of the three parts: your answer, or "not known". How sure you are, and on what: a reference I can look up, or your own experience, said as such. I cannot judge the method of your system; I can check that the answer is about this patient and this powder.
Deadline	Before her next visit, in two weeks. If it comes later, she may already have started on her neighbour's advice alone.

The question goes to the Ayush doctor at the co-located facility. If there is none, it goes to a teacher at the hospital of a government Ayush college.

Add the row to your contact list now; a later section shows how to keep it.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Ayush systems	a qualified Ayush practitioner; for the State's arrangements, the State's Ayush directorate	(yours to fill)		what this system offers a patient for weight, on what evidence, and what it interacts with		

WHERE THIS PICTURE BREAKS. Routing is the wrong move when the question is yours after all: whether she should keep taking her diabetes tablets, her weight, her blood sugar record. Those stay with you, and you answer them in the same visit.

It is also not routing if you send the question and stop listening. The reply still gets the five checks. And if the patient has already started the powder and is unwell, this is not a question to post and wait on. She is your patient today.

MUST KNOW POINTS FOR YOU.

- The error is to treat Ayush as something outside government that you can wave away. It has its own Union ministry. Route an Ayush question to that system's owner, as you would any other field's.
- Do not tell a patient "it is herbal, so it is safe with your tablets". Do not tell her "there is no evidence it works" either. Say what you can do today, and send the three-part question to an Ayush practitioner.
- Copy the product's name and listed contents into her card. Ask her to bring the pack, and send the question before her next visit.
- The State directorate's page this book holds describes colleges and their hospitals only. It does not say which office runs Ayush dispensaries or Ayushman Arogya Mandirs (Ayush). Do not fill the gap with a guess.
- You can judge the reply with the five checks. If it fails, ask back. If a reply conflicts with another, ask a second Ayush practitioner. If two practitioners still disagree, the field is not settled on this question: say so in those words, decide with the patient what to do meanwhile, and do not pick the view you prefer.

COMMON MISREADING. Reading the National Health Policy's pluralism principle as the government saying Ayush remedies work for weight. The principle gives patients "who so choose and when appropriate" access to Ayush care providers. It says nothing about any remedy's effect, and it does not say when access is appropriate.

EXERCISE 1 (retrieval). From memory: who owns a question about what an Ayush system offers a patient for weight? Name one place in the public health system where you can find that

person. Then say what the held page about Chhattisgarh's Directorate of Ayush says the directorate is responsible for. Say also what the page does not say.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (design). A made-up request: the medical officer of your urban primary health centre has a question. Should patients with obesity and knee pain be referred to the yoga sessions at a nearby Ayushman Arogya Mandir (Ayush)? She will decide at next month's staff meeting. Write the question you would ask, in the five parts, and say to whom it goes.

EXERCISE 3 (critique). A made-up line from a colleague in the OPD, to the patient of this section: "It's herbal, so it won't interact with your diabetes tablets. Try it for a month." Name the signal that should have stopped your colleague, say why the line is improvising, and rewrite it.

10 · Trade, investment and intellectual property law

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Trade and intellectual property law is the law of the agreements between countries that limit what a member country may do about trade and about intellectual property, together with the national laws that carry those agreements out. Its centre, for this book, is the World Trade Organization (WTO).

The WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (the TRIPS Agreement), signed in 1994, binds its members to give effect to its provisions, each by the method it chooses within its own legal system. "Intellectual property" in the Agreement means seven categories: copyright and related rights, trademarks, geographical indications, industrial designs, patents, layout-designs of integrated circuits, and undisclosed information.

Article 8.1 lets members adopt measures necessary to protect public health and nutrition, provided that the measures are consistent with the Agreement. The WTO's Declaration on the TRIPS Agreement and public health, adopted at Doha in 2001, agrees that the Agreement "does not and should not prevent members from taking measures to protect public health".

Its owner is a trade lawyer; a country's official position is its government's. Investment law, which the curriculum this book follows also lists, is covered by no source this book holds. [171, 172, 172, 173, 174, 175, 176, 177, 178, 179, 179, 180, 181, 182, 183, 184, 185]

IN PLAIN TERMS. This is a field where the first signal can fire before you have said a word. Countries sign agreements about trade. A trade lawyer reads those agreements for a living.

Start with one agreement. The World Trade Organization (WTO) has an agreement on intellectual property, the Agreement on Trade-Related Aspects of Intellectual Property Rights. It is called the TRIPS Agreement — the WTO's agreement on intellectual property, which its members must give effect to in their own legal systems.

"Intellectual property" has a fixed meaning here: the categories in Sections 1 through 7 of Part II. The contents page lists seven. They are copyright and related rights; trademarks — a brand's name or mark; geographical indications; industrial designs; patents — rights over inventions; layout-designs of integrated circuits; and undisclosed information. This section needs only trademarks and patents; the others are named so the list is complete. A tax on a drink is not on that list.

One article, Article 8.1, speaks to health. It has two halves. The first says what members may do. They may adopt "measures necessary to protect public health and nutrition". The second sets the condition: "provided that such measures are consistent with the provisions of this Agreement".

Medicines and access are taught in Book 46, *Pharmacotherapy of obesity*, and Book 61, *Health financing, HTA and pharmaceutical access in India* (HTA is health technology assessment). They are not summarised here.

The curriculum this book follows lists trade and investment law together. No source this book holds covers investment treaties.

Now ask who owns this in India. The owner of the legal reading is a trade lawyer, for example at a university law faculty or in practice. Which department speaks for it on WTO matters, and which on intellectual property, is not in any text this book holds.

The Allocation of Business Rules, as amended to 22 July 2026, list a "Ministry of Commerce and Industry (Vanijya aur Udyog Mantralaya)" with two departments. They are the "Department of Commerce (Vanijya Vibhag)" and the Department for Promotion of Industry and Internal Trade. The Rules' Second Schedule is headed "DISTRIBUTION OF SUBJECTS AMONG THE MINISTRIES / DEPARTMENTS". So each department's entry there says what it deals with. Open the Rules at https://cabsec.gov.in/allocationofbusinessrules/completeaobrules/, find both entries, search them for "World Trade Organization" and for "patents", and name the department whose entry says so. Book 5, *Policy process, framing and advocacy craft*, showed you how.

WTO detail belongs to Book 16, *Indian regulatory architecture and the live policy agenda*.

Field	Owner	Where to look
Trade, investment and intellectual property law	a trade lawyer; for India's official position, the Union government	a university law faculty or a practising trade lawyer; for the government's position, the department whose entry in the Allocation of Business Rules lists the subject (trace it)

Illustration 1. Start with the two WTO texts that touch public health, and try to answer a question from them.

1. Open the TRIPS Agreement on the WTO's website, at https://www.wto.org/english/docs_e/legal_e/27-trips_01_e.htm. Go to Part I, Article 8. Read paragraph 1. Underline "public health and nutrition". Then underline the last clause, "provided that such measures are consistent with the provisions of this Agreement".
2. Open the Declaration on the TRIPS Agreement and public health, at https://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_trips_e.htm. Read paragraph 4: "We agree that the TRIPS Agreement does not and should not prevent members from taking measures to protect public health."
3. Now try to answer a question a reporter might ask, from these two texts: "Can WTO rules stop a sugar tax?" You cannot, and there are three reasons.

First, the Agreement defines "intellectual property" by the categories in Sections 1 through 7 of Part II. A tax is not one of them, so these are not even the right texts to read. Which WTO agreement a tax would be tested against is in no text this book holds.

Second, take a measure the Agreement does touch, such as a label rule that limits how a brand's mark may appear on a pack. Article 8.1 does not say whether that measure is "consistent with

the provisions of this Agreement". Deciding that means reading the rest of the Agreement, and what has been decided under it. That is the lawyer's work.

Third, paragraph 4 of the Declaration states what members agreed in 2001 about the Agreement and public health, in particular medicines. It decides no one case.

So the field's kind of answer is a reading: this measure engages these provisions of this agreement, and on what has been decided so far, here is how strong the case on each side is. You can quote an article. You cannot give that reading.

WHERE THIS PICTURE BREAKS. The two texts are real and short, which makes them tempting to quote alone. They set principles; they do not decide disputes. The Agreement has its own part on dispute prevention and settlement, Part V in the contents, which this book does not open. The texts are the WTO's web reproduction, which the WTO says has no legal standing. The TRIPS page is headed "(unamended)": the Agreement has been amended since, and this book has not read the amendment. Nothing here says what India has done under TRIPS, or what position India has taken.

Illustration 2. A made-up call: a reporter from a Hindi daily phones at six in the evening. Her story goes to print tonight.

> *"The State is talking about a tax on sugary drinks. A drinks company says WTO rules won't allow it. You're a public health doctor. Can WTO rules stop a sugar tax? One line for the story."*

Start with what you can give her. Why the health department is interested in sugary drinks at all is a public-health question, and you can talk about it. What such a tax does is taught in Book 56, *Fiscal instruments: taxation and subsidy design in India*; this section says nothing about it. You can also tell her who would know about the WTO side, today.

Now the signal. **Unknown standard** fires first. You do not know which agreement is the standard reference for a tax, or how WTO disputes are decided. **About to act** follows: she will print your line tonight.

This is a public setting, so you use the public sentence in its exact words: "That is outside what I can assess, and here is who can." Then you name the owner. A trade lawyer, for example at a university law faculty, can read the agreements. For India's position, the owner is the Union government's department responsible, which you will find for her if she wants it.

Now write the question you would ask a trade lawyer, in the five parts. This field has no curriculum question. The Question row below is this book's own.

Part	Your question
Decision	Whether the district's public health team should support the proposed State tax on sugary drinks in its comments to the State, and what it says to the press. The reporter files tonight; the team's comment is due in a month.
Context	A State proposes a tax on sugary drinks. A drinks company says WTO rules forbid it. We have read Article 8.1 of TRIPS and paragraph 4 of the Doha Declaration; we do not know which agreement applies to a tax.

Question	Which WTO agreements, if any, does a State tax on sugary drinks engage, what would a challenge have to show, and how strong is such a challenge on what has been decided so far?
Form	A short answer (engages / does not engage, and which provisions), how sure you are and on what, and one or two references I can cite. I cannot judge the legal reasoning; tell me where lawyers disagree.
Deadline	A one-line answer for the press by 8 p.m. tonight, if you can; the full answer within three weeks. If the full answer comes later, the team comments without it.

Last, the row for your contact list. Put it in now and leave the name for you to fill.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Trade, investment and intellectual property law	a trade lawyer; for India's official position, the Union government	(yours to fill)		which WTO agreements a State tax on sugary drinks engages, and how strong a challenge would be		

WHERE THIS PICTURE BREAKS. Routing is the wrong move when the question turns out to be about health, not law. "Would a tax on sugary drinks reduce how much people drink?" is an evidence question. It belongs to Book 56, *Fiscal instruments: taxation and subsidy design in India*, and to you, not to the lawyer. It is also the wrong move to stop at the lawyer when the question is what India will argue. That is the government's position, not any one lawyer's opinion.

MUST KNOW POINTS FOR YOU.

- Do not tell a reporter that WTO rules protect nutrition measures because Article 8.1 of TRIPS says "public health and nutrition". The same sentence ends "provided that such measures are consistent with the provisions of this Agreement".
- The error is to read the Doha Declaration as WTO approval of any health measure. It says the TRIPS Agreement "does not and should not prevent members from taking measures to protect public health".
- Before you name the department that speaks for India on a WTO or patent question, open the entries of the two Commerce and Industry departments. Write its name and the item number in your note.
- You can read a treaty article aloud. You cannot say whether a measure is consistent with it.
- The curriculum lists investment law with trade law, and this book holds no source on investment treaties. If asked about one, say so and route it.

COMMON MISREADING. Reading "nutrition" in Article 8.1 of TRIPS as a WTO guarantee for food taxes and labels. The article lets members adopt such measures only if they are consistent with the Agreement, and the Agreement is about intellectual property.

EXERCISE 1 (retrieval). From memory: who owns the question "is this health measure allowed under WTO rules?", and who owns India's official answer to it? Name the WTO agreement on intellectual property, and say what its Article 8.1 allows and on what condition.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (design). A made-up request: at the district NCD meeting, the district NCD officer proposes asking the State to require a warning symbol on snack packets sold near schools. A company's letter says the rule would breach its trademark rights. The officer wants to know by next month's meeting whether to go ahead. Write the question you would ask, in the five parts, and say who gets it.

EXERCISE 3 (critique). A made-up line from a professor of public health quoted in a newspaper: "WTO law explicitly protects nutrition measures. Article 8 of TRIPS says so. A sugar tax is completely safe from challenge." Name the signal that should have stopped the professor, and rewrite the line.

11 · Economists of work and of firms: labour economics, and advertising research

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Labour economics studies work and pay: who is employed, at what wage, and why. Its question about obesity is whether body weight changes a person's employment, wages or productivity and, if it does, whether through lower productivity or through employers' discrimination. The owner of this question is a labour economist.

Advertising research studies what adverts do. Experiments on food advertising measure how much people eat after seeing it. The owner of this question is a marketing scientist.

In economically developed countries, Cawley's 2015 review reports that weight lowers wages, by amounts that differ by gender and race. No study we hold in full measures obesity's effect on pay in India; one comparative study's abstract reports excess weight rewarded, not penalised, in Indian wages. Boyland and colleagues' 2016 meta-analysis found that seeing food adverts in an experiment raised how much children ate soon afterwards, and found no evidence of an effect in adults. [186, 187, 188, 188, 189, 190, 190, 191, 191, 192, 193, 194, 195, 196, 196, 196, 196, 186, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 190, 186]

IN PLAIN TERMS. This section uses the edge, the five signals and the five-part question from the sections before it. It applies them to two fields that sound close to yours and are not. A reporter asks whether workers with obesity earn less. A committee asks whether a snack brand's hoardings — the large advertising boards beside a road — make children eat more. Both questions sound like yours, because they mention obesity. Neither is. The first is about pay. The second is about what adverts do.

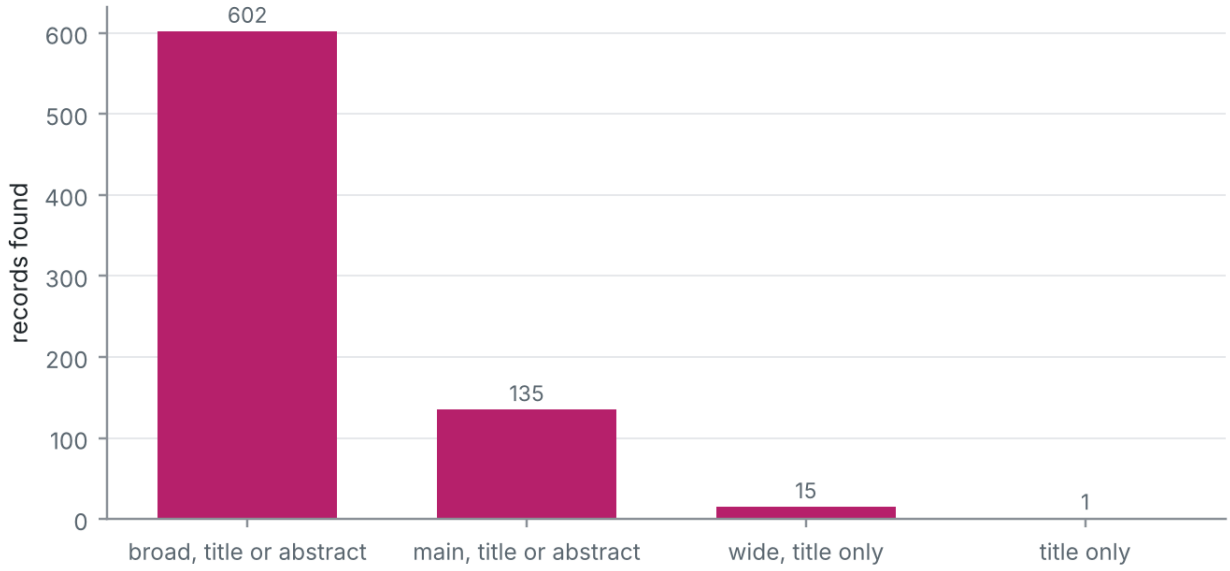
Nobody can assign weight to people at random. So these economists look for natural experiments — situations in which something outside a person's own choice shifts their weight.

A marketing scientist works in advertising research, the study of what adverts do. Impact is how quickly the audience receives the advert's message. Engagement is any interaction with the advert, such as a click on an internet advert.

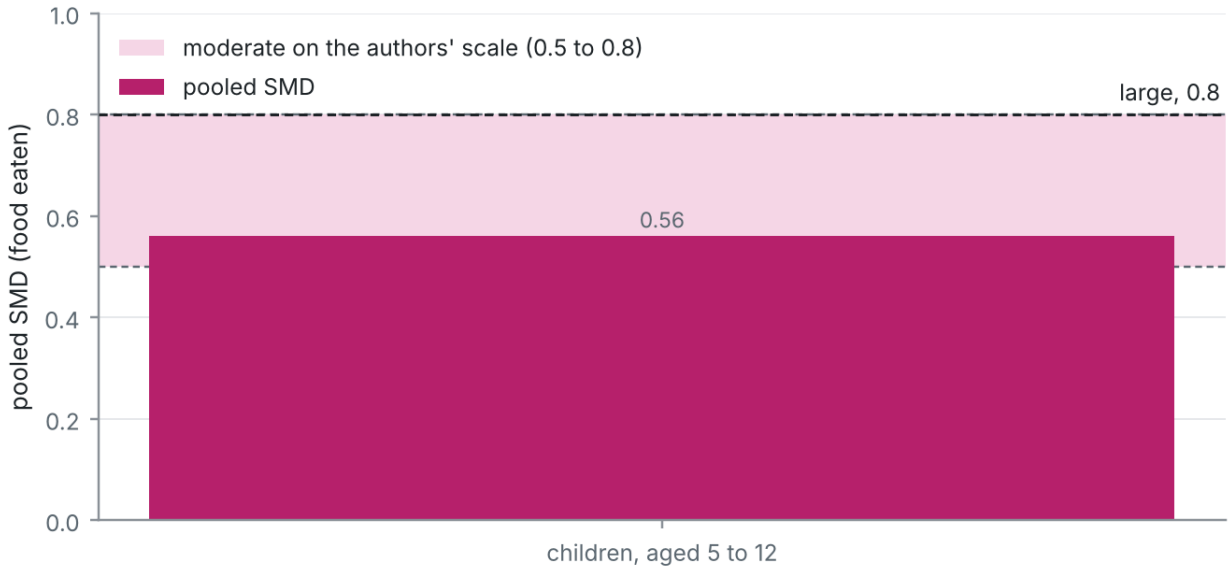
Here is who owns each question, and where to start looking in India.

Field	Owner	Where to look
Labour economics of obesity	a labour economist	an economics department of a university; the authors of the papers a search finds, such as those in this section
Advertising research	a marketing scientist	the marketing faculty of a management institute

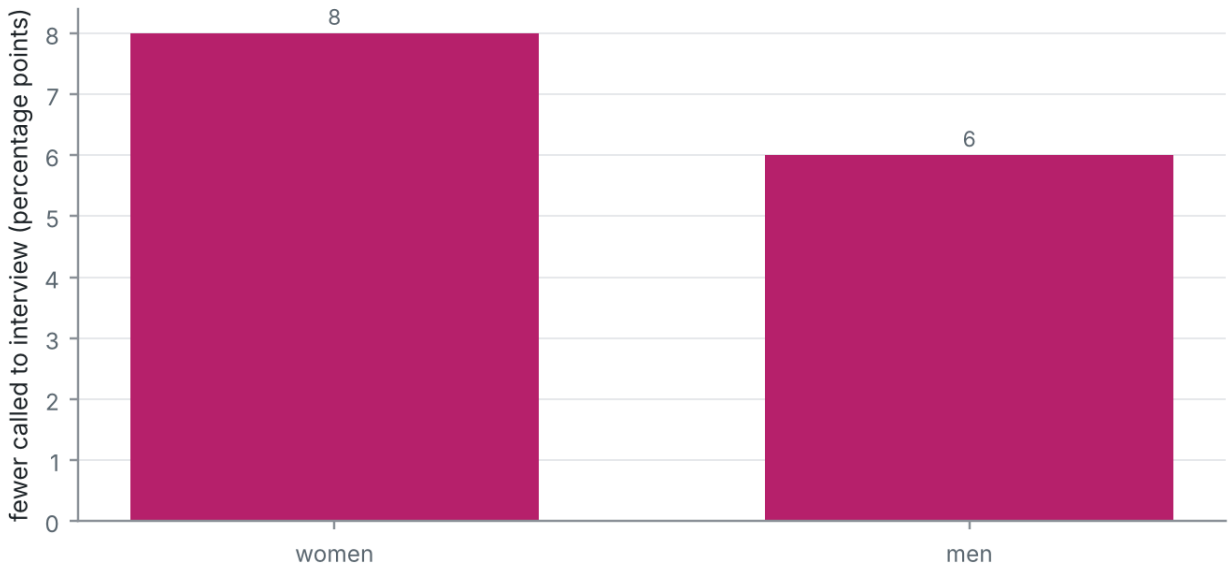
These are kinds of places, not named offices; no source we hold lists the people.



This book's own search, not a published study: the same question, asked of OpenAlex with four search strings on 10 Oct 2026: 602, 135, 15 and 1 records found. Records found are not studies of the question; reading the titles shows which are. The same broad string over full texts found 99,812 records, left out because nobody can screen them.



Boyland and colleagues' pooled result for children aged 5 to 12, eating soon after television or internet food adverts in experiments: a standardised mean difference (SMD) of 0.56. The authors read 0.2 as small, 0.5 as moderate and 0.8 as large, so 0.56 is moderate. It is not weight, and in adults the experiments found no evidence of an effect.



Rooth's experiment in Sweden: paired job applications to 989 real job openings, alike except that one photo was altered to make the applicant look as if they had obesity. That applicant was called to interview 8 percentage points less often among women and 6 percentage points less often among men.

Illustration 1. Start with the kind of answer a labour economist can give you and you cannot.

Open Cawley's review, "An economy of scales", in the Journal of Health Economics, 2015 (https://doi.org/10.1016/j.jhealeco.2015.03.001). Find the part on wages and read its summary. It says: "In summary, there is evidence that weight lowers wages in economically developed countries." The next sentence adds: "Studies have found this effect for both women and men, but the magnitude of the effects differs by gender and race." That is the field's kind of answer: an estimate of what weight does to pay, with its setting.

Now see the craft on one study you can follow. It is not a natural experiment: it changes how heavy job applicants look, not their weight. Cawley's review reports it. In Sweden, a researcher named Rooth sent paired job applications to 989 real job openings. The two applications in each pair were as alike as possible. In one of them, the photo was altered by software so the applicant looked as if they had obesity. The applicant whose photo was altered was called to interview less often: 8 percentage points less for women, and 6 percentage points less for men. The review gives these gaps, not how often the other applicant was called.

Read next what the review does not tell you. Its evidence is from economically developed countries. In its own list of work still to do, it says that whether the wage penalty comes from lower productivity or from discrimination is still to be estimated. A wage penalty is lower pay for one group than for otherwise similar workers. The review also says that "there is little evidence on the causal effect of weight on productivity."

Now the curriculum's claim about India, and what was measured. The curriculum this book follows says the field has "a real Indian literature gap". No published study we hold measures this. What was measured is this book's own search, run on 9 and 10 Oct 2026. It is a search, not a published study.

The search ran in PubMed on 9 Oct 2026 and in OpenAlex on 10 Oct 2026. OpenAlex is a free index of research papers. It was used because economics papers may sit outside PubMed. PubMed is the free index of medical journals run by the US National Library of Medicine. Its four strings found 332, 86, 23 and 1 records; of the 86 and 23 whose titles were all read, the one Indian economics paper is "Labor market engagement and the body mass index of working adults: Evidence from India." (https://doi.org/10.1016/j.ehb.2019.01.006) It studies how the sector and the physical intensity of the work people do go with their BMI. That is work affecting weight, not weight affecting pay.

OpenAlex was not given the PubMed strings. It was given four strings of its own, written in its search syntax. Here is how many records each found on 10 Oct 2026.

Search (OpenAlex, 10 Oct 2026)	Records found
broad, title or abstract	602
main, title or abstract	135
wide, title only	15
title only	1

The four strings are below. Each is something you can type into a search box that takes AND and OR. AND keeps only records that match both sides; OR keeps records that match either. Brackets group the words an OR joins, and quotation marks keep a phrase together.

1. Broad, in title or abstract: (obesity OR overweight OR "body mass index" OR BMI) AND (India OR Indian) AND (wage OR wages OR earnings OR employment OR productivity OR "labour market" OR "labor market")
2. Main, in title or abstract: (obesity OR overweight OR "excess weight" OR "body mass index" OR BMI) AND (India OR Indian) AND (wage OR wages OR earnings OR "labour market" OR "labor market" OR "labour markets" OR "labor markets")
3. Wide, in the title only: (obesity OR overweight OR weight OR "body mass index" OR BMI OR height OR anthropometric) AND (India OR Indian) AND (wage OR wages OR earnings OR employment OR labour OR labor OR productivity)
4. In the title only: (obesity OR overweight OR "body mass index" OR BMI OR "body weight") AND (India OR Indian) AND (wage OR wages OR earnings OR employment OR productivity OR labour OR labor)

The same question, asked four ways, gives very different counts. A count is not a list of studies. The broad string run over the full text of papers found 99,812 records; nobody can read that many titles, so it is left out of the figure of search counts at the start of this section. That figure draws the other four counts as bars.

Now read the titles. The titles show a thin Indian literature. A few economics papers study body size and earnings, mostly, from their titles, at the undernourished end. Two are "Height, weight and earnings among coalminers in India" (2005, https://doi.org/10.1016/j.ehb.2005.10.003) and a study of BMI and earnings under the National Rural Employment Guarantee Scheme in Ra-

jasthan (2013, https://doi.org/10.1016/j.asieco.2013.03.001). The wage-penalty question asked elsewhere has hardly been asked in India.

One comparative study includes India: "Is Excess Weight Penalised or Rewarded in Middle-Income Countries' Labour Markets? Comparative Evidence from China, India and Mexico" (Kyklos, 2020, https://doi.org/10.1111/kykl.12220). Its abstract, as the search record holds it, reports that in India excess weight went with higher hourly wages, not lower. The full paper was not read, and this book gives no number from it.

You can rerun the search. An API is the web address a program, or you, can send a search to. OpenAlex says: "OpenAlex data is free, and so is casual use of the API — you can make basic queries with no key at all." The references after section 17 list it as "Search record: Indian studies of obesity and employment, wages, earnings or productivity in PubMed and OpenAlex", with OpenAlex's search address, https://api.openalex.org/works. To rerun the main search, type that address into a browser's address bar, follow it at once with ?filter=title_and_abstract.search: and then string 2 above, and read the count near the top of the reply. EconLit and IDEAS/RePEc, two indexes of economics papers, were not searched. Hindi-language papers and government reports were not searched either.

Now the second field, advertising research, and its kind of answer about eating. Open Boyland and colleagues, "Advertising as a cue to consume", in the American Journal of Clinical Nutrition, 2016 (https://doi.org/10.3945/ajcn.115.120022). It is a meta-analysis — a study that combines the results of earlier studies of the same question into one answer. The studies it combines exposed people to food adverts on television or the internet, or to a control — an advert for something other than food, or no advert — and then measured how much they ate. Twenty-two articles qualified. Of these, 18 gave data for the pooled result — the results of the separate experiments combined into one number. Those 18 gave 20 comparisons.

Read the children's result with the authors' scale. Here the mean difference (MD) is the gap between the average amount eaten after food adverts and after the control. The standard deviation (SD) measures how spread out the amounts were. The paper reports a standardised mean difference (SMD): the MD divided by the SD, which gives the MD as a number of standard deviations. Which SD is used is part of the definition, and the part of the paper this book holds does not say which. For children, the pooled SMD was 0.56. Children ate more after food adverts than after the control. The authors read 0.2 as small, 0.5 as moderate and 0.8 as large. On that reading, 0.56 is a moderate effect. Its 95% confidence interval ran from 0.18 to 0.94, so the data fit anything from a small to a large effect. In adults, the experiments found no evidence of an effect: the pooled SMD was 0.00.

Last, read what 0.56 does not tell you. It is eating soon after adverts, in experiments. It is not weight, and it is not hoardings. Only acute exposure was studied: the studies looked at a short exposure and eating soon after. Whether the extra eating is later made up for, and so leads to weight gain, was not tested. The studies with children ran almost entirely in schools, and the children were aged 5 to 12 years. The adverts were on television or the internet. This book has not checked in which countries the studies were run.

Figures quoted in this illustration are from [219, 220, 221].

WHERE THIS PICTURE BREAKS. Cawley's review settles the direction of an effect in economically developed countries, not its size or cause in India, and the one comparative study that included India reported the opposite in its abstract. The counts from this book's own search, not a published study, say what OpenAlex matched on 10 Oct 2026 for four strings; run them later and the counts will differ, and a matched record is not a study of the question. Boyland's 0.56 holds for children aged 5 to 12, eating soon after television or internet adverts in experiments; it says nothing about weight, adults, hoardings or the months after.

Illustration 2. Start with the first field. A made-up call: a reporter from a Hindi daily phones you at six in the evening. "We are running a story tonight. The headline says: 'Obese workers cost India crores.' Can you confirm it?"

The sentence on the tip of your tongue is: "Yes. Studies show that obesity lowers productivity and wages." Stop and name the first signal that fires. It is **One source**. Your answer would rest on one review you cannot judge, and that review is of other countries. Then **About to act** joins it, because the reporter will print your words tonight. **One source** says you are past the edge; **About to act** says stop now.

Next, say the part that is yours. The headline's words are yours to fix. "Obese workers" puts the condition before the person; write "workers with obesity". Naming the person first keeps a condition from standing for the whole person; this course writes it that way throughout, and Book 48, *Eating behaviour, mental health and weight stigma*, teaches why. And "cost India crores" is a figure with no source given. Offer the reporter this headline: "Workers with obesity and pay in India: what is known, and what is not". Then say the public sentence, followed by the owner:

> *"That is outside what I can assess, and here is who can: a labour economist. I will send one the question tonight. Meanwhile I can tell you what a search of two research indexes on 9 and 10 October found: the question has hardly been asked in India. That was a search, not a published study."*

Here is the question you would send to a labour economist.

Part	Your question
Decision	Whether a Hindi daily runs the claim that workers with obesity cost Indian employers crores, and whether my name appears beside it. The reporter is waiting tonight.
Context	The claim's source is not given. I hold a 2015 review of studies from economically developed countries, and this book's own search, run on 9 and 10 Oct 2026 and not a published study, which found the question hardly studied in India, with one comparative study whose abstract reports excess weight rewarded, not penalised, in Indian wages. I have not read that study in full.
Question	Is there an Indian estimate of what obesity does to workers' pay, employment or productivity, or what it costs employers? If so, which study, and how much weight can it bear?
Form	Yes or no; if yes, the study and one line on how far it can be trusted. I cannot judge the method; tell me how sure you are and on what.

Deadline	Tonight, before the story is filed. If it comes later, the story runs without my comment.

Now the second field, where a different signal fires first. A made-up meeting: at the district NCD review, a member says, “A snack company has put up hoardings outside three schools. Its agency’s report says the hoardings have high impact. So they must be making children eat more?”

The tempting reply is: “Yes. High impact means children eat more, and a meta-analysis shows advertising increases eating.” The first signal is **Loose word**. You are about to use “impact” in its everyday sense, and you could not say what the agency meant by it. In marketing, impact is how quickly the audience receives the message.

Now say the part you can read. The meta-analysis measured whether children in experiments ate more soon after food adverts on television or the internet. It did not measure hoardings, and it did not measure weight. Whether these hoardings change what these children eat, you cannot say. So you say: “That is outside what I can assess, and here is who can: a marketing scientist. I will send them the question this week and bring the reply to the next review.” Here is the question you would send.

Part	Your question
Decision	Whether the district NCD programme raises the hoardings near schools with the district administration, and whether it spends survey money measuring their effect. The district NCD officer is waiting for advice at the next review meeting.
Context	Hoardings for one snack brand stand outside three schools. The agency’s report calls them “high impact”; I have not seen what it measured. The children are of school age. I hold one meta-analysis of experiments with television and internet adverts, which measured eating soon afterwards.
Question	For hoardings outside schools, what can be measured — what children remember of them, what they buy — and has any study measured whether such hoardings change what children eat?
Form	A list of what can be measured and how, with a reference for any study that exists. Tell me how sure you are and on what; I cannot judge the methods.
Deadline	Before the next review meeting. If it comes later, the meeting discusses the hoardings on the agency’s word alone.

Add these two rows to your contact list. Its full columns come in the section on keeping the list; for now fill Field, Owner and the question.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Labour economics of obesity	a labour economist	(yours to fill)		Is there an Indian estimate of what obesity does to pay, employment or productivity?		

Advertising research	a marketing scientist	(yours to fill)	What can be measured about hoardings outside schools, and has any study measured their effect on eating?

WHERE THIS PICTURE BREAKS. Route the question only when it really is about pay or about what adverts do. If the reporter asks how many adults in a district have obesity, or how BMI is measured, the question is yours: answer it. And if the decision cannot wait for a reply, say what the evidence you hold covers, say what it does not, and name the owner; do not fill the gap yourself.

MUST KNOW POINTS FOR YOU.

- Do not tell a reporter that obesity lowers wages or productivity in India. The wage evidence you can cite comes from economically developed countries. Say what the evidence covers, then name the labour economist.
- Do not say that food advertising makes people eat more, as if that settled a decision. The meta-analysis found children ate more soon after television or internet adverts in experiments, and found no evidence that adults did.
- "High impact" in an agency's report does not mean the advert changed what anyone ate or bought. In marketing, impact is how quickly the audience receives the message.
- The curriculum's "real Indian literature gap" is not settled. It would be settled by searching EconLit, IDEAS/RePEc and Indian working-paper series with the same strings, and by reading the Kyklos 2020 study in full. Until then, name the indexes and say: "A search of two research indexes on 9 and 10 Oct 2026 found the question hardly asked in India. It was a search, not a published study."
- A count of records is not a count of studies. This book's own search, run on 9 and 10 Oct 2026, is a search, not a published study: it shows what one index matched, for one string, on one day.

COMMON MISREADING. "A search found almost nothing, so Indian workers with obesity are not paid less." A search that finds little has measured the literature, not the labour market. It means the question is open in India, not that the answer is no; the one comparative study found reports, in its abstract, excess weight rewarded in Indian wages.

EXERCISE 1 (retrieval). From memory: name the owner of a question about obesity and wages, and the owner of a question about what food adverts do. For each, give one kind of answer they can produce that you cannot.

EXERCISE 2 (design). A made-up request: the medical superintendent of a district hospital wants to start a weight programme for staff, and asks you whether staff with obesity take more sick leave, so that she can justify its cost. Write the question you would send to a labour economist, in five parts.

EXERCISE 3 (design). A made-up request: the ward's cricket tournament is sponsored by a soft-drink brand, whose banners line the ground and whose stall sells its drinks. The councillor asks

whether the sponsorship makes the children who play buy more of the drink. Write the question for a marketing scientist, in five parts.

EXERCISE 4 (critique). A made-up line from a district meeting: "Indian studies prove that obesity cuts productivity, so a workplace weight programme will pay for itself." Name the first signal that should have stopped the speaker, and rewrite the line.

EXERCISE 5 (critique). A made-up line: an agency's report says, "The campaign's hoardings achieved high impact and strong engagement among children." A colleague reads it out at a meeting as, "The hoardings changed what children eat." Find the signal and rewrite the colleague's line.

EXERCISE 6 (interpretation). Rerun the main search. Run string 2 in OpenAlex, as Illustration 1 shows, read the count near the top of the reply, and compare it with 135 on 10 Oct 2026. Then read the first twenty titles and mark each: does it study whether body weight changes pay or employment in India? Say what your count tells you and what it does not.

12 · Planetary health: diet, climate and land use

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Planetary health is the health of people together with the natural systems they depend on. The EAT–Lancet Commission of 2019 described a universal healthy reference diet.

The Commission set scientific targets for six Earth system processes that food production pushes: climate change, biodiversity loss, freshwater use, the nitrogen cycle, the phosphorus cycle and land-system change.

A Lancet Commission report on obesity, undernutrition and climate change, of the same year, framed them as one Global Syndemic: epidemics that occur together, interact, and share drivers in food and agriculture, transportation, urban design and land use.

A sustainability scientist owns the question of what a diet does to emissions, water and land. [222, 222, 222, 223, 224, 224, 225, 226, 226, 226, 226, 227, 226, 228, 229, 230, 230, 228, 226, 231, 232]

IN PLAIN TERMS. Nutrition tells you whether a diet is healthy for people. Whether a diet stays within the planet's limits is a different calculation, done by a different owner.

Start with two words. Planetary health — the health of people together with the natural systems they depend on — is how a Lancet Commission report describes what climate change threatens. The same report calls obesity, undernutrition and climate change three pandemics — epidemics that, in its words, affect "most people in every country and region worldwide". It says they make up a syndemic — epidemics that occur together in time and place, interact, and share underlying causes.

The report says linking the three "emphasises the need for common solutions".

A second report, from the EAT–Lancet Commission, gives the field its most quoted idea. The reference diet — the Commission's diet meant to be healthy for people and within the planet's limits — is described by the Commission in numbers. This book gives it in words only. It largely consists of vegetables, fruits, whole grains, legumes, nuts and unsaturated oils. It includes a low to moderate amount of seafood and poultry. It includes no or a low quantity of red meat, processed meat, added sugar, refined grains and starchy vegetables. The Commission calls it a reference diet, "a basis for estimating the health and environmental effects" of changing diets.

It sets no targets for any country, sector or business. It gives no plan for turning global targets into national or local ones. And it says the reference diet can be adapted to the food cultures of every region.

Field	Owner	Where to look
Planetary health: diet, climate and land use	a sustainability scientist	an environmental-science department; the Indian authors of papers on the Commission's diet that you have read

How planetary health enters Indian food policy is taught in Book 125, *Food systems, value chains and Indian food policy*.

Illustration 1. Start with the report itself. Open the EAT–Lancet Commission report, Willett and colleagues, *The Lancet* 2019, at https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31788-4/fulltext. The site may ask you to register before it shows the full text.

Search for *six key Earth system processes*.

> *Scientific targets for the safe operating space of food systems were established for six key Earth system processes.*

Then search for *biodiversity loss, freshwater use*.

> *food production is among the largest drivers of global environmental change by contributing to climate change, biodiversity loss, freshwater use, interference with the global nitrogen and phosphorus cycles, and land-system change*

In plain words: food production pushes on six of the planet's systems, and the Commission set a limit for each. Its "safe operating space" is the room left inside those limits and inside the healthy ranges of the diet.

Search for *about 10 billion*.

> *food systems can provide healthy diets (ie, reference diet) for an estimated global population of about 10 billion people by 2050 and remain within a safe operating space.*

Read the next sentence too.

> *However, even small increases in consumption of red meat or dairy foods would make this goal difficult or impossible to achieve.*

In plain words: the Commission's model says the reference diet fits within those limits for about 10 billion people by 2050, and that even small increases in red meat or dairy would make that goal difficult or impossible to reach.

This is the sustainability scientist's kind of answer: a diet, run through a model of the food system, checked against limits for climate, water, land, nitrogen, phosphorus and biodiversity. You cannot run that model, and you cannot judge it.

Now see what the answer does not settle. Search for *uncertainty range*.

> *However, the uncertainty range for these food boundaries remains high because of the inherent complexity in Earth system dynamics.*

Search for *does not provide a plan*.

> *this framework does not provide a plan for translating global targets to national and subnational governments, businesses, and other local actors*

Search for *nor does it have a mandate*.

> *This Commission is not setting actionable science-based targets (panel 1) on behalf of any country, sector, or business, nor does it have a mandate to do so.*

Figures quoted in this illustration are from [233].

WHERE THIS PICTURE BREAKS. The Commission's limits are global, and it says itself that their uncertainty is high. It sets no target for any country and gives no plan for turning its global targets into national or local ones. So the report alone cannot tell you what a change in an Indian family's diet would do to emissions, water or land. Whether the diet meets Indian nutritional needs is a separate question again.

Illustration 2. A made-up call. The reporter from the Hindi daily again. "A big international report says the whole world must eat one planetary diet, with almost no meat, to save the climate. Should Indian families change what they eat? I need your line by eight."

The first signal is **One source**. Any answer you give would rest on one report whose modelling you cannot judge.

Start with what you can answer, because it is reading. You can tell her what the report itself says. It calls its diet a reference diet, a basis for estimating effects. It says the diet can be adapted to the food cultures of every region. It says traditional diets "such as those in Indonesia, Mexico, India, China, and West Africa, also include little red meat", and that "Legume consumption has traditionally been high in many cultures, such as Mexico, India, and Rwanda." It sets no targets for any country. All of that is reading, and it is yours. For the rest, you say: "That is outside what I can assess, and here is who can: a sustainability scientist. I will send one the question tonight; for now, quote only what the report says."

Two lines tempt you, and both are improvising. "Indian diets are already planet-friendly, so nothing needs to change." That claims an environmental result you cannot compute. "Yes, every family should switch to this diet." That claims the diet suits Indian nutrition, which is another book's question, and it claims more than the report's own word "reference".

So write the question you would ask a sustainability scientist, in the five parts.

Part	What you write
Decision	What I say on the record tonight about whether Indian families should change their diet for the climate. The reporter files at 8 pm; the story reaches a Hindi-reading public.
Context	The 2019 EAT–Lancet Commission report. Its reference diet and its limits are global; it sets no target for any country and says its diet can be adapted to food cultures. I can say what the report says. I cannot judge its environmental modelling.

Part	What you write
Question	For the diets Indian families commonly eat, which changes would matter most for greenhouse-gas emissions, water and land use, and how sure can anyone be of that for India from this report?
Form	Two or three changes, largest first, each in one plain sentence I may quote, and how sure you are. If this report cannot answer it for India, say so in one sentence I may quote.
Deadline	Today, 8 pm. If later, I say only what the report itself says.

Last, the row for your contact list. Put it in now and leave the name for you to fill.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Planetary health: diet, climate and land use	a sustainability scientist	(yours to fill)		Which diet changes matter most for emissions, water and land in India, and how sure is that?		

WHERE THIS PICTURE BREAKS. If she only asks what the report recommends, read it to her; that is yours. If she asks whether the diet is healthy for Indians, the owner is a nutrition expert, not a sustainability scientist, and the question belongs with Book 151, *Indian dietary patterns, guidelines, food composition and diet cost*.

MUST KNOW POINTS FOR YOU.

- Do not tell a reporter that Indian diets are "already planet-friendly", or that Indian families "must" switch to the reference diet. Say what the report says, and route the rest.
- The "planetary diet" is not a prescription for each person. The Commission calls it a reference diet, a basis for estimating the health and environmental effects of changing diets.
- The Commission's targets are global, and it says their uncertainty is high and that it gives no plan for countries. Route the question to a sustainability scientist before anyone quotes a global number as a local target.
- When an obesity proposal touches food supply, transport, urban design or land use, ask whether it could also serve undernutrition or climate.
- If you propose adding sustainability to a dietary guideline, expect opposition. The Syndemic report says many countries' attempts failed under pressure from food industry lobbies.

COMMON MISREADING. "Science has found the one diet that is healthy and saves the planet, so everyone should eat it." The Commission describes a reference diet as a basis for estimating ef-

fects, says it can be adapted to every region's food, and sets no target for any country. Its limits are global and, in its own words, highly uncertain.

EXERCISE 1 (retrieval). What is a syndemic? Which three conditions does the Lancet report join into the Global Syndemic? Who owns the question of what a diet does to emissions, water and land?

EXERCISE 2 (retrieval). Name the six Earth system processes for which the EAT–Lancet Commission set targets.

EXERCISE 3 (design). A made-up request. The district collector's office plans to change part of the grain in a school meal scheme "for health and for the climate", and asks you for the climate case before a meeting in three weeks. Write the question you would send to a sustainability scientist, in the five parts.

EXERCISE 4 (critique). A made-up line from a district meeting: "One report settles it: the EAT–Lancet report. Our district diet plan should copy its amounts exactly." Name the first signal that should fire in the speaker, and rewrite the line.

13 · Streets and plans: urban and transport planning, and the municipal office

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Urban and transport planning decides what the land in a town is used for and where its streets, footpaths, cycle tracks and public transport go, and fixes those decisions in plans, such as a city's master plan. India's National Urban Transport Policy of 2006 holds that transport planning "is intrinsically linked to land use planning" and that both must be developed together.

The owners of a question about a ward's streets are an urban or transport planner and the municipal town-planning office. [234, 235, 234, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 251, 251, 252]

IN PLAIN TERMS. You met the Wards Committee in an earlier section, where the councillor chairs and you attend for health advice. Questions about the ward's streets reach that committee, and they are not yours to answer. Urban and transport planners decide what land is for and where streets, paths and buses go, and they write those decisions into plans.

The policy speaks of a master plan — a city's plan for how its land is used and where its roads and transport go as it grows. The policy says "an integrated master plan needs to internalize the features of sustainable transport systems". That was the policy's intention in 2006. It is not a fact about any city today.

The curriculum this book follows names "the master and mobility plans that fix them". No document this book holds defines a mobility plan. It is a planner's word, and the planner is who you ask what it means for your town.

Now ask who holds the plan. Book 5, *Policy process, framing and advocacy craft*, showed you the Constitution's Twelfth Schedule, the list of matters that municipalities may be given work on. Item 1 reads "Urban planning including town planning."

Article 243W, which Book 5 also showed you, says the Legislature of a State "may, by law, endow" the municipalities with powers and authority. That includes functions "in relation to the matters listed in the Twelfth Schedule". So whether your municipality makes the town plan depends on your State's law, and this book does not hold that law.

The policy puts the work in the same place. It says responsibility for planning and carrying out urban transport "rests with the State governments and the municipal bodies".

In the Union government, the Allocation of Business Rules give the Ministry of Housing and Urban Affairs (MoHUA) two departments, inserted by an amendment dated 22 July 2026. Item 4 of the Department of Urban Development reads "Town and Country Planning". This is the Union's business in the field.

Here is the row for your list of owners.

Field	Owner	Where to look
Urban and transport planning	an urban or transport planner; the municipal town-planning office	your municipal corporation's town-planning office (ask the corporation which office makes and keeps the town plan); a university department of planning or architecture (advice); at the Union level, MoHUA's Department of Urban Development, for national policy

The first two places are kinds of place, given as advice.

Illustration 1. Start with a cycle track that was built and not used, and see what the policy says about it.

Open the National Urban Transport Policy (https://mohua.gov.in/static/uploads/2025/10/0da700a8b86f2faee310bd49592ee99a.pdf). Search for "cycle tracks". Read paragraph 28. The safety of cyclists and pedestrians is to be addressed by "encouraging the construction of segregated rights of way for bicycles and pedestrians" — paths kept separate from motor traffic.

Read on into paragraph 29. The failure comes first: "It has been the experience that many such cycle tracks and pedestrian paths do not get used as initially envisaged." Then the policy gives an explanation, and reports it only as "a view". The view is that these facilities "are designed badly and without fully recognizing the limitations and problems faced by cyclists or pedestrians". Its remedy is to build them "after an open debate on the designs with experts and the community that is expected to use them".

Now read paragraph 30. The Central Government "would give priority to the construction of cycle tracks and pedestrian paths in all cities".

Last, ask what you would need to know to say whether one lane on one road will be used. Its width. Where it starts and ends. The crossings. The shade. What the main road carries. You do not know how to judge any of these. A planner does. That is the field's kind of answer: a design, and where it sits in a plan.

WHERE THIS PICTURE BREAKS. Paragraph 29 reports an experience and "a view" about why. It is not a study, and it gives no count of how many tracks went unused. The policy is the Union's statement of 2006 of what it "would" do and support. It does not tell you what your city's plan says now, and this book holds no later version.

Nothing here says that a cycle lane changes how active people are, or their weight. That evidence is taught in Book 24, *Physical activity and sedentary behaviour science*.

Illustration 2. A made-up meeting: the Wards Committee. The councillor reads a letter from the corporation's engineer.

> *"The corporation will build a cycle lane. It can go along the main road or along the lane behind the market. The committee should send its view by Friday."*

The councillor turns to you.

> *"You're the health person. Which one will get our people cycling?"*

Start with what you can answer now. You can say who in the ward is least active, if the health department has a ward survey that measured it. You can also say that, whatever is built, the ward can count who uses it before and after, and you can help design that count. Both are yours.

Now the signal. **About to act** fires first: the committee sends its view on Friday, and the corporation will build what it recommends. Behind it is **No test**. You cannot say what result would show "the main road" or "behind the market" wrong.

You say: "I can tell you who in the ward is least active, and I can help count who uses the lane once it is built. Which route gets people cycling is a design question. That is outside what I can assess, and here is who can: the town-planning office, and through it an urban or transport planner. I'll write to them today, so we have a reply before Friday."

The curriculum this book follows gives the question in these words. Write it in five parts.

Part	Your question
Decision	The Wards Committee's view on where the corporation builds the cycle lane: the main road or the lane behind the market. The councillor and the committee are waiting; the corporation's engineer wants the view by Friday.
Context	The ward has a main road and a lane behind the market (map attached). What the health department knows about who is least active in the ward is attached, if a survey exists. The committee's aim is more walking and cycling among those who do least.
Question	"what would make this ward's streets walkable and cyclable for the least active, and which plan or budget does that sit in?"
Form	A recommendation between the two routes, or a third, with the reasons a committee can follow; how sure you are and on what; the name of the plan the lane would sit in, and the budget its money would come from. I cannot judge street design; tell me what would make you change your recommendation.
Deadline	Thursday, so the committee can discuss it before Friday. If it comes later, the committee sends its view without it.

The question goes to the municipal town-planning office, with a request that an urban or transport planner answer it. The "which plan or budget" half is what makes the reply useful later, because it tells you where the decision can still be changed.

Add the row to your contact list now; a later section shows how to keep it.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Urban and transport planning	an urban or transport planner; the municipal town-planning office	(yours to fill)		what would make this ward's streets walkable and cyclable for the least active, and which plan or budget that sits in		

WHERE THIS PICTURE BREAKS. The move is wrong when the question is yours: who in the ward is least active, how to count use before and after, how the ward would know whether anything changed. Those stay with you.

It is also wrong to route the question "will this bring obesity down?" to a planner. A planner can tell you whether a lane is likely to be used, not what that does to weight. That half is evidence on activity, taught in Book 24, *Physical activity and sedentary behaviour science*, and you say so.

MUST KNOW POINTS FOR YOU.

- Do not tell a committee that a cycle lane will get people cycling, or that it will bring obesity down. The 2006 transport policy itself records that many cycle tracks and pedestrian paths "do not get used as initially envisaged".
- The error is to say the Constitution makes town planning the municipality's job. The Twelfth Schedule lists "Urban planning including town planning", and Article 243W lets the State Legislature, by law, give municipalities that work. Who draws your town's plan depends on your State's law; ask the corporation, or trace it.
- Always ask the second half of the question: which plan or budget does it sit in.
- The National Urban Transport Policy you can read is the Union's statement of 2006, in the words "would" and "should". It does not tell you what any city's plan says today, and this book holds no later version.
- The Ministry of Housing and Urban Affairs' Department of Urban Development holds "Town and Country Planning" as Union business, item 4 of its entry. It is not the office that decides your ward's streets.

COMMON MISREADING. Reading the 2006 policy's priority for cycle tracks as evidence that cycle tracks raise activity. The policy states what the Union would support and records that many tracks went unused; it measures nothing about activity or weight.

EXERCISE 1 (retrieval). From memory: who owns a question about making a ward's streets walkable and cyclable? Give the curriculum's question in its words. Then say what the 2006 transport policy says about cycle tracks that were built and not used, and what it proposes.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (design). A made-up request: at the Wards Committee, the head of a government school asks a question. Would a footpath and a safe crossing on the road outside the school get more children walking to school? The committee meets again in a month. Write the question you would ask, in the five parts, and say who gets it and what stays yours.

EXERCISE 3 (critique). A made-up line from a committee member: "Cycle lanes don't work in India. I only need one document for that: the government's own policy says nobody uses them. Spend the money on something else." Name the signal that should have stopped the speaker, say what the policy actually says, and rewrite the line.

14 · Running an institution: service rules, accounts and audit, public procurement, contracts

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Running anything beyond your own team brings four kinds of question, each with its own owner.

What a hire requires is set by service rules and labour law; the owner is the institution's administrative officer. How money is recorded and checked is a matter of accounts and audit. Inside your institution the owner is the finance officer. The auditor of the Union's and the States' accounts is the Comptroller and Auditor-General of India (CAG), appointed under Article 148 of the Constitution, whose duties over the accounts of the Union, the States and other bodies are those Parliament's laws prescribe (Article 149). How a government body buys is set by public procurement rules; the owner is the purchase (stores) officer. The Union's General Financial Rules 2017 ask for legal and financial advice in drafting a contract that does not use a standard form (Rule 225); this book holds no rule on memoranda of understanding. For both, the owner is a lawyer, reached through the institution's legal cell. [253, 254, 255, 255, 256, 257, 258, 259, 260, 261, 262, 262, 263, 263, 264, 265, 266, 267, 268, 269, 270, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280]

IN PLAIN TERMS. Running anything bigger than your own team brings legal and money questions. Leading the team itself is taught in Book 69, *Teaching, mentorship and coalition building* (Rung 2).

There are four fields.

First, a hire. Service rules — the rules that set a government post's pay, leave, conduct and the rest — and labour law decide what a hire requires: what kind of post, what process, and what the person may be promised. No source this book holds sets these out, so this section says nothing about their content. The owner is the institution's administrative officer.

Second, accounts and audit. Accounts are the record of money received and spent. Audit — a check, by someone other than the spender, that money was spent and recorded as the rules and the accounts say — is the other half of the job. Statutory accounts — accounts a law or a rule requires a body to keep — are part of this. Inside your institution, questions about them go to the finance officer.

For the accounts of the Union and the States, the auditor is the Comptroller and Auditor-General of India (CAG).

The Union's own rulebook for money is the General Financial Rules 2017 (GFR), taught below. Rule 236 covers a body that gets a government grant.

The rule gives two separate tests for when the CAG audits a grantee. First, the CAG "shall" audit it when the grants or loans in a year are at least Rs 25 lakh and also "not less than seventy-five

percent of the total expenditure of the Institution", so 75 per cent or more of its spending. Both conditions must hold. Second, the CAG "may also" audit it when the grants or loans in a year are "not less than Rupees one crore", which is Rs 1 crore, whatever share of its spending that is. In all other cases the institution has its accounts audited by chartered accountants of its own choice (Rule 236(3)). These figures are as printed in the GFR updated up to 31 January 2026.

The CAG, or the chartered accountant, is the auditor, not someone you ask. The person inside your institution who can tell you what audit will check is the finance officer. That is this book's advice, like every owner named here by kind.

Third, public procurement — a government body buying goods or services under its financial rules. For the Union government's offices, those rules are the GFR. The owner is the purchase (stores) officer — the person in charge of your institution's purchase or stores section.

The copy this book holds is "Updated up to 31.01.2026". The GFR are "applicable to all Central Government Ministries / Departments, attached and subordinate bodies" (Rule 1).

Rule 144 makes whoever holds the power to buy responsible for bringing "efficiency, economy, and transparency", and for "fair and equitable treatment of suppliers and promotion of competition". The same rule says what the description of the thing to be bought must be: "objective, functional, generic and measurable". It must not "indicate a requirement for a particular trade mark, trade name or brand". This is the part a health person can do well. You can say what the item must do.

The Government e-Marketplace (GeM) is the government's online market for common goods and services. Union ministries and departments must use it for what it offers, and State offices may use it. Buying by ministries or departments "will be mandatory for Goods or Services available on GeM" (Rule 149).

A State's own offices buy under the State's own financial rules, which this book does not hold. That is why, in the scene below, the first answer you need is which rule book applies.

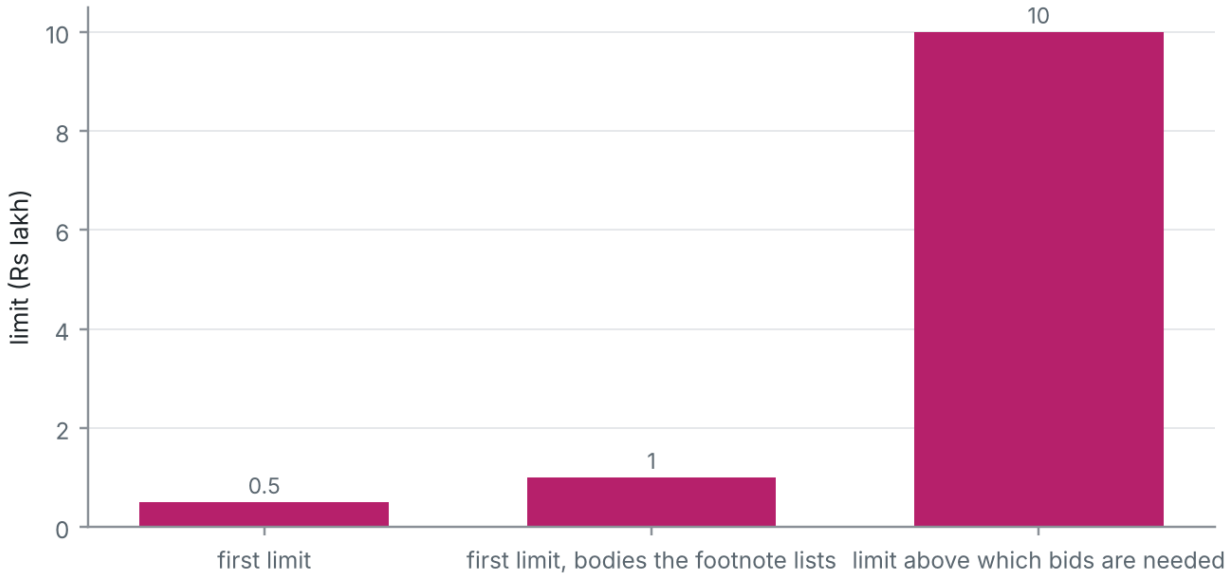
Fourth, contracts and memoranda of understanding. A memorandum of understanding — a written agreement between two bodies about what each will do — is not covered by any rule this book holds.

For contracts, the GFR themselves send the drafting to advisers (Rule 225). For both, the owner is a lawyer, reached through the institution's legal cell.

Here are the four owners, and where to look for each.

Field	Owner	Where to look
Service rules and labour law for a hire	the administrative officer	your institution's administration office
Statutory accounts and audit	the finance officer; for public bodies, the CAG as auditor	your institution's finance or accounts office; the CAG audits, and you do not write to the CAG yourself
Public procurement	the purchase (stores) officer	your institution's purchase or stores section
Contracts and memoranda of understanding	a lawyer, through the institution's legal cell	your institution's legal cell, through the administration office if there is no cell

These are kinds of places, given as advice.



The value limits of Rule 149 of the General Financial Rules, in lakh rupees. Up to Rs 50,000, any available supplier on GeM; above it and up to Rs 10 lakh, the lowest price among sellers of at least three different manufacturers; above Rs 10 lakh, bids. A footnote replaces the first limit with Rs 1 lakh for the bodies it lists, twice the general one. Which limit covers your institution is the purchase officer's answer.

Illustration 1. Start with a purchase and the rule that governs it, and see how much of it you can read.

Open the General Financial Rules 2017 on the Department of Expenditure's website (https://doe.gov.in/files/circulars_document/GFRupdatedupto31012026.pdf). Search for "Rule 149". Read the routes by value, then set them out in a table. The figures are as printed in the GFR updated up to 31 January 2026.

Value of the purchase on GeM	How Rule 149 says to buy
up to Rs 50,000	through any available supplier on GeM that meets the quality, specification and delivery period
above Rs 50,000 and up to Rs 10 lakh	through the GeM seller with the lowest price among at least three different manufacturers
above Rs 10 lakh	through the supplier with the lowest price, after obtaining bids by online bidding or reverse auction on GeM

The rule prints the middle limit as "Rs.10,00,000/-". That is ten lakh, and the table writes it that way. Bids are priced offers that suppliers send in answer to a call for them; that call is what people mean by "a tender". How GeM's online bidding and reverse-auction tools run is the purchase officer's work, and this book does not teach it.

Now read the footnotes under the rule. One replaces the first limit with "Rs. 1,00,000/-" (Rs 1 lakh; the rules print "/-" after whole-rupee amounts) for scientific ministries, and for "Education-

al and Research Institutes" that run post-graduate and doctoral courses or research. Ask yourself: is my institution one of these? You may not know.

Read Rule 149(viii). A demand for goods "shall not be divided into small quantities to make piecemeal purchases" to avoid the bidding route. Then read Rule 145. Who may sanction a purchase is set by "the Delegation of Financial Powers Rules", which this book does not hold.

Last, list what you would need to know to say how this purchase must be made. Does the GFR apply to your body at all (Rule 1)? Is the item on GeM? Which footnote covers your institution? Who holds the power to sanction it? Does the whole year's demand count as one purchase? That list is the purchase (stores) officer's daily work. You can read the rule. You cannot apply it.

Figures quoted in this illustration are from [281].

WHERE THIS PICTURE BREAKS. The GFR are the Union government's rules (Rule 1). A district programme run by a State government buys under that State's own financial rules, which this book does not hold, though GeM is open to State offices.

The limits are the amended figures as printed in the consolidation updated to 31 January 2026. The footnotes show that office orders change them, so the figure you read may not be the figure that applies on the day you buy. Nothing here says what audit has found about any purchase.

Illustration 2. A made-up meeting: the district NCD programme review. The district NCD officer holds up a supplier's catalogue.

> *"The screening money has come. We need weighing scales for the camps. You're the community medicine person: pick a model from this catalogue and we'll send the order today."*

Start with what you can do, there and then. Write what the scale must do for screening. It must weigh the heaviest adult who will come to a camp. It must read finely enough for the camp's purpose. It must be open to calibration — measuring a machine against something already known, so its readings mean something. It must survive being carried between camps. Write all of this with no brand name. Rule 144 asks exactly this of a description: "objective, functional, generic and measurable", with no brand. That page is yours.

Now the signal. **About to act** fires first, because the order goes today. Behind it is **Unknown standard**. You do not know which rule book governs this purchase, whether the GFR or the State's, or which route its value requires.

You might say: "I'll write the specification now, without a brand. Which route the rules require for this purchase, and what audit will check, is a different question. That is outside what I can assess, and here is who can: the purchase (stores) officer. Can we send it to them today, with the specification, and place the order once they reply?"

The curriculum this book follows gives the question in these words.

Part	Your question
Decision	Whether, how and when the district buys weighing scales for its screening camps. The district NCD officer decides; the camps are waiting for the scales.

Context	A purchase of weighing scales for adult screening, paid from the screening budget (the amount and the number of scales are attached). Our specification, with no brand, is attached. We do not know whether the item is on GeM or which rules govern this purchase.
Question	"what does this hire, contract or purchase require, and what will audit check?", fitted: "What does this purchase of weighing scales require, and what will audit check in its file?"
Form	The route to buy by (GeM or another, and which rule), the steps and papers needed, the authority who must sanction it, and what audit will look for in the file. I cannot judge public procurement rules; tell me how sure you are and on what, and where the answer depends on facts you need from us.
Deadline	Before the next camp schedule is fixed, in two weeks. If it comes later, the camps start without the scales, or the order is placed without the rules checked.

The same question fits the other three owners. Each of these is one you would send in the same five parts when you write it in full. They are this book's wording, not the curriculum's.

- To the administrative officer, for a hire: "What does it take to engage a data-entry person for six months from the screening budget, and what may we promise them?"
- To the finance officer, for accounts and audit: "Which accounts must we keep for the screening grant, and what will audit check in them?"
- To the legal cell, for a memorandum of understanding: "Can you draft or check our memorandum with the college that will lend us staff for the camps, and what must it contain?"

Add the four rows to your contact list now; a later section shows how to keep it.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Service rules and labour law for a hire	the administrative officer	(yours to fill)		what this hire requires, and what may be promised		
Statutory accounts and audit	the finance officer; for public bodies, the CAG as auditor	(yours to fill)		which accounts this grant needs, and what audit will check		
Public procurement	the purchase (stores) officer	(yours to fill)		what this purchase requires, and what audit will check		
Contracts and memoranda of understanding	a lawyer, through the institution's legal cell	(yours to fill)		what this memorandum must contain		

WHERE THIS PICTURE BREAKS. The specification is yours, and routing it away would be a failure of the other kind: nobody else in the room knows what a screening scale must do.

Routing is also the wrong frame once the officer has replied. A reply that names the rule and the route is not something you second-guess. You check it with the five checks (Asked: is it about this purchase; How sure: does it say how sure, and on what; Own field: does it name what lies

outside public procurement, such as the State's own rules; References: does the rule it cites say what the reply says; Decision: does it settle whether, how and when to buy), and then you act on it.

MUST KNOW POINTS FOR YOU.

- Do not tell a meeting 'it is under fifty thousand, so buy it from any supplier'. Whether the General Financial Rules apply at all, which limit covers your institution (a footnote raises the first limit to Rs 1 lakh for listed bodies), whether the item is on GeM, and whether the year's demand counts as one purchase are each the purchase (stores) officer's answer. Rule 149(viii) forbids splitting a demand to stay under a limit.
- Do not tell a committee that 'audit won't look at something this small'. Ask the finance officer what audit will check.
- Do not promise anyone a post, a term or a pay in a meeting. What a hire requires is set by service rules and labour law that this book does not hold; the administrative officer answers it before anyone is told anything.
- Do not agree to a contract's or a memorandum's wording 'in principle' across a table. For contracts, the General Financial Rules ask for legal and financial advice before clauses are drafted outside a standard form, or a standard form is changed; for a memorandum, ask the legal cell.
- In every purchase, write the specification yourself: what the item must do, measurably, with no brand.
- The General Financial Rules you can read are the Union government's, updated to 31 January 2026, and they are changed by office orders. Quote a GFR limit only with the words 'for Union bodies, as of' and its date, and let the purchase (stores) officer say which rules apply.

COMMON MISREADING. Reading the GFR's rupee limits as the rule for every government purchase in India. They are the Union government's rules, updated to 31 January 2026; a State's offices buy under the State's own rules, and a footnote changes the first limit for some bodies.

EXERCISE 1 (retrieval). From memory: name the owner of each of these questions. What does a hire require? What will audit check in a grant's accounts? How must a purchase be made? What must a memorandum of understanding contain? Then give the curriculum's question for this field in its words.

Record your confidence as a percentage before turning to the answer.

EXERCISE 2 (design). A made-up request: at the district NCD meeting, the district NCD officer asks you to take on a person for six months. The person will enter screening data, paid from the screening budget, starting next month. Write the question you would ask, in the five parts, and say who gets it.

EXERCISE 3 (critique). A made-up line at the district NCD meeting (the price is made up): 'The scale costs Rs 45,000, so no tender is needed. Just buy it from the shop near the office.' Name the

signal that should have stopped the speaker, say what the speaker could not know, and rewrite the line.

15 · Campaign production and media buying

Checked against the sources as they stood on 2026-10-16.

DEFINITION. Campaign production makes the advertising message: the visual or spoken information that informs or persuades an audience, usually in five parts — headline, subheading, copy, images and a call to action. Media buying chooses and pays for the media that carry the message, usually a mix of them. A media plan states what a budget buys in two quantities. Reach is the estimated number of people in the audience who will see the message. Frequency is the number of times each of them will see it in a stated period. Together they set the schedule, and, in the words of OpenStax's open textbook *Principles of Marketing*, "there are trade-offs between reach and frequency".

In India, television rating agencies must register with the Ministry of Information and Broadcasting. Its TV Ratings Policy 2026 replaced the guidelines of 16 January 2014. A rating agency measures viewing in a panel — a fixed sample of homes chosen for audience measurement; the 2026 policy calls them metered homes, and raises the number it requires from 50,000 to 80,000. In a written reply in the Rajya Sabha (the upper house of Parliament), posted on 24 July 2026, the Ministry said that no entity was yet registered under the new policy.

The National Health Mission (NHM) funds the States' information, education and communication (IEC) and behaviour change communication (BCC). Its key programme management staff, as a 2019 benchmark document lists them, include a State IEC officer or State BCC officer, who prepares the State's IEC/BCC plan each year and evaluates it. The owners of a campaign's reach and of how its exposure is measured are a communications or social-marketing agency, and the State IEC officer. [282, 283, 284, 285, 286, 287, 287, 288, 289, 290, 291, 291, 292, 293, 294, 295, 295, 296, 295, 297, 297, 298, 190, 190, 299, 299, 300, 301, 302, 302, 303, 303, 190, 304, 305, 191, 306, 307, 307, 308, 309, 310]

IN PLAIN TERMS. A campaign is made by two trades, and neither is yours.

Making the advert is campaign production (the curriculum's list also calls it creative production).

The message is the picture or words that inform or persuade the audience. It usually has five parts: headline, subheading, copy — the text that answers the audience's first questions — images, and a call to action — the line that tells the audience what to do now.

Getting the message seen is media buying, and it starts with a media plan. The planner picks the media after the message is settled, and usually picks a mix of them, "that are most likely to reach the target audience". Media buying — paying for the space or airtime in which a message runs — is what the budget goes on.

A planner answers in two numbers, and you must know them before anyone uses them. Reach — the estimated number of people in the audience who will see the message. Frequency — how

many times each of them sees it in a stated period. A planner has to choose, in OpenStax's words, "whether reaching the most people or reaching the same people the most is more beneficial".

A planner usually works forward: price the tasks, estimate the reach and frequency they need, and set the budget from that (the first illustration below quotes the method). When a budget already exists, you ask the same thing the other way: what reach and frequency does this sum buy?

Exposure — in a media plan, a person seeing or hearing the message. In your own studies, an exposure is what differs between the groups compared; the two words are not the same. For television, counting exposure is a regulated trade. The 2014 guidelines for television rating agencies said the panel homes for measuring audiences had to be "drawn from the pool of households selected through an establishment survey". They said every agency had to register with the Ministry of Information and Broadcasting (MIB), and had to publish its method.

The MIB released the TV Ratings Policy 2026, which replaced them. Under the new policy, any entity in the business of television ratings has to register.

As on 24 July 2026, the Ministry told the Rajya Sabha that no entity was registered under the new policy. Which agency produces India's television ratings today, and on what panel, this book does not hold. Ask the planner.

For internet adverts, ask how the platform counted views; this book holds no source on how platforms count.

After a campaign launches, post-tests check what people took in. OpenStax defines post-testing as "testing the effectiveness of a campaign after it has launched". Designing and testing campaigns belongs to Book 37, *Behavioural theory, choice architecture and intervention design*.

The National Health Mission (NHM) does its awareness work through information, education and communication (IEC) and behaviour change communication (BCC) campaigns. A benchmark document of April 2019, for NHM's key programme management staff, lists a "State IEC officer/ State BCC officer".

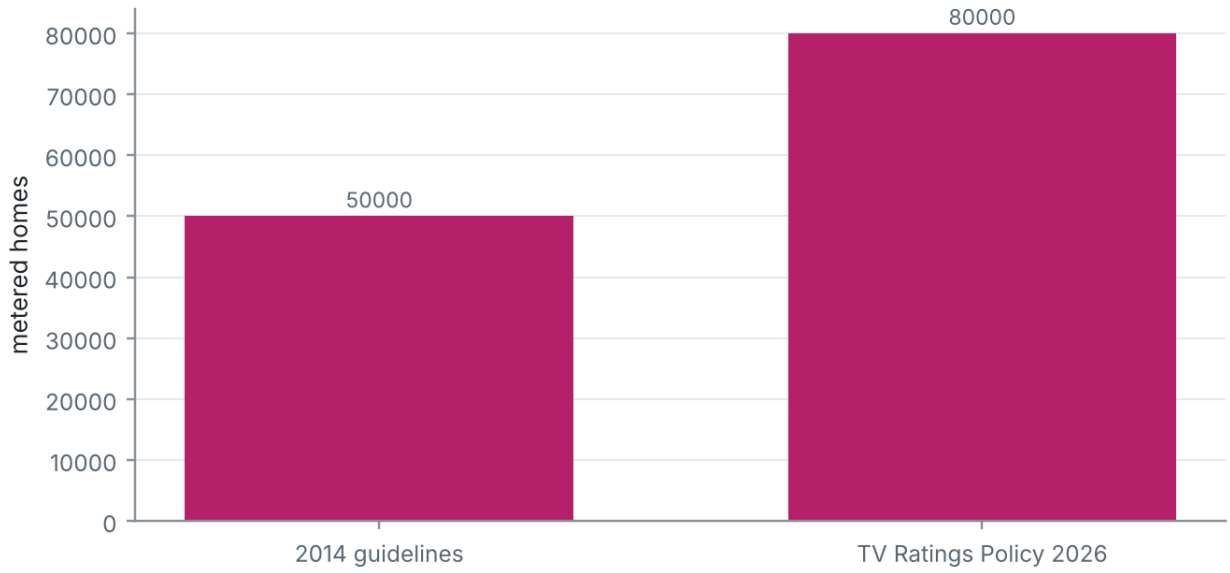
That officer prepares an "IEC/ BCC strategy plan" for the State each year, with measurable indicators, by November. The officer evaluates the BCC strategy once a year and reports to the NHM Mission Director.

The document is from 2019 and does not describe any one State's office. Check the post's present name with your State's NHM office.

Here is the row for your list of owners.

Field	Owner	Where to look
Campaign production and media buying	a communications or social-marketing agency; the State IEC officer	the State IEC officer/ State BCC officer at your State's NHM office; an agency your state or district has used before, which that officer can name

These are kinds of places; this book holds no list of agencies.



Metered homes the rules require in a television audience panel in India: 50,000 under the 2014 guidelines (the size the panel was to reach) and 80,000 under the TV Ratings Policy 2026, as a written reply in the Rajya Sabha gave them on 24 July 2026. The figures say nothing about who measures today: as on that date, no entity was registered under the new policy.

Illustration 1. Start with how a planner works, and read it yourself.

Open OpenStax, *Principles of Marketing*, section 13.4 (https://openstax.org/books/principles-marketing/pages/13-4-steps-in-the-imc-planning-process). Find "Objective and Task" and read it. It says:

> *The tasks are priced, and the level of reach (number of consumers who will see the message) and the frequency (the number of times the consumer will see the message) are estimated. Based on the tasks necessary to achieve the campaign objectives, the budget is established.*

This is the answer you cannot give: for each medium, how many people in your audience will see the message, and how often, for the money.

Now read what campaigns have changed. Open Wakefield, Loken and Hornik, "Use of mass media campaigns to change health behaviour", *The Lancet*, 2010 (https://pmc.ncbi.nlm.nih.gov/articles/PMC4248563/). Find three findings.

- Campaigns "can produce positive changes or prevent negative changes in health-related behaviours across large populations".
- For nutrition and physical activity, "short-term changes can be achieved, sustained effects are difficult to maintain after campaigns end".
- Success is likelier "when the target behaviour is one-off or episodic … rather than habitual or ongoing (eg, food choices, sun exposure, physical activity)".

Now link them to reach and frequency. The review's policy panel asks for funding to "enable frequent and widespread exposure to campaign messages continuously over time, especially for

ongoing behaviours". It also notes that a cluttered media world makes adequate exposure harder.

Ask what the review does not tell you. It does not say what your campaign will do in your district. Almost all the campaigns it assessed came with other programme parts, so a campaign's own effect is hard to isolate. It gives no reach or frequency for any budget. This book has not checked whether any of the campaigns it reviews were Indian.

Last, read the rules on counting television audiences. Under the 2014 guidelines, the panel was to grow by 10,000 homes a year until it reached 50,000. The 2026 policy raises the figure for metered homes from 50,000 to 80,000. The figure shows both. These figures are the size of the panel the rules require. They are not the number of people any campaign reaches, and they do not tell you who is measuring today: as on 24 July 2026, no entity was registered under the new policy.

Figures quoted in this illustration are from [311].

WHERE THIS PICTURE BREAKS. OpenStax describes how a commercial marketer sets a budget; a health campaign has the same arithmetic of reach and frequency but a different aim, and the review shows aims about habits are the hardest to meet. Wakefield and colleagues summarise campaigns mostly run elsewhere, with other programmes beside them. The panel figures are the rules' requirement as reported on 24 July 2026, not a measured audience.

Illustration 2. A made-up meeting: at the district NCD review, the district NCD officer turns to the budget for the obesity awareness campaign. "The agency's draft says this budget gives us a reach of most adults in the district. Is that good value?"

The tempting reply is "Yes. If it reaches most adults, that is excellent coverage." The first signal is **Loose word**. You would be using "reach" in its everyday sense, "gets to". To the planner it is an estimate of how many people in a stated audience will see the message, and it means little without its frequency, its period and how it was estimated. You could not say which of these the draft meant.

Say the part you can. You can say what the review found about campaigns on eating and activity: short-term change, hard to keep, and likelier with other programmes beside them. You can ask what the campaign is for. Then say: "Whether this budget buys the reach the draft claims is a different question. That is outside what I can assess, and here is who can: the agency that wrote the draft, and the State IEC officer. I will send them the question this week."

The curriculum this book follows gives the question in these words.

Part	Your question
Decision	Whether the district NCD review approves the obesity awareness campaign budget as drafted, or asks for a different mix of media. The district NCD officer is waiting; the budget is decided at the next review.
Context	The audience is the adults the district's NCD programme serves, in towns and villages. The draft names television, radio, hoardings and social media. The aim is that adults know where to get screened. The draft says the budget reaches "most adults" and gives no frequency, period or source.
Question	"what reach and frequency will this budget buy in this audience, and how will exposure be measured?"

Form	For each medium: an estimated reach (people in this audience) and frequency (times each sees it) over the campaign's weeks, the source of each estimate, and how exposure will be counted afterwards. I cannot judge your planning method; tell me how sure you are and on what.
Deadline	A week before the next review. If it comes later, the budget is approved on the draft's word.

The question goes to the agency that wrote the draft, with a copy to the State IEC officer, who can say whether the campaign sits in the State's IEC/BCC plan.

Add the row to your contact list now; a later section shows how to keep it.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Campaign production and media buying	a communications or social-marketing agency; the State IEC officer	(yours to fill)		what reach and frequency this budget buys in this audience, and how exposure will be measured		

WHERE THIS PICTURE BREAKS. Route only the planning. What a sum buys in reach and frequency is this section's question; what adverts do to what people eat or buy is the marketing scientist's, in the section on economists of work and of firms. Whether people in the district have obesity, who the campaign should be for and what it should ask them to do are questions you can help answer. And if the question is whether the campaign changed anyone's eating, that is an evaluation, not a media plan: it needs its own design.

MUST KNOW POINTS FOR YOU.

- Do not promise a committee that a campaign will reach everyone or change how people eat. Reach is a planner's estimate for a stated audience and period.
- "Exposure" in a media plan is not the exposure of your own studies. There it means a person seeing or hearing the message; in a study it is what differs between the groups compared.
- The TV Ratings Policy 2026 raised the number of metered homes a rating panel must have from 50,000 to 80,000 (Ministry of Information and Broadcasting, reply of 24 July 2026). That is a requirement, not a panel anyone is measuring with: no agency was registered under it on that date.
- This book cannot tell you who measures India's television audiences today: as on 24 July 2026, no entity was registered under the new policy, and it holds no source on how platforms count online views. Ask the planner which measurement each figure comes from, and its date.
- Where no agency has yet been engaged, ask the State IEC officer before you call one. The benchmark document is from 2019: check the post's present name first.

COMMON MISREADING. "A big reach means the campaign worked." Reach says how many people in the audience the planner estimates will see the message. Whether they took it in is a post-test, and whether they changed what they do is an evaluation.

EXERCISE 1 (retrieval). From memory: what are reach and frequency, and who owns the question of what a campaign budget buys?

EXERCISE 2 (design). A made-up request: the medical officer of an urban primary health centre wants posters on the city's buses for one month. They would tell people that the centre checks weight and blood pressure. She has a fixed sum and asks you whether it is enough. Write the question for a communications or social-marketing agency, in five parts.

EXERCISE 3 (critique). A made-up line from a review meeting: 'The hoardings went up on forty main roads, so the campaign reached the whole city.' (The number is made up.) Find the signal and rewrite the line.

EXERCISE 4 (interpretation). Read the figure and the reply of 24 July 2026. A district NCD officer says, 'Now that the panel has 80,000 homes, the ratings will tell us how many people saw our television spot.' What does the figure support, and what does it not?

16 · The contact list, and saying it in public

DEFINITION. A contact list is your own list of owners: one row for each field whose questions you route, in seven columns — Field, Owner, Name and institution, How you know them, Last question asked, Asked on, Checked on. How you know them takes one of three values. Worked with: you have asked them a question and used their reply, or done a piece of work together. Met: you have spoken with them but not yet worked on a question together. Found: you have located them and not yet made contact.

The public sentence is what you say, in any setting, when a question asked of you has left what you can assess: "That is outside what I can assess, and here is who can." It comes after the part you can answer, and the owner comes after it. [312, 313, 314, 315, 316, 317, 318]

IN PLAIN TERMS. Each field section before this one ended on a row for your list. This section stands on all of them. Now the rows become a list you keep.

The curriculum this book follows sets the target in these words: "A maintained contact list of named specialists in each adjacent field, with at least three of them people you have actually worked with." So the list has a row for every field, and at least three rows must say worked with. Only that value counts toward the three. A row moves from found to met when you first speak to them. It moves from met to worked with when you ask a real question and use the reply.

Four ways to fill a row. A name comes from one of four places.

1. A department. Each field section named the kind of university or government department to look in.
2. A professional society — a body of people in that field.
3. The author of a paper you have read. The corresponding author's address is printed on the paper.
4. An introduction from a colleague. Ask someone who has worked with an owner to introduce you.

Keeping it alive. A list goes stale unless you check it on a date. Write the review date in your diary, six months from today, and every six months after. At each review, for each row, ask two things: is the person still there, and still doing this work? If yes, write today's date under Checked on. If not, find their successor. A row whose Checked on date is more than six months old does not count toward the three until you check it again. A row still at found after one review needs a decision: make contact, or delete it. Six months is this book's rule, not a finding.

The public sentence. The sentence has a shape: what you can say, then the sentence, then the owner, then what happens next. Here is the sentence, in its exact words: "That is outside what I can assess, and here is who can."

Before it, say the part of the question you can answer, plainly. After it, name the owner. Use their name if they are on your list as worked with or met, and their kind if not. Then give the next step: “I will ask them this week”, or “I can put you in touch”.

Where, and how it gets easier. You say it wherever you route a question: in a lecture, a committee, an interview on the record, and with a patient, where you also say what they should keep doing meanwhile. This section practises the three public settings because they are the hardest. Say the same words each time. Saying it without embarrassment is practice, not temperament. Say it first where little rides on it, such as a class you teach.

No study this book holds measures how listeners judge someone who says this sentence. What you control is what they leave with: the part you could answer, an owner, and a next step. A confident answer that is acted on cannot be taken back from everyone who acted on it.

Illustration 1. A made-up list: a resident spent one evening on department websites and wrote five rows.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Circuit neuroscience of appetite	a systems neuroscientist	a teacher in a university physiology department	found			
Statistical genetics	a statistical geneticist	a teacher in a university genetics department	found			
Labour economics of obesity	a labour economist	an author of an Indian economics paper on work and BMI	found			
Public procurement	the purchase (stores) officer	the purchase (stores) officer, this institute	found			
Ayush systems	a qualified Ayush practitioner; for the State’s arrangements, the State’s Ayush directorate	the Ayush medical officer, co-located PHC	found			

Check it. Count the rows that say worked with: none. Look at Checked on: it is blank everywhere, so you cannot say any of them is still there. Look at Last question asked: it is blank, so none of them has been tested. The list looks full and does no work.

Make it work. The next move for each row is a real question.

1. Start with the rows nearest your own work. The purchase (stores) officer is in your own institute. Send the question the section on running an institution gave you (made up: a purchase of weighing scales for screening), and use the reply. The row becomes worked with.
2. The Ayush medical officer at the co-located PHC: go and introduce yourself. The row becomes met.

3. The author of the paper: write to the corresponding author with one five-part question. When the reply comes and you use it, the row becomes worked with.
4. Ask the genetics teacher whether they would answer a short question from you. If they introduce you to a statistical geneticist they work with, the new person goes in the row. That is the fourth way.

Here is the same list some weeks later. The dates are made up.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Circuit neuroscience of appetite	a systems neuroscientist	a teacher in a university physiology department	met			20 Nov 2026
Statistical genetics	a statistical geneticist	a statistical geneticist in a university genetics department, introduced by a colleague	worked with	Can a child gene test predict obesity in Indian children well enough to act on?	2 Nov 2026	20 Nov 2026
Labour economics of obesity	a labour economist	an author of an Indian economics paper on work and BMI	worked with	Is there an Indian estimate of what obesity does to pay, employment or productivity?	28 Oct 2026	20 Nov 2026
Public procurement	the purchase (stores) officer	the purchase (stores) officer, this institute	worked with	What does this purchase of weighing scales require, and what will audit check?	21 Oct 2026	20 Nov 2026
Ayush systems	a qualified Ayush practitioner; for the State's arrangements, the State's Ayush directorate	the Ayush medical officer, co-located PHC	met			20 Nov 2026

Count again: three rows say worked with. Three worked-with rows meet the curriculum's number, though the list has only five rows. A full list has a row for every field the book names. Write the next review date: 20 May 2027.

WHERE THIS PICTURE BREAKS. Three rows marked worked with meet the curriculum's count, not the purpose. A list is only as good as its next check: a person who has moved on, or stopped doing the work, makes a row wrong without changing a word in it. And worked with means you used a reply once. It does not mean the next reply will be right, which the five checks on a reply still decide.

Illustration 2. A made-up call: a reporter from a Hindi daily phones you, on the record.

> *"A company is selling a gene test online. It says it can tell parents whether their child will have obesity. Does it work?"*

Here are three weak answers. Each fails in its own way.

1. "I'm not the right person to ask." It ends the call. The reporter still needs an answer and will find someone who gives one. You have said nothing you could have said, and named no owner.
2. "That's not really my area, but these tests are mostly useless." This is a made-up example of improvising, not a claim about any test. The first half is true. The second half is the improvising the first half should have stopped. The reporter will print the second half.
3. "Nobody really knows." It is a claim about a whole field, made by someone who cannot assess that field.

Now the strong answer.

> *"Here is what I can tell you. I can tell you how we judge any screening test in children: we ask how often it is right in children like the ones it will be used on. Whether this gene test is right that often is a different question. That is outside what I can assess, and here is who can: a statistical geneticist. I have worked with one at a university genetics department, and I can put you in touch today."*

Check it against the shape given above: what you can say, the sentence, the owner, the next step. The part you can say is how a screening test is judged, which is your own field. The sentence is in its exact words. The owner comes from your list. This book invents no names, so it gives a kind; on a real call, with a row that says worked with, you would give the person's name. The next step is today.

WHERE THIS PICTURE BREAKS. The sentence is for a question that has left you. If the reporter had asked how common obesity is in Indian children by a national survey, or how it is measured, the question is yours, and the sentence would be a refusal dressed as modesty. And the sentence without an owner after it is only half done. If you have no one on your list, say you will find the owner and by when.

MUST KNOW POINTS FOR YOU.

- Say the public sentence in its exact words, after the part you can answer and before the owner. Without the owner it is a refusal.
- "I'm not the right person" ends the call and sends the reporter to whoever will improvise. "Not my area, but..." is worse: the improvising follows the disclaimer that was meant to stop it.
- Only rows marked worked with count toward the three the curriculum asks for, and a row with no Checked on date may already be wrong.

- A row stops being trustworthy when its Checked on date is more than six months old: do not count it toward the three until you have checked it again.
- No study this book holds measures how listeners judge someone who says the sentence. What you control is what they leave with: the part you could answer, an owner and a next step.

REPORTING IT. Say it in these words, after the part you can answer, and follow it with the owner.

"That is outside what I can assess, and here is who can."

EXERCISE 1 (retrieval). From memory: name the seven columns of the contact list in order, the three values of How you know them, and the four ways to fill a row.

EXERCISE 2 (build). Build your contact list. Make one row for each of the 18 fields the field sections named, in the seven columns. Fill every row you can today, mark How you know them honestly, and send a five-part question to at least one owner this week. Keep going until at least three rows say worked with. Write your next review date at the top.

EXERCISE 3 (teaching). A first-year resident says, "If I tell a committee 'that is outside what I can assess', they will think I don't know my subject." You have ten minutes and a whiteboard. Teach the shape of the public sentence, and have the resident say it once.

EXERCISE 4 (critique). Three made-up answers, each said in public. Name what is wrong with each, and rewrite it.

1. In a lecture, a student asks whether a new appetite drug works through the brain: "I'm not the right person for that."
2. In a committee, asked whether a sugar tax would break trade rules: "That's not my area, but I'm sure it's fine."
3. To a reporter, asked about a "planetary diet": "Nobody really knows what diet is good for the planet."

17 · Worked journey: A ward councillor's question, routed

DEFINITION. This section runs one question through the whole method, in the order real work uses it. A councillor asks whether two local schemes will bring obesity down in the ward. You split the question into its parts and mark each one inside or outside what you can assess, by the five signals. You answer the part that is yours. You name an owner for each other part, send each a five-part question, and judge each reply with the five checks. You enter each owner in your contact list. Then, in public, you say what you can answer, the public sentence, and who can answer the rest. The section ends on what the replies do not settle. [319, 320, 41, 321, 322, 240, 242, 323, 323, 324, 324, 325]

IN PLAIN TERMS. This section uses no new tool.

The case has seven steps.

1. A councillor asks a question, and you hear it as it was asked.
2. You split the question into parts, mark each as inside or outside what you can assess, and answer the part that is yours.
3. You name the owner of each part that is not yours.
4. You write each owner a question in five parts.
5. You judge each reply with the five checks, and you ask back when a check fails.
6. You enter each owner in your contact list.
7. In public, you say what you can answer, the public sentence, and who can answer the rest.

The case runs over two meetings and four weeks. Routing takes days, so this book's rule is to start it the day the question is asked.

Illustration 1. Step 1. The question. Wards Committees are set up in a municipality of 3,00,000 (three lakh) people or more (Article 243S of the Constitution, https://indiacode.gov.in/handle/123456789/618394). Where a committee covers one ward, the ward's own member of the municipality chairs it. Now the meeting.

> *A made-up meeting, 11 Dec 2026: the Wards Committee of a municipal corporation. The councillor is in the chair, and you attend as the community medicine resident the corporation asked for health advice. The councillor asks: "The corporation is building a cycle lane on the main road, and the government Ayurveda college has offered a weight-loss camp in the ward. Will these two bring obesity down here?"*

Step 2. Recognise. The councillor named two schemes. The question holds a third part that nobody said aloud: how the ward would know whether obesity changed. Split the question into its three parts, and mark each one inside or past your edge.

Part of the question	Inside or past your edge	Signal
Will the cycle lane bring obesity down here?	past	**About to act**, with **No test**
Will the camp bring obesity down here?	past	**About to act**, with **Unknown standard**
How would the ward know whether obesity changed?	inside	none

Take the rows one at a time. The lane: the committee will tell residents what to expect, and may press the corporation on the lane's design, so **About to act** fires. Behind it, **No test**: you cannot say what result, on this ward's streets, would show a yes or a no wrong. The camp: **About to act** again. Behind it, **Unknown standard**: you do not know Ayurveda's standard references or methods, so you could not check any answer you gave. The hidden part is yours: measuring whether obesity changes is community medicine.

Now say the part you can answer, inside the same meeting.

> *"I can answer one part now. If the committee wants to know whether obesity changes in the ward, we measure adults before the lane opens and the camp begins, and again later, in the same way. I can design that with the health department. Whether the lane will get people walking and cycling, and what the camp will do for the people who go, are the other two parts. That is outside what I can assess, and here is who can: the municipal town-planning office for the lane, and a qualified Ayush practitioner for the camp. I will put the questions to them tomorrow and bring their answers to the next meeting."*

That is the public sentence, in its exact words, then the owners, then the next step. You will say it again at the next meeting, with what the owners said.

Step 3. Name the owners. Each part that is not yours has an owner this book has already named.

For the lane, urban planning is among the matters the Constitution's Twelfth Schedule lists for a State's law to give to municipalities (Article 243W). Its first item is "Urban planning including town planning". Roads are another: "Roads and bridges". The owner is the municipal town-planning office, and through it an urban or transport planner. The planner owns the street half: what would make the streets walkable and cyclable, and whether residents are likely to use the lane. What more walking and cycling would do to obesity is not the planner's question. Its owner is people who study physical activity in communities, and step 7 says where this course teaches that evidence.

For the camp, the owner is a qualified Ayush practitioner. The nearest is the Ayush medical officer at a primary health centre where Ayush is co-located. The Ministry of Ayush's Annual Report 2024-25 (https://ayush.gov.in/assets/pdf/annualReport/Annual-Report24-25_English.pdf) says the Government of India places Ayush facilities in PHCs, CHCs and district hospitals, "thus expanding choices of the patients". It adds that the Ministry of Health and Family Welfare supports the engagement of Ayush doctors there. The other possible owner is a teacher at the college's own hospital.

Because the college is a government college, the State's Ayush directorate stands behind it. Chhattisgarh's directorate (https://cgayush.admissions.nic.in/cg-ayush/, as its portal read on 9 Oct 2026) is one example. It gives its primary responsibility as making infrastructure, equipment, drugs and other essentials available to run the government colleges and hospitals. You ask the Ayush medical officer first, because a practitioner can answer for what a system offers a patient; the directorate equips and staffs colleges and hospitals, and is not who you ask about this camp's evidence.

Figures quoted in this illustration are from [45].

WHERE THIS PICTURE BREAKS. Splitting the question works because each part has a different owner. If the councillor had asked only how the ward would know whether obesity changed, there would be nothing to route: the whole question would be yours. And a part is not yours just because it mentions obesity; the lane and the camp are questions about a street and a system of medicine.

Illustration 2. Step 4. Write the questions. The curriculum this book follows gives both questions in these words. Each sits in its Question row unchanged, with one line saying what "this ward" and "this patient" mean here.

To the municipal town-planning office, sent 12 Dec 2026:

Part	Your question
Decision	At its meeting on 8 Jan 2027, the Wards Committee decides what to tell residents about the cycle lane on the main road, and whether to ask the corporation for anything more before work starts. The councillor is waiting for my advice.
Context	The corporation is building the lane on the ward's main road. The committee has asked whether it will bring obesity down. I can measure obesity in the ward; I cannot judge street design. I have not seen the lane's drawings.
Question	"what would make this ward's streets walkable and cyclable for the least active, and which plan or budget does that sit in?" Here, the ward is ours, and the lane on the main road is the first thing to look at.
Form	A short list of what would make the most difference, the lane included, each with the plan and the budget it sits in. Tell me how sure you are on each, and on what; I cannot judge the designs.
Deadline	By 1 Jan 2027, a week before the meeting. If it comes later, the committee discusses the lane without it.

To the Ayush medical officer at the co-located PHC, sent 12 Dec 2026:

Part	Your question
Decision	At its meeting on 8 Jan 2027, the Wards Committee decides whether to welcome the government Ayurveda college's weight-loss camp in the ward, and what to tell residents about it. The councillor is waiting for my advice.
Context	The college has offered a weight-loss camp for the ward's residents. I do not know what the camp will provide. Some residents who may come take tablets for diabetes from the urban primary health centre. I cannot judge Ayurveda's methods or its standard references.
Question	"what does this system offer this patient for weight, on what evidence, and what does it interact with in the treatment they already have?" Here, "this patient" is each resident who comes to the camp, and above all those already taking tablets from the centre.

Part	Your question
Form	What the camp will give each resident; the evidence, with references; and, for residents on tablets, what the camp will check and who will be told. Tell me how sure you are on each, and on what; I cannot judge the methods.
Deadline	By 1 Jan 2027, a week before the meeting. If it comes later, the committee decides about the camp without it.

Step 5. Judge the replies. Start with the reply that fails.

> *A made-up reply, 22 Dec 2026, from the Ayush medical officer: "Thank you for writing. Ayurveda is one of the Ayush systems, with its own colleges, such as the one offering the camp, and its own way of assessing each person, including advice on diet and daily routine. The college's teachers are experienced, and I am sure the camp will be well run. You are welcome to visit our centre on any weekday."*

Run the five checks and mark them.

Check	Your mark	Your reason
Asked	fails	It answers "what is Ayurveda?", a neighbouring question. It says nothing about this camp or these residents.
How sure	fails	"I am sure the camp will be well run" is about the running of the camp, and rests on nothing stated. On the camp's evidence, it says nothing.
Own field	passes	It stays inside the system it describes.
References	fails	It gives none, and How sure names nothing it rests on.
Decision	fails	It neither changes nor confirms what you will tell the committee, because it answered another question.

Asked, **How sure** and **References** fail, and your own Decision row is clear, so you ask back. References fails only because the reply cites nothing and names no basis, so the ask-back covers it. Write to the same owner, quote your Question row, and name what is missing.

> *A made-up ask-back, 23 Dec 2026, to the Ayush medical officer: "Thank you. My question was: 'what does this system offer this patient for weight, on what evidence, and what does it interact with in the treatment they already have?', for the residents who come to the college's camp. Your reply tells me about Ayurveda in general. What is missing: what this camp will give each resident; the evidence, with its references; how sure you are, and on what; and, for residents taking diabetes tablets from the centre, what the camp will check and who will be told."*

Now the reply that passes.

> *A made-up reply, 29 Dec 2026, from the municipal town-planning office: "Three things would matter most for the least active in your ward. First, footpaths that run without breaks, and are kept free of stalls and parked vehicles, on the roads to the market and the school. Second, safe crossings on the main road. Third, the cycle lane, if residents can reach it safely from the lanes where they live. The cycle lane is in the corporation's road-works budget for this year. The footpaths and crossings are in no plan yet; they would have to be proposed for next year's budget. We are sure of where each one sits, because we hold those documents. We are less sure that residents will use the lane. The National Urban Transport Policy says that many cycle tracks and pedestrian paths 'do not get used as initially envisaged', and asks for open debate on their designs 'with experts and the community that is expected to use them' (paragraph 29). Whether walking and cycling more would change obesity in the ward is not ours to say; the health department would know how to measure it."*

Check	Your mark	Your reason
Asked	passes	It says what would make the streets walkable and cyclable for the least active, and which plan or budget each sits in.
How sure	passes	Sure of where each item sits, on the documents the office holds; less sure that residents will use the lane, on the national policy's own words.
Own field	passes	It names what lies outside its field, whether obesity would change, and who can measure it.
References	passes	Open the National Urban Transport Policy and find paragraph 29: both quoted phrases are there, and they say what the reply says.
Decision	passes	It changes your advice: the committee can ask for footpaths and crossings in next year's budget, and for an open debate on the lane's design with residents.

The policy is at https://mohua.gov.in/static/uploads/2025/10/0da700a8b86f2faee310bd49592ee99a.pdf. Checking the reference is Book 0's four acts in one line: find it, confirm it, find the passage, read it. Goldman's first commandment, for the person who answers, is that "the consultant should determine the question that is being asked" (the owner, in the paper's word). This reply did.

Last, the second Ayush reply.

> *A made-up reply, 30 Dec 2026, from the Ayush medical officer: "The college will hold the camp on three Saturdays at our centre, which serves your ward; I host it, so I answer for it. Each resident sees a teacher from the college, who records their weight and waist, asks about their diet, daily routine and any medicines, and gives advice on diet and daily routine. Some will be offered yoga sessions at the centre, and some may be given an Ayurvedic medicine. The camp follows the college's written protocol, which lists the studies it relies on; I attach it. I cannot tell you whether residents of this ward will lose weight, or how much: that has not been measured here, and I would want the protocol's studies judged by someone who can judge them. Anyone who takes tablets for diabetes will be asked to bring them. The camp will not change them. The protocol lists every medicine the camp may give, and the camp will write down any it gives, so that the doctor at the centre who prescribes the tablets can check each one against them. Whether the camp changes obesity in the ward is for whoever measures it; you said that would be the health department."*

Check	Your mark	Your reason
Asked	passes	It says what this camp gives these residents and on what evidence, and, on what it interacts with, lists every medicine it may give for the prescribing doctor to check.
How sure	passes	It says what it cannot tell you (whether residents here will lose weight) and why: not measured here.
Own field	passes	It names what lies outside: judging the studies, and measuring change in the ward.
References	passes	You open the attached protocol (made up) and find each study it lists: each exists, and each passage the protocol cites says what the protocol says it says. You do not judge the studies' methods, and this check says nothing about whether the camp works.
Decision	passes	It confirms what you will tell the committee: what the camp offers, that its effect on weight here is not known, and how residents on tablets are kept safe.

Responsive does not mean right. It means the reply is usable for the decision; whether the studies' methods are sound is a second owner's question, if the committee needs it judged.

Step 6. The contact list. Two rows go into your list.

Field	Owner	Name and institution	How you know them	Last question asked	Asked on	Checked on
Urban and transport planning	an urban or transport planner; the municipal town-planning office	the town-planning officer, the municipal corporation	worked with	what would make this ward's streets walkable and cyclable for the least active, and which plan or budget that sits in	12 Dec 2026	8 Jan 2027
Ayush systems	a qualified Ayush practitioner; for the State's arrangements, the State's Ayush directorate	the Ayush medical officer, co-located PHC	worked with	what the college's camp gives residents for weight, on what evidence, and what it does for those on diabetes tablets	23 Dec 2026	8 Jan 2027

Both say worked with, because you asked each a question and used the reply. The Ayush row's Asked on is the date you asked back, because that was the last question.

WHERE THIS PICTURE BREAKS. Both replies came on time and from people willing to answer. A reply may not come, or may come after the meeting; then you tell the committee what you asked, of whom, and when you expect it, and you do not answer in the owner's place. And a responsive reply is still only as good as the references behind it, which you can find and read but not judge.

Illustration 3. Step 7. What you say, in public.

> *A made-up meeting, 8 Jan 2027: the Wards Committee again. The councillor asks, "So, will these two bring obesity down here?"*
>
> *You say: "There are three parts to that. One is mine. We can know whether obesity changes in the ward: we measure adults now, before the lane opens and the camp begins, and again in the same way a year later. That will show whether it changed, not which of the two changed it. Whether the lane will get our least active residents walking and cycling, and what the camp will do for the people who go, are the other two parts. That is outside what I can assess, and here is who can. The town-planning office has told us what would make our streets walkable, and where the money for each part sits. The Ayush medical officer at the health centre has told us what the camp gives each resident, and how residents on diabetes tablets are kept safe. I suggest we invite them both to the next meeting."*

Book 24, *Physical activity and sedentary behaviour science*, teaches what the evidence on physical activity and weight shows. This book does not. Notice that the public sentence appears again, in its exact words, and the two owners follow it at once.

Now read what the replies do not settle. Neither reply says whether obesity in the ward will fall, and neither owner claimed to know. The before-and-after measure will show whether obesity changed, not what changed it: the lane, the camp and everything else in the ward change at the same time. Nothing in this journey judged the lane's design or Ayurveda's methods; both stayed with their owners. The planning reply rests on paragraph 29 of a 2006 policy that you checked says what the reply says; whether residents of this ward will use this lane is still unknown.

WHERE THIS PICTURE BREAKS. This case had two owners who could be reached and a committee that could wait four weeks. When the committee must decide at once, say the part you can answer and the public sentence, name the owners, and ask the committee to decide only what does not depend on their replies.

MUST KNOW POINTS FOR YOU.

- In a committee, split the question into its parts before you answer any of it. Answer the part that is yours, route the rest, and say aloud which is which.
- A before-and-after measure in one ward shows whether obesity changed, not which of the things that changed at the same time caused it. Say so when you offer it, or the committee will hear a promise you cannot keep.

- A reply that describes a system, an office or a plan in general has answered a neighbouring question. Ask back, in writing, quoting your Question row and naming what is missing, before the meeting.
- When residents on prescribed tablets may join any camp, ask what the camp will check and who will be told, and keep the doctor who prescribes the tablets informed.
- Nothing in this case judged the lane's design or Ayurveda's methods; both stayed with their owners.

EXERCISE 1 (retrieval). From memory: list the seven steps of this case in order, with one line each.

EXERCISE 2 (critique). A made-up line from a member at the first meeting: "Cycling burns fat, so the lane will bring obesity down. And the camp can't do any harm, so let it run." Name the signals that should have stopped the speaker, and rewrite the line.

EXERCISE 3 (design). A made-up addition at the next meeting: the corporation will pay for hoardings in the ward to announce the camp, and will place the order on 20 Jan 2027. The councillor asks, "Will people actually see them?" Write the question in five parts, and say to whom it goes.

EXERCISE 4 (critique). A third made-up reply arrives, from a colleague at the college: "Our camps are always popular, and our teachers are very experienced. I am confident this camp will be a success." Run the five checks, and say what you do next.

EXERCISE 5 (teaching). Audience: a journalist. Three minutes, no jargon, one quotable sentence. After the second meeting, a reporter from a Hindi daily asks you: "Will the cycle lane fix obesity in the ward?" Answer in three minutes, with one sentence they can quote.

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Appendix · Worked answers

1 · The edge of your competence: four depths, and where routing sits

EXERCISE 1. Route: recognise a question as the field's and name its owner. Read: follow a paper in the field and say what it claims. Critique: judge whether the paper's methods support its claims. Do: produce the field's work yourself.

The edge test, for one question, has two parts. Can you say what result would show your answer wrong? And can you check that result yourself? If you cannot do both, the question is past your edge.

EXERCISE 2. The flaw is reasoning from depth in a field to the edge for one question. Training in community medicine puts the resident at the do depth for surveys, not at the critique depth for a genetic method. Run the test. What result would show that the score is not valid in this district? The resident cannot name one for the genetic method, so cannot check it.

What the resident can answer is how the district's own data could be used. Once someone who owns the method says what to compare, the data can show whether the score's predictions match what happens.

A rewrite: "I can tell you what our district data would let us check. Whether the score's genetic method holds for our population, I cannot judge. That is outside what I can assess, and here is who can: a statistical geneticist, and I will send them the question."

EXERCISE 3. Draw the four depths as four rows. Reading three papers puts the resident at the read depth: they can say what each paper claims. The patient's question asks for more, which is whether a product will help this patient.

Ask the resident the two questions on the board. What result would show "it will help her" wrong? They may name one, such as "her symptoms do not change". But they cannot check in advance which product, dose and patient the papers' results apply to. That needs the critique depth and clinical judgement in that field. So that part is past their edge.

What they can do is say what the papers claim, and route the clinical question to its owner. For this patient, the owner is the treating clinician who knows the field. Close with the rule: depth says where to start looking, and the test settles the question in front of you.

2 · Improvising, not ignorance: confidence that does not follow accuracy

EXERCISE 1. Improvising is giving a confident answer to a question past your edge, where you cannot check your own reasoning. It is possible because confidence does not reliably follow accuracy.

Meyer and colleagues (2013) studied 118 general internists in the United States. They diagnosed four written cases online. Accuracy was 55.3% on easier and 5.8% on harder cases. Confidence was 7.2 and 6.4 out of 10.

Davis and colleagues (2006) made a systematic review of 17 studies limited to five English-speaking countries. In 13 of 20 comparisons, doctors' self-assessment had little, no or an inverse relationship with an outside measure.

Kruger and Dunning (1999) ran four studies, the first with undergraduates. The bottom quarter scored at the 12th percentile and placed themselves at the 62nd.

EXERCISE 2. It shows that, on four written cases, general internists in the United States became 0.8 points less confident out of 10. Their accuracy fell by 49.5 percentage points. Confidence moved little when accuracy moved a lot.

It does not show these things. First, it does not show that doctors are overconfident about everything. It covers four written cases in one field. On those cases the authors report miscalibration "in the overconfident direction", larger on the harder cases. Second, it says nothing about real patients, since the authors say their methods of case delivery limit real-world validity. Third, it says nothing about doctors answering outside their own field, or about Indian doctors.

Also, the 118 were volunteers: 17.9% of the 658 who viewed the invitation.

EXERCISE 3. The study found that higher confidence went with fewer requests for additional diagnostic tests. Fewer requests for second opinions went with more years of experience, not with confidence.

A correct line: "In Meyer et al. (2013), physicians in the United States diagnosed written cases. They asked for fewer extra tests when they were more confident. They did not ask for more second opinions when they were less confident or less accurate, or when the cases were harder."

EXERCISE 4. Say that feeling sure and being right are less connected than people think. In one study in the United States, doctors given hard written cases got fewer than one in ten right. They still rated their confidence at 6.4 out of 10. That is not far below the 7.2 they gave easier cases, which they got right about half the time. A review of studies of doctors judging their own skill finds the same weak link.

Then give the strength of the evidence. These are several studies, mostly in the United States and other English-speaking countries, on test cases rather than real patients. They show the pattern, not how often it happens in Indian clinics.

Quotable sentence: "Feeling sure is not a sign of being right, so a good expert tells you which part they can check and which part they cannot."

3 · Recognising, mid-conversation, that the question has left you

EXERCISE 1. 1 No test: you cannot say what result would show your answer wrong. 2 Loose word: you are using a word you could not define if asked. 3 Unknown standard: you do not know the field's standard reference or method. 4 One source: your answer rests on one source you cannot judge. 5 About to act: the person asking is about to act on what you say.

Signal 5 does not mean you are past your edge. It means the cost of improvising is about to be paid, and it turns the other four into a duty to stop.

The sentence: "That is outside what I can assess, and here is who can."

EXERCISE 2. Write line 4 on the board: "I don't know anything about that tea." It is honest, and the signal (Unknown standard) did fire. But it stops there. The committee hears that the doctor has no concern, and decides.

Ask the resident: who could answer? What would you send them? Then add the three missing moves on the board. First, the part you can answer (here, little: you can find out who sells the tea and who drinks it). Second, the public sentence, word for word. Third, the kind of owner, here a qualified Ayush practitioner, and the offer to send a written question.

Close: "I don't know" ends the conversation. Routing moves the question to someone who can end it properly.

1.

Thought	Signal
1	Loose word
2	About to act
3	One source
4	Unknown standard
5	No test

Thought 5 is the edge test itself. Thoughts 1, 3 and 4 are the ways the same gap shows up in talk. Thought 2 is not a gap at all: it tells you the cost of a gap is about to be paid.

2.

Case	Past your edge?	What you do next
1	Not on this signal alone	Run No test on purpose. If you can say what would show your answer wrong and check it, answer. If not, stop.
2	Yes	Loose word alone says you are past your edge. Stop, say whose word it is, and route the question.
3	Not shown either way	Silence is not proof: confidence barely follows accuracy. If anyone may later act on your answer, run No test on purpose before you give it.

3. A model answer: "I can tell you how we would know: count the people walking to the stop for a week before the route opens and a week after. Whether the route will make people walk more, I cannot say. That is outside what I can assess, and here is who can: a transport planner. I will write the question for one."

Check the answer for the four moves. The part you can answer comes first. The public sentence is word for word. The owner is named as a kind. There is an offer to send the question.

4.

Line	Inside or past your edge?	Signals	Why
1	Mixed	—	Part is about her care here, part about genetics
2	Inside	none	Measuring her and following her on treatment is clinical care your training covers
3	Past	No test; Loose word	You cannot say what result would show "they don't matter much" wrong, and "matter" hides a claim you could not define
4	—	About to act	She is about to stop her tablets

Line 4 is the urgent one. A rewrite of line 3, which also answers line 4: "Please don't stop your tablets without talking to the doctor here who prescribes them; we can check together how they are working for you. What genes explain about weight, I cannot tell you. That is outside what I can assess, and here is who can: a doctor who works on the genetics of weight. I can find out how to ask one."

The rewrite makes no claim about genes and obesity in either direction.

5.

Line	Inside or past your edge?	Signals	Why
2	Inside	none	What a predictive test must show is a question of study design, which is your field
3	Past	Loose word; No test (One source too, if your view rests on one thing you read)	You could not define “polygenic score”, and you cannot say what would show “solid” wrong
4	—	About to act	Your words go to print tonight

Rewrite: “Quote me on this: a test like this has to show, in a study others can check, that the children it flags really do develop obesity more often than those it does not. Whether this company’s test has shown that, I cannot judge. That is outside what I can assess, and here is who can: a statistical geneticist. I can suggest a university genetics department you could call before nine.”

6.

Line	Inside or past your edge?	Signals	Why
2	Inside	none	Checking a scale against a known weight is what Book 0’s section on random and systematic error teaches
3	Past	Unknown standard; No test	You do not know which rule sets the limit or what it is, so you cannot say what would show “fine” wrong
4	—	About to act	The order is signed today

Rewrite: “What the scales must do for screening, I can tell you, and I’ll write it down for the order. Whether we can buy them from the shop without a tender, I cannot say. That is outside what I can assess, and here is who can: the purchase (stores) officer. Could we ask before the order is signed?”

7. Line 2 was marked inside and is past. Corrected:

Line	Inside or past your edge?	Signals	Why
2	Past	Loose word; One source	“Validated” is the vendor’s word, used in the vendor’s sense, and the only source is the vendor’s own brochure, which you cannot judge
3	—	About to act	The district is about to buy

Why it looked inside: “validated” and “accurate” are words the resident uses every week in survey work, so the line felt like home ground. The words were familiar. The method behind them was not.

A rewrite: “I can tell you what our own screening data would let us check once we have the tool’s predictions. Whether the vendor’s method holds, I cannot judge from a brochure. That is outside what I can assess, and here is who can: someone who builds and tests such methods. I will write the question for one before we sign.”

8. Line 1 was marked past and is inside. You can say what would show your answer wrong (a recount from the survey data gives a different number) and you can check it yourself, by recounting against the cut-off the survey used. Running and reading a community survey is your own work. Corrected:

Line	Inside or past your edge?	Signals	Why
1	Inside	none	A count from survey data against the survey’s own cut-off; you can recount it yourself

Why the wrong mark looked right: numbers from a survey can feel like someone else's job, and routing feels safe. It is not safe here. The committee leaves without an answer you could have given that day. A better line 2: "I can count that from the survey data and bring you the number at the next meeting."

9. Signals: No test (the doctor cannot say what result would show "definitely reduce obesity by next year" wrong, and check it before next year) and About to act (a newspaper prints it, and readers and organisers act on it). Possibly Loose word, if "reduce obesity" was not defined: fewer people with obesity, or a lower average weight?

A rewrite: "I can tell you how the area would know: measure people's weight and waist before the classes start and again after a year. Whether the classes will reduce obesity, I cannot say. That is outside what I can assess, and here is who can: people who study physical activity in communities. I can tell you how to reach some."

What the rewrite does not establish: that the classes will not work. It says nothing about their effect in either direction. It also does not establish that the measurement plan will show the classes' effect, since other things change in a year. That is a question of study design, to work out before the classes start.

10. The claim treats being a doctor as being at the do depth in every field that touches health. The edge test is per question. For many questions a patient asks (whether a device suits her, what a product contains, what genes explain), a doctor cannot say what result would show their answer wrong and check it themselves, so No test fires. When the patient will act on the answer, About to act fires too. So the signals say that a good doctor answers the part inside their edge and routes the rest, with the public sentence and an owner.

What this does not establish: that routing is always right (routing what is yours is also a failure); that a doctor need know nothing about the adjacent fields (you need the route depth to name the owner and recognise the question); or that the patient will be satisfied with a routed answer.

The colleague's underlying point, that a doctor should not leave a patient with nothing, holds. The four moves give the patient more than an improvised answer would.

4 · Writing the question so the answer is usable

EXERCISE 1. Decision: the decision the answer serves, and who is waiting for it. Context: what the owner needs to know (population, setting, data already in hand). Question: the question itself, narrow and answerable from the owner's field. Form: the form of answer you can use (yes or no, a range, a recommendation, a reference), and your own limit ("I cannot judge the method; tell me how sure you are and on what"). Deadline: when you need it, and what happens if it comes later.

The order is the order the owner needs them in: what the answer is for comes before what you ask.

EXERCISE 2. A model; other wordings pass if every part is filled from the facts given.

Part	Your question
Decision	The district NCD officer decides by 20 Nov 2026 which version of the camp form goes to print. He is waiting.
Context	The current form and the one-page draft are attached. Camp staff fill it in by hand for each adult screened. The data are entered later for the district's reports.
Question	Which items on the current form can be removed or merged without losing what the district's reports need, and does the one-page draft lose any of those?
Form	A marked copy of the form: keep, merge or drop against each item, with a line on why. I cannot judge form design; tell me how sure you are about each change, and on what.
Deadline	By 18 Nov 2026. If it comes later, the current form is printed again unchanged.

Why each row: the Decision names the decision (which version prints) and who is waiting. The Context gives only what changes the answer (hand-filled, entered later, used for reports). The Question is one question the owner can answer. The Form asks for a usable shape and states your limit. The Deadline gives a date before the print date and the consequence.

EXERCISE 3. Three things.

First, the figures come from two different series, and they measure different things. In one hospital's series the asker and the owner had different ideas of why the consultation was asked for in 15% of cases. In another service no specific question was asked in 24%, and the owner ignored the question in another 12%. None of them is "one in six": 15% is about one in seven.

Second, "goes wrong" is not what was counted. What was counted was a mismatch of understanding, or a missing or ignored question. Goldman reports that those consultations had less effect, not that each one failed.

Third, the series are hospital consultation services reported in 1983, one of them in Boston, so the figures show that the failure happens, not how often it happens elsewhere.

1.

Part	Line
Decision	3
Context	5
Question	2
Form	4
Deadline	1

Order: 3, 5, 2, 4, 1. Each line answers one of the five questions in turn: what is it for, what does the owner need to know, what exactly do you ask, what shape do you want back, by when.

2.

Question	Missing part	Why
1	Form	No shape of answer is asked for, and no limit is stated
2	Context	Which group, which register, what is in it: the owner has nothing to look at
3	Decision	No decision named and no one waiting: "we need to know" is not a decision
4	Deadline	No date, and no consequence

For question 3, note that Tuesday's meeting is a date, not a decision. A decision would say what the committee will choose between.

3.

Part	In Goldman's line
Decision	not stated
Context	"this 56-year-old woman with breast cancer"
Question	"opinion on cause of leg weakness"
Form	not stated
Deadline	not stated

It carries Context and Question. On a hospital ward the decision, the form and the urgency are often understood by both doctors, which is why Goldman's commandments put urgency on the owner to find out. Outside a ward, in a committee or a district meeting, nobody shares that understanding, so you write all five.

4. A model:

Part	Your question
Decision	On 20 Nov 2026 the Wards Committee decides whether to put lighting for the park path on its list of requests for next year's ward works. The councillor is waiting.
Context	The path runs round the park; a sketch is attached. Women who walk there say it is too dark after six in the evening. There are lamps on the road outside the park and none on the path.
Question	Can the path be lit from six to nine in the evening, and roughly what would that involve: new poles, or lamps on existing ones?
Form	Yes or no, the kind of work involved, and which list or budget it would go on. I cannot judge the electrical work; tell me how sure you are and on what.
Deadline	By 13 Nov 2026. If it comes later, the request goes on the list without detail, or not at all.

The decision is the committee's: put it on the list or not. The engineer is asked only what an engineer can answer. The Form asks which list or budget it goes on, because the committee's decision depends on that.

5. A model:

Part	Your question
Decision	The district NCD officer decides by 20 Nov 2026 whether the camps hand out a printed diet sheet to adults found to have obesity, and if so which one. He is waiting.
Context	Adults screened at village camps, many working in fields or at home; leaflets are read in Hindi. We have no sheet now. Staff have about five minutes with each person.
Question	Can you draft a one-page diet sheet in Hindi for these adults, suited to food they can buy locally, that camp staff can explain in five minutes?
Form	A draft sheet, or a reason it should not be handed out at a camp. I cannot judge the advice itself; tell me how sure you are of each line and on what.
Deadline	By 15 Nov 2026, so it can be printed. If it comes later, the camps restart without a sheet.

The minute named an owner and a topic. The rewrite adds the decision (hand out a sheet or not), the context that changes the advice (who, what they can buy, five minutes), a question the dietitian can answer, and the deadline set by the print date. This is routing at the do depth: you could read a diet sheet, and the dietitian writes one.

6. A model:

Part	Your question
Decision	The Wards Committee decides on 20 Nov 2026 whether to ask the corporation to close one street to cars from six to nine on Sunday mornings. The councillor is waiting.
Context	A residential street of about a kilometre, with a school and a temple on it (map attached). The aim is a safe place to walk and cycle.
Question	What would you need from us, and what would you need to decide, before a street like this could be closed to cars on Sunday mornings?

Part	Your question
Form	A list of what you would need and who would have to agree. I cannot judge traffic arrangements; tell me how sure you are and on what.
Deadline	By 13 Nov 2026. If it comes later, the committee will discuss the idea without your view.

When you cannot narrow the question, ask the owner what they would need to know. Salerno and colleagues' first commandment is "Determine your customer". The other four parts stay, so the answer still serves a decision by a date.

7. Every row is filled and none does its job. The Decision row names no decision and no one waiting: "to learn more" is a wish, so nothing tells the owner what kind of answer matters. That is the break, and the rest follows from it.

With no decision, the Question has nothing to narrow it, so it asks for the causes of obesity in general, which no owner can answer for one ward. The Form has no limit stated, so the answer will not say how sure. "When convenient" is not a deadline.

Why it looks reasonable: it is a filled table, in the right order, and it sounds earnest. The test is whether each row is filled from what you actually know. Here the asker did not yet know what decision the answer served, and should not have sent it.

8. Two rows broke. The Question row hands the owner the committee's decision ("should the corporation …") and bundles a second question that is not the owner's, whether the machines change weight in the ward. A sports-medicine doctor can say whether the machines are safe for these users. The decision belongs to the committee, and the weight question has its own owner, people who study physical activity in communities. Book 24, *Physical activity and sedentary behaviour science*, teaches that evidence. The Form row asks for a recommendation and states no limit, so the answer will not say how sure, or on what.

Repaired. Question: "Which of these machines are safe for adults over fifty with knee pain or obesity to use without anyone supervising, and which should carry a sign or be replaced?" Form: "A list, each machine marked safe, safe with a sign, or replace. I cannot judge the machines' design; tell me how sure you are on each, and on what."

Why the wrong version looks reasonable: the Decision row is good, and the Question row simply copies it, which feels like keeping the question close to the decision.

9. It is not a routed question. It has an owner (the medical college, which is an institution, not a person or office whose job the question is) and a topic, and nothing else: no decision, no question, no form, no deadline.

First, find the decision. Ask the member what the committee is deciding. Suppose (made up) it is whether to spend the ward's health budget line on a weekly weight-and-waist check at the community hall. Then:

Part	Your question
Decision	The Wards Committee decides on 4 Dec 2026 whether to fund a weekly weight-and-waist check at the community hall next year. The councillor is waiting.
Context	Adults in the ward; the hall is open on weekday evenings; two health workers could staff it.
Question	What would a weekly check need, in staff, equipment and records, to give results the ward could use, and what would it miss?
Form	A short list of what it needs and what it would miss. I cannot judge the design; tell me how sure you are and on what.
Deadline	By 27 Nov 2026; after that the committee decides without it.

What a good answer would not settle: whether the committee should fund it (that is the committee's decision, with the answer as one premise); whether the check will reduce obesity in the ward (no answer to this question addresses that); and whether the person who answers is right (the next section's checks say whether an answer is usable, not whether it is true). "We will do what they say" gives the decision away, which a routed question never does.

10.

Part	Your question
Decision	The district NCD officer decides by noon tomorrow whether to sign the attached MoU with the NGO as it stands, sign with changes, or ask for more time. He is waiting.
Context	The MoU is attached. The NGO would run awareness sessions at the screening camps. No money changes hands, as far as the draft shows.
Question	Is there any clause in this MoU that the district should not sign as it stands, and if so, which and why?
Form	A list of clauses to change or drop, or "nothing that stops signing". I cannot judge legal drafting; tell me how sure you are, and whether a fuller review would be needed.
Deadline	By 11 am tomorrow. If it comes later, the officer will ask the NGO for more time, or sign without advice.

What the deadline changes: with less than a day, ask for what can be answered in that time (is there anything we must not sign?), not for a full review, and ask the owner to say whether a full review is needed. That puts the deadline's cost on the page instead of hiding it.

What an answer by noon would not establish: that the MoU is a good idea (that is the officer's decision); that the partnership will work; or that nothing in the MoU will cause trouble later. A quick reading is not a full review, and the answer should say so.

5 · Judging whether a reply is responsive, without being able to give it

EXERCISE 1. Asked, How sure, Own field, References, Decision. Ask back (to the same owner) when Asked, How sure or Own field fails. Ask a second owner when References fails or two replies disagree. If Decision fails, go back to your own Decision row first. If two owners in the field still disagree, say the field is not settled on that question and decide with the asker what to do meanwhile. You never judge the owner's method.

EXERCISE 2. Asked (answer the question asked; if unclear, ask what decision it serves), How sure (how sure, on what evidence), Own field (stay inside it; name what lies outside and who owns it), Next step (what you would do next). Asked, How sure and Own field are shared, because answering well is passing the checks the asker will run on you.

EXERCISE 3.

Check	Mark	Reason
Asked	fails	The question was whether her tablets need a change before she starts walking. The reply does not say yes or no.
How sure	fails	Nothing on how sure, or on what
Own field	passes	It stays in the clinic's field and touches nothing outside it
References	fails	None given, and How sure gave no basis

Decision	fails	The medical officer cannot decide anything from it

The message back: “Thank you for seeing her. Our question was whether any change to her diabetes tablets is needed before she starts walking 30 minutes a day. Could you say yes or no, and if yes, what change? Her next visit is on 10 Nov 2026.”

The reply’s advice may be sound. It is an answer to a neighbouring question (what should she do about her weight), not the one asked. The 30 minutes a day is the made-up patient’s plan, not advice from this book.

EXERCISE 4. Write the check on the board: how sure, and on what. Point to the second half: the check is passed by a named basis, not a tone.

Draw two bars: accuracy 55.3% and 5.8% on easier and harder written cases. Then draw confidence 7.2 and 6.4 out of 10 (Meyer, 118 general internists in the United States). The first pair falls a long way. The second hardly moves. So tone tells you little on a hard question.

Then the move: ask back for the basis (“which study, which guideline, or your own experience?”). End with the limit. This does not mean owners are usually wrong. It means you cannot tell from how sure they sound.

1.

Line	Asked?	Why
1	answers it	Yes, with the limit and where it is printed
2	neighbouring	Says the scales are common, not whether they reach 150 kg
3	answers it	No, with the limit
4	neighbouring	Answers a question nobody asked

A “no” answers the question as much as a “yes”.

2.

Fragment	Check	Mark
1	How sure	passes: how sure, and on what
2	Own field	fails: a nutrition scientist advising on budget, with no edge named
3	References	fails: the reference cannot be found, so the first of Book 0’s four acts fails
4	Decision	passes: it names your decision and says it stands, which is what “firmly confirms” means; what the confirmation rests on is check 2’s question, not check 5’s
5	Own field	passes: names what lies outside and who owns it

3.

Sentence	Item
1	Asked
2	Asked: this is the answer itself, which item 1 asks for, but it says nothing on how sure or on what
3	Own field

Missing: How sure (say how sure, and on what: here, on how the records were kept, which you have not yet seen) and Next step. A next step could be: "Send me two months of records from before and two after, and I will tell you by Friday whether they can be compared."

4.

Check	Mark	Reason
Asked	passes	A marked copy, keep, merge or drop
How sure	passes	Sure of named changes, on the templates; not sure about item 12, and says why
Own field	passes	Names what lies outside (the State's use of item 12) and who owns it (the State cell)
References	passes	The three templates you sent, which you can check yourself
Decision	passes	Tells the officer which form to print, with one question left to put to the State

Responsive. Next: ask the State cell about item 12 before 20 Nov.

5. Book 0's four acts.

Find it: the survey exists (Salerno, Hurst, Halvorson and Mercado, Archives of Internal Medicine, 2007).

Confirm it: it is the source named, a survey of 323 referring physicians at three US academic centres.

Find the passage: the abstract, and the results on references.

Read it: it says the opposite of the reply. Only 29% thought references useful. Even among nonsurgeons, the group most in favour, it was 41%, against 18% of surgeons. The reference is real and does not say what it was cited for. Check 4 fails.

Note what you did not do: you did not judge the survey's method.

6. First, run the checks on each. Both may pass Asked and How sure. The disagreement is about a fact the second reply claims: that a study exists and says this. That is check 4, and you can run it yourself with Book 0's four acts. Open the attached paper. Confirm it is what it is said to be. Find the passage. Read whether it tested this model, in adults with obesity, against a reference measure.

If it does, write back to the first owner with the paper and ask whether it changes their answer. If the paper does not say what the reply says, check 4 fails for the second reply.

If both still stand after that — both cite real sources that say what they claim, and still disagree — the field is not settled on that question. Say so in those words to the district NCD officer, and decide with him what to do meanwhile: for example, leave the line off the form until it is settled.

Do not decide which owner's method is better. That is judging the method.

7. Asked broke. The judgement marked it on length, not on whether the reply answers the question. Three pages on why waist matters answer a neighbouring question (does waist matter for health?), not "should these camps record it, yes or no".

How sure broke too: it was passed on the count of references, which says nothing about how sure the owner is or on what. Everything after followed. The eleven real references were checked for being findable, not for saying that the camps should record waist. And "confirms" was read into a reply that never said yes.

Repair: try to write the answer to your question in one sentence from the reply. You cannot. Ask back: "Thank you. Our question was whether the camps should record waist as well as weight, yes or no, and on what."

Why the wrong judgement looks reasonable: length and references look like care, and care looks like an answer.

8. The Decision step broke, and it broke by judging the method. Whether templates or a pilot test is the right way to decide which items to cut is the owner's field. The asker cannot assess it.

The four checks before it passed. Check 5 should ask only whether the reply changes or confirms the decision. It does: it says which items to cut.

If the asker has a real doubt about the method, the move is a second owner, not a refusal.

Why the wrong judgement looks reasonable: "a pilot test" sounds more thorough, and the asker may have read about pilot tests. Reading about a method is the read depth, not the critique depth.

9. You have only a report of the reply, and one word of it: "certain". Ask for the reply itself. Then run the checks.

Asked: what was the professor asked? "Will the leaflet work" is not yet a question: work at what, for whom? If the question was loose, write it in five parts first.

How sure: "absolutely certain" is how sure, with no "on what". It fails as it stands.

Own field: unknown until you know the professor's field.

References: fails as it stands: none reported, and How sure names no basis.

Decision: the meeting is about to act (print), which is the moment the checks matter most.

What a full pass would not establish: that the leaflet will work. A responsive reply is usable, not proven, and the checks cannot see inside the professor's method. For a print run this size, a second owner's reply before printing costs little. The ten thousand is the made-up member's figure.

10. Checks on your reply:

- Asked fails. The question was whether the OPD weights can show whether counselling works, and the reply says counselling is important.
- How sure fails. "Most patients lose weight" is stated with no basis.
- Own field fails. The yoga class is advice nobody asked for, outside the question.
- References fails: none given, and How sure named no basis.
- Decision fails. The colleague still cannot tell whether the weights can be used.

A rewrite:

Item	Your rewritten reply
Asked	You asked whether the OPD's routine weights can show whether diet counselling is working.
How sure	On their own, no, and I am sure of that: the adults weighed are whoever came to the OPD, and those who came back after counselling may differ from those who did not. I have not seen how the weights are recorded.
Own field	What the counselling should contain is for the centre's dietitian, not me.
Next step	Send me three months of the register, and I will tell you within a week whether counselled and not-counselled adults can be compared at all, and what you would need to record to compare them.

What the rewrite does not establish: whether the counselling works. It says only what the weights can and cannot show. Your sentence "most patients lose weight" is gone because it had no basis you could name.

6 · Below the clinic: circuit neuroscience, cell and molecular biology, statistical genetics

EXERCISE 1. Circuit neuroscience of appetite: a systems neuroscientist. Its answers say which groups of nerve cells, in which parts of the brain, sense which signal. They also say what happens to eating and weight when the cells are switched on or off, mostly in animals.

Cell and molecular biology of fat: a metabolic biologist. Its answers say which kinds of cell a fat tissue holds and which genes each kind is using, as in a single-cell atlas.

Statistical genetics: a statistical geneticist. Its answers say which variants go with a trait, through which gene, and whether a genetic score predicts the trait, and in whom.

EXERCISE 2. Genotype imputation fills in DNA letters a test did not read, using a reference panel of fully read genomes.

Fine-mapping narrows a stretch of DNA linked to a trait down to the variant most likely to cause the signal. It is needed because a GWAS signal points at a region and rarely at the variant itself.

Colocalisation tests whether a trait and a gene's activity are driven by the same variant.

A transcriptome-wide association study (TWAS) tests whether a gene's predicted activity goes with the trait.

EXERCISE 3.

Part	What you write
Decision	Whether the district shares its screening records and samples for this study; the district NCD officer decides at the review meeting in two weeks.
Context	200 adults from one district's screening programme; records hold weight, height and waist; no DNA has been read yet; the student has not said which test or reference panel would be used.
Question	Can a genome-wide association study of obesity in 200 people find anything, and if not, what number of people or what other design would?
Form	Yes, no or "only if", with the reason in one paragraph; tell me how sure you are; I cannot judge study power.
Deadline	Ten days from today, so the officer has it before the meeting; if later, the request waits for the next meeting.

You do not need to know the answer to ask it. The 2026 review by Caballero and Mahjani highlights "how frequency and effect size interact to determine statistical power". In plain words, how common a variant is and how large its effect is, taken together, decide what a study can find.

Data protection and consent are separate questions with their own owners, and this question does not answer them.

EXERCISE 4. **Loose word** fires first. "Hunger switch" is a word the speaker could not define if asked. The review literature describes a network linking the brain with the gut, the pancreas and fat tissue, often redundant. The second half then claims a treatment effect: past the edge again.

A rewrite: "Appetite is governed by a network that runs between the brain and the gut, the pancreas and fat tissue. Whether a medicine can act on one part of it, and how much that would change weight, is a question for a systems neuroscientist."

7 · Methods you consult before you design: causal discovery, interference, deep learning

EXERCISE 1. Causal discovery: a causal inference methodologist. Interference: a methodologist, asked before the design is fixed, because the design that can separate spillover (randomising groups, then people) is chosen at the start. Deep learning and the cloud: a machine-learning engineer or data scientist, as a collaborator.

So two must be asked first: the interference methodologist before the design, and the causal inference methodologist before a purchase, because a causal discovery algorithm is usually offered for purchase. The third owner, for deep learning and the cloud, is a collaborator you work with throughout. This part is advice, not a measured finding. Ask before you buy, because a tool that has already been bought and fed your records is harder to question.

EXERCISE 2.

Part	What you write
Decision	Whether the college moves OPD records to the cloud service for this project; the medical superintendent decides on Monday.
Context	OPD records of patients with diabetes; the outcome is admission; no model has been built yet; a 2019 review found machine learning about equal to logistic regression where comparisons were at low risk of bias.
Question	Would a machine-learning model predict admission among our patients better than a logistic regression on the same records, and how would we test that fairly before relying on it?
Form	Yes, no, or "only with this test", and what the test needs from us; tell me how sure you are; I cannot judge the model.
Deadline	Friday, so I can brief the superintendent on Monday. If later, the move waits.

Moving patients' records to an outside service also needs the IT office and whoever handles patient consent. Name them, and do not answer for them.

EXERCISE 3. **Unknown standard** fires first. Children in one school share lunches, playgrounds and teachers, so the programme can spill across classes. You do not know the field's standard design for that.

In the cholera trial, a comparison inside the high-coverage group made the vaccine look as if it had little effect, because neighbours were protected too. Whether spillover happened here is the methodologist's question.

A rewrite: "Children in programme classes gained less weight than their schoolmates in other classes. Because the classes share a school, the programme may have reached the comparison children too. We are asking a methodologist what this design can and cannot show."

8 · Endoscopic and device therapies

EXERCISE 1. An intragastric balloon is one or more silicone balloons placed in the stomach through an endoscope, filled there, and removed, usually within six months; it takes up space and slows emptying. Endoscopic sleeve gastroplasty stitches the stomach wall from inside into a narrow tube. The owner is a bariatric endoscopist.

EXERCISE 2.

Part	What you write

Decision	Whether the district passes the offer to people found to have obesity in screening; the district NCD officer decides at next month's review.
Context	Adults screened in the district programme; their body mass index and some blood sugar results are recorded; the hospital offers intragastric balloons in camps; no individual assessment is described in the offer.
Question	Is a camp the right setting to offer intragastric balloons to people found in screening, and what assessment and follow-up should each person have before and after?
Form	A recommendation: pass it on, pass it on with conditions (which), or do not. Tell me how sure you are and on what. I cannot judge the procedure.
Deadline	Two weeks before the review, so the officer can reply to the hospital. If later, the offer is not passed on until the next review.

Whether the district may pass on a private offer at all is a question for the district's administrative officer, not the endoscopist.

EXERCISE 3. **About to act** fires first: readers will ask for a procedure on the strength of the line. The writer is also past the edge, with nothing they could check. "As good as surgery and safer" and "everyone" are claims about outcomes and eligibility.

A rewrite: "Endoscopic sleeve gastroplasty narrows the stomach by stitching it from inside. Whether it suits a particular person is for a bariatric endoscopist to judge. If you have obesity and diabetes and want to know your options, ask your doctor for a referral."

9 · Ayush systems and the offices that hold them

EXERCISE 1. A qualified Ayush practitioner. You can find one as the Ayush doctor at a primary health centre, community health centre or district hospital where Ayush is co-located under the National Ayush Mission. Another place is the hospital of a government Ayush college. The directorate's admissions page says its primary responsibility is making infrastructure, equipment, drugs and staff available to run the government colleges and hospitals. It says the directorate administers 2 government Ayurveda colleges and 9 private Ayush colleges. It does not say who runs Ayush dispensaries or Ayushman Arogya Mandirs (Ayush) in the State.

EXERCISE 2.

Part	Your question
Decision	Whether the centre refers its patients with obesity and knee pain to the yoga sessions; the medical officer decides at next month's staff meeting.
Context	Adults with obesity and knee pain seen at an urban primary health centre; the sessions run at a nearby AAM (Ayush); what the centre already knows about the patients (their ages, other conditions) is attached.
Question	Which parts of these sessions are suitable for adults with obesity and knee pain, which should they avoid, on what evidence, and what should make them stop and see us?
Form	A short list (suitable / avoid / stop signs), how sure you are and on what, and a reference I can look up. I cannot judge yoga's method myself.
Deadline	One week before the staff meeting; if later, the decision is made without your answer.

It goes to the qualified practitioner who runs or supervises the sessions, because Yoga is one of the Ayush systems. The AAM (Ayush) will tell you who that is.

Notice what stays yours: which of the centre's patients have knee pain, and how you will know whether those referred came back better or worse.

EXERCISE 3. **About to act** fires first: she will start on his word. Behind it is **No test**. He cannot say what result would show "it won't interact" wrong, and "herbal" is a **Loose word** doing the work of an argument. The line is improvising because it is confident and he cannot check it. It also says something about the product's effect. Neither he nor you can assess that.

Rewrite: "That is outside what I can assess, and here is who can: the Ayush doctor at our centre. Keep taking your tablets as before. I'll ask the Ayush doctor at the centre and tell you at your next visit; bring the packet."

Notice what the rewrite does not say: that the powder is safe, unsafe, useful or useless.

10 · Trade, investment and intellectual property law

EXERCISE 1. A trade lawyer owns the legal reading. India's official position is the Union government's, through the department whose Allocation of Business entry lists the subject. The agreement is the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), 1994. Article 8.1 lets members adopt measures necessary to protect public health and nutrition, provided the measures are consistent with the provisions of the Agreement.

EXERCISE 2.

Part	What you write
Decision	Whether the district asks the State for the warning-symbol rule; the district NCD officer decides at next month's meeting.
Context	The proposed rule (attached), the company's letter (attached), and that the rule would be the State's. We have read TRIPS Article 8.1; we have not read India's trademark law.
Question	Does a State rule requiring a warning symbol on snack packets conflict with trademark rights under Indian law or under India's WTO obligations, and if there is a risk, what change to the rule would reduce it?
Form	Yes, no or uncertain, with the provisions engaged; how sure you are and on what; a change we could make. I cannot judge the legal reasoning; tell me where lawyers would disagree.
Deadline	A week before next month's meeting; later, the officer decides without it.

It goes to a lawyer who works on trademarks and trade law. Notice the word "State". Whether a State can make such a rule at all is also a question for the lawyer. Book 5 showed you how to start tracing it.

EXERCISE 3. **One source** fires: the whole answer rests on one article the professor cannot judge in context, and he has read only half of it. **Unknown standard** sits behind it: TRIPS is about intellectual property, and which agreement a tax is tested against is not something he has checked. "Completely safe" is improvising: he cannot say what would show it wrong.

A rewrite: "TRIPS, the WTO agreement on intellectual property, lets countries take measures to protect public health and nutrition if those measures are consistent with the agreement. Whether a sugar tax could be challenged under WTO rules, I cannot say. That is outside what I can assess, and here is who can: a trade lawyer. Ask one before the State decides."

11 · Economists of work and of firms: labour economics, and advertising research

EXERCISE 1. A labour economist: an estimate of whether weight changes employment, wages or productivity, from natural experiments, and whether any gap comes from productivity or discrimination. A marketing scientist: measures of how quickly an audience receives an advert, how people interact with it, what they remember of it and what they buy after it; experiments on food adverts measure eating soon after.

EXERCISE 2.

Part	Your question
Decision	Whether the medical superintendent funds a staff weight programme on the grounds that it will reduce sick leave. She is waiting for advice before the next budget.
Context	One district hospital's staff. The hospital holds its own leave records; I do not know whether staff weights are recorded. The studies I know of come from economically developed countries.
Question	Is there a sound estimate, from India or a similar setting, of whether obesity causes more sick leave? Could this hospital's own records answer it, and if not, why not?
Form	Yes or no for each half, with the study or the reason. Tell me how sure you are and on what; I cannot judge the methods.
Deadline	Before the budget is drafted. If it comes later, the programme is decided without it.

Cawley's review lists the causal effect of obesity on absenteeism as still needing estimates, so expect the answer to be that little is known. The question still has to be asked, because the decision is about money.

EXERCISE 3.

Part	Your question
Decision	Whether the councillor asks the organisers to refuse drink sponsorship next season. The councillor is waiting before the organisers sign the next sponsor.
Context	One ward tournament; banners round the ground and a stall selling the brand's drinks. Players are children and teenagers. I hold an experimental meta-analysis of television and internet food adverts, not of sponsorship or banners.
Question	What could be measured here — what the children recall, what they buy at the stall — and has any study measured whether sports sponsorship changes what children buy?
Form	A list of measures and how to take them, and a reference for any study. Tell me how sure you are and on what; I cannot judge the methods.
Deadline	Before the sponsor for next season is signed. If it comes later, the decision is made without it.

EXERCISE 4. **One source** (and with it **No test**): the speaker cannot name the Indian study, and could not say what would show the claim wrong. This book's own search ran on 9 and 10 Oct 2026, and it is not a published study. It found the question hardly asked in India, and Cawley's review notes little evidence on weight's causal effect on productivity even elsewhere. Rewrite: "I do not know of an Indian study of obesity and productivity. Whether a workplace programme would pay for itself is outside what I can assess, and here is who can: a labour economist. I will ask one before we decide."

EXERCISE 5. **Loose word**: "impact" and "engagement" are marketing terms. Impact is how quickly the audience receives the message; engagement is any interaction with the advert, such as a click. Neither is a measure of eating.

Rewrite: “The agency says children saw the hoardings quickly and interacted with them. It has not said whether anyone’s eating changed. That is outside what I can assess, and here is who can: a marketing scientist. I will ask them what was measured.”

EXERCISE 6. Your count may differ from 135: OpenAlex adds and corrects records, so a count belongs to its date. Write yours down with today’s date. The count tells you how many records matched the words. It does not tell you how many study the question: most titles will be about other things (prevalence, clinics, workplaces, other countries), and only reading them shows which do. A mark of “yes” on a title is a reason to read the abstract, not a finding. Nothing here searched EconLit, IDEAS/RePEc or Indian reports, so a short list is not proof that no study exists.

12 · Planetary health: diet, climate and land use

EXERCISE 1. Two or more epidemics that occur together in time and place, interact, and share underlying drivers. Obesity, undernutrition and climate change. A sustainability scientist.

EXERCISE 2. Climate change, biodiversity loss, freshwater use, the nitrogen cycle, the phosphorus cycle, and land-system change.

EXERCISE 3.

Part	What you write
Decision	Whether the district changes part of the grain in the school meal scheme; the collector’s office decides at its meeting in three weeks.
Context	The scheme’s current grain and the proposed one, the quantities per child and the number of schools (attach the office’s figures). The climate case is the office’s claim, not yet checked. The nutrition side is a separate question.
Question	Would this change lower the scheme’s greenhouse-gas emissions, water use or land use, by roughly how much, and how sure can you be for this district?
Form	Yes, no or “cannot tell”, with a rough size if there is one and what it rests on. Tell me how sure you are. I cannot judge the modelling.
Deadline	Ten days from today, so I can brief the office before the meeting. If it comes later, the office decides without the climate case.

Whether the new grain meets the children’s nutritional needs is a separate question for a nutrition owner. Whether it is affordable and available is for the scheme’s administrators.

EXERCISE 4. **One source** fires first. The speaker’s whole plan rests on one report they cannot judge. The report itself sets no target for any country and gives no plan for turning its global targets into local ones.

A rewrite: “The EAT–Lancet Commission gives a global reference diet, which it says can be adapted to local food cultures. What it would mean for our district is outside what I can assess, and here is who can: a nutrition owner for our people’s needs, and a sustainability scientist for the climate. We will ask both before we use it in a district plan.”

13 · Streets and plans: urban and transport planning, and the municipal office

EXERCISE 1. An urban or transport planner, and the municipal town-planning office. “What would make this ward’s streets walkable and cyclable for the least active, and which plan or budget does that sit in?” The policy says many cycle tracks and pedestrian paths do not get used as initially envisaged. One view is that they were designed

badly, without recognising the problems cyclists and pedestrians face. It proposes building them after an open debate on the designs with experts and the community that will use them.

EXERCISE 2.

Part	Your question
Decision	Whether the committee asks the corporation for a footpath and a crossing outside the school; the councillor and committee decide at next month's meeting; the head of the school is waiting.
Context	The road outside the school (map attached); how children reach school now, if the school has counted it; the aim is more children walking.
Question	"What would make the road outside this school walkable for its children, and which plan or budget does that sit in?"
Form	What to build and where, how sure you are and on what, and the plan and budget it sits in; I cannot judge road design.
Deadline	A week before next month's meeting. If it comes later, the committee decides without it.

The Question row is fitted from the curriculum's question for a different road, and says so here. It goes to the municipal town-planning office for a planner's reply. What stays yours is how the school will count children walking before and after. What walking does for children's weight is not the planner's question either. Its owner is people who study physical activity in communities. Book 24, *Physical activity and sedentary behaviour science*, teaches that evidence.

EXERCISE 3. **One source**: the speaker rests the whole claim on one document and has misread it. The policy says "many", not all, cycle tracks and pedestrian paths "do not get used as initially envisaged". It reports "a view" that bad design is why. It proposes designing them in open debate with experts and users. It does not say they do not work in India. **About to act** follows: the committee may drop the lane on this line.

Rewrite: "The 2006 transport policy says many cycle tracks have gone unused, and reports a view that poor design is why. Whether this one would be used is outside what I can assess, and here is who can: the town-planning office. Let's ask them before we decide."

14 · Running an institution: service rules, accounts and audit, public procurement, contracts

EXERCISE 1. The administrative officer. The finance officer (the CAG is the auditor for public accounts, not someone you write to). The purchase (stores) officer. A lawyer, through the institution's legal cell. "What does this hire, contract or purchase require, and what will audit check?"

EXERCISE 2.

Part	Your question
Decision	Whether, and how, the district engages a data-entry person for six months; the district NCD officer decides; the screening data are waiting.
Context	Six months' work entering screening data; paid from the screening budget (amount attached); the work, hours and place described (attached).
Question	"what does this hire, contract or purchase require, and what will audit check?", fitted: "What does this hire require — post, process, papers — and what will audit check in it?"

Form	The route (post, contract or another), the steps and approvals, what may be promised to the person, and what audit looks for; I cannot judge service rules, so tell me how sure you are and on what.
Dead line	Two weeks before next month's start; later, the person is engaged without the rules checked, or the work starts late.

It goes to the administrative officer, with a copy to the finance officer for the audit half. What stays yours: what the work is, how much of it there is, and how you will check the data entered.

EXERCISE 3. **Unknown standard** fires first: the speaker does not know which rules govern this purchase or what they require. **About to act** follows: the purchase is about to be made.

What the speaker could not know: three things. First, whether the GFR apply. They are the Union's rules; a State programme follows the State's. Second, whether the scale is on GeM. If it is, Rule 149 makes buying through GeM mandatory for bodies under the GFR, and "the shop near the office" is not a route the rule names. Third, whether the year's demand for scales is one purchase that must not be split.

Rewrite: "Here is the specification, without a brand. Which route the rules require is a different question. That is outside what I can assess, and here is who can: the purchase (stores) officer. Let's send it to them today and place the order once they reply." Notice the rewrite does not say the shop is wrong either: that is the officer's answer.

15 · Campaign production and media buying

EXERCISE 1. Reach: the estimated number of people in the audience who will see the message. Frequency: how many times each of them sees it in a stated period. Owners: a communications or social-marketing agency, and the State IEC officer under the National Health Mission.

EXERCISE 2.

Part	Your question
Decision	Whether the medical officer spends the fixed sum on bus posters for one month, or on something else. She is waiting before she places the order.
Context	Adults in the area the centre serves. Posters on city buses for one month. The aim is that adults know the centre checks weight and blood pressure. The sum is fixed.
Question	What reach and frequency will this sum buy, in this audience, on these buses, over one month, and how will exposure be measured?
Form	An estimated reach and frequency with the source of each, and how you would count exposure afterwards. Tell me how sure you are and on what; I cannot judge your method.
Deadline	Before the order is placed. If it comes later, she decides without it.

EXERCISE 3. **Loose word**: 'reached' is used in its everyday sense. Reach is an estimate of how many people in the audience saw the message; a count of roads is a count of places. Rewrite: 'The hoardings went up on forty main roads. How many people in our audience saw them, and how often, is an estimate for the agency to give us, with its source.'

EXERCISE 4. It supports one thing: the rules now require a panel of 80,000 metered homes, up from 50,000. It does not say any agency is measuring under those rules: as on that date, none was registered. It does not say how

many people saw any spot. A panel is a sample of homes. Turning it into an audience for one district is the rating agency's and the planner's work. Ask the planner which measurement the figure for your spot comes from.

16 · The contact list, and saying it in public

EXERCISE 1. Field, Owner, Name and institution, How you know them, Last question asked, Asked on, Checked on. Worked with, met, found. A department, a professional society, the author of a paper you have read, an introduction from a colleague.

EXERCISE 2. There is no single right list. Check yours against this:

1. Eighteen rows, one per field: circuit neuroscience of appetite; cell and molecular biology of fat; statistical genetics; causal discovery algorithms; interference and spillover; deep learning and cloud infrastructure; endoscopic and device therapies; Ayush systems; trade, investment and intellectual property law; labour economics of obesity; advertising research; planetary health: diet, climate and land use; urban and transport planning; service rules and labour law for a hire; statutory accounts and audit; public procurement; contracts and memoranda of understanding; campaign production and media buying.
2. Every Owner cell in its section's words.
3. Every Name and institution cell is a real person and a place, or says "(yours to fill)". No invented names.
4. How you know them is one of worked with, met, found, and each worked with row has a Last question asked and an Asked on date.
5. At least three rows say worked with.
6. Every filled row has a Checked on date, and the next review date is six months away.

EXERCISE 3. Draw four boxes in a row: What I can say · The sentence · The owner · The next step. Fill them with one example from the resident's own week (a question they were asked and could only half answer).

Point out that the first box is where they show their subject: the sentence never comes alone. Write the sentence in the second box in its exact words, "That is outside what I can assess, and here is who can." Then the owner, from their own list if they have one, and a next step with a day attached.

Say honestly that no study we hold measures how listeners judge it. What the resident controls is that the committee leaves with an answer, an owner and a next step.

Have them say the four boxes aloud once, then once more without looking.

EXERCISE 4.

1. A refusal: no part answered, no owner. Rewrite: "I can tell you how we would judge its trials. How it acts in the brain is a different question. That is outside what I can assess, and here is who can: a systems neuroscientist. I'll bring you a name next week."
2. Improvising after the disclaimer: the second half is a confident answer the speaker cannot check. Rewrite: "Why the committee is looking at a sugar tax is a health question, and I can speak to that. Whether the tax breaks trade rules is a different question. That is outside what I can assess, and here is who can: a trade lawyer. I'll put it to one before the next meeting."

3. A claim about a whole field, by someone who cannot assess it. Rewrite: "I can tell you how the diet's effects on health would be judged. What it does for the planet is a different question. That is outside what I can assess, and here is who can: a sustainability scientist. I can send you the name of one by tomorrow."

17 · A ward councillor's question, routed

EXERCISE 1. 1. The question as asked. 2. Recognise: split it, mark each part inside or outside, name the signals; answer your part. 3. Name the owner of each outside part. 4. Write each owner a five-part question. 5. Judge each reply with the five checks; ask back when Asked, How sure or Own field fails. 6. Enter each owner in the contact list. 7. In public: say what you can answer, the public sentence, and who can answer the rest.

EXERCISE 2. For the lane: **About to act** with **No test** — the speaker cannot say what result in this ward would show the claim wrong. For the camp: **About to act** with **Unknown standard** — "can't do any harm" is a judgement about a system of medicine whose standard the speaker does not know. Rewrite: "That is outside what I can assess, and here is who can: whether the lane will get people cycling is a question for the town-planning office, and what the camp offers is a question for an Ayush practitioner. Let's ask them both, and measure obesity in the ward before and after."

EXERCISE 3. "Will people see them?" asks about reach, so it goes to a communications or social-marketing agency, with a copy to the State IEC officer. What hoardings do to what people buy or do would be a marketing scientist's question instead. Here is the question.

Part	Your question
Decision	Whether the corporation spends its sum on hoardings for the camp, or on another way of telling residents. The councillor is waiting; the order is placed on 20 Jan 2027.
Context	Residents of one ward, adults. Hoardings for the three camp Saturdays. The aim is that residents know the camp's dates and place.
Question	"what reach and frequency will this budget buy in this audience, and how will exposure be measured?"
Form	An estimated reach and frequency for the hoardings over the weeks before the camp, with the source of each, and how exposure will be counted. Tell me how sure you are and on what; I cannot judge your method.
Deadline	By 15 Jan 2027, before the order is placed on 20 Jan. If it comes later, the hoardings are ordered without it.

EXERCISE 4.

Check	Your mark	Your reason
Asked	fails	Popularity and experience were not asked about.
How sure	fails	It states confidence, and gives nothing it rests on.
Own field	fails	"A success" leaves unsaid what lies outside the college's field: whether obesity changes in the ward.
References	fails	None given, and How sure names no basis.
Decision	fails	It neither changes nor confirms your advice.

Checks 1 to 4 fail; References fails only because none are given and no basis is named, so one ask-back covers all four, quoting your Question row. Confidence is not a reason to accept a reply: the section on improvising showed confidence that did not follow accuracy.

EXERCISE 5. Say what you can: the ward will measure adults' weight and waist now and again a year later, which will show whether obesity changed but not what changed it. Then the sentence, in its exact words: "That is outside what I can assess, and here is who can." Then the owner: the town-planning office has told the committee what would make the ward's streets walkable, and whether residents will use the lane is still unknown. Quotable sentence: "We will know whether obesity changes in the ward because we will measure it; whether the lane gets people cycling is a question for the planners, and they have told us what else the streets need."

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
audit	a check, by someone other than the spender, that money was spent and recorded as the rules and the accounts say	14
Ayush	the Ministry of Ayush's name for Ayurveda, Yoga and Naturopathy, Unani, Siddha, Sowa-Rigpa and Homoeopathy	9
bariatric	to do with treating obesity	8
brainstem	a part of the brain whose nerve cells, with the hypothalamus's, trade signals with the gut, the pancreas and fat tissue	6
causal discovery (algorithm)	a computer method that tries to work out, from data, which variables cause which	7
causal graph	a drawing of variables joined by arrows from cause to effect	7
circuit neuroscience	the study of which groups of nerve cells, connected to which, produce a behaviour such as eating	6
cloud (computing)	running an analysis on remote computers, which you reach by uploading your data	7
co-location (Ayush)	an Ayush facility placed inside a primary health centre, community health centre or district hospital, so patients choose in one place	9
colocalisation	testing whether a trait and a gene's activity are driven by the same variant	6
consultation	asking a colleague in another field for an opinion on one question, and their answer; the consultation papers call the owner the "consultant"	4
contact list	your own list of owners, one row per field; kept in seven columns, with how you know each owner and when you last checked (Book 11, section 16)	1, 16
deep learning	models that learn complex patterns from very large amounts of data	7
depth (of knowing a field)	how far you can go in a field, judged by what you can do: route, read, critique or do	1
edge (of your competence)	for one question, the point past which you cannot say what would show your answer wrong and check it yourself	1
endoscope	a thin, flexible tube passed down the throat to see and work inside the gut	8

Term	Plain words	Section
endoscopic sleeve gastroplasty (ESG)	stitching through the full thickness of the stomach wall, from inside, through an endoscope, to make the stomach a narrow tube	8
engagement (of an advert)	in marketing, any interaction with the advert, such as a click on an internet advert	11
exposure	(1) what differs between the people being compared: something they have, do or meet (Book 7); (2) in a media plan, a person seeing or hearing the message (Book 11)	15
fine-mapping	narrowing a stretch of DNA linked to a trait down to the variant most likely to cause the signal	6
frequency (of a campaign)	how many times each person in the audience sees the message in a stated period	15
genome-wide association study (GWAS)	a scan of the whole of many people's DNA for variants that go with a trait	6
genotype imputation	filling in DNA letters a test did not read, using a reference panel of fully read genomes	6
Government e-Marketplace (GeM)	the government's online market for common goods and services, which Union offices must use for what it offers, and which State offices may use	14
hoarding	a large advertising board beside a road	11
hypothalamus	a part of the brain whose nerve cells, with the brainstem's, trade signals with the gut, the pancreas and fat tissue; some of its cells sense leptin	6
impact (of an advert)	in marketing, how quickly the audience receives the advert's message; not a change in anyone's behaviour	11
improvising	giving a confident answer to a question past your edge, where you cannot check your own reasoning	2
interference (spillover)	one person's treatment changing another person's outcome	7
intragastric balloon (IGB)	one or more silicone balloons placed in the stomach empty through an endoscope, filled there, and taken out, typically within six months	8
labour economics	the study of work and pay: who is employed, at what wage, and why	11
leptin	a hormone made mainly in fat tissue; how much there is reflects how much fat the body holds	6
logistic regression	the ordinary statistical way to predict whether a person has, or will get, a condition	7
machine learning	computer methods, such as artificial neural networks, support vector machines and random forests, offered as alternatives to logistic regression	7
master plan	a city's plan for how its land is used and where its roads and transport go as it grows	13

Term	Plain words	Section
media buying	paying for the space or airtime in which a message runs	15
memorandum of understanding (MoU)	a written agreement between two bodies about what each will do	14
Mendelian randomisation (MR)	a way of using genes to test whether an exposure causes an outcome (named only; taught in Book 40)	6
natural experiment	a situation in which something outside a person's own choice shifts the thing being studied, such as their weight	11
owner (of a question)	the person or office whose job it is to answer it	1
patent	a time-limited right to stop others making or selling an invention	10
percentile	where a score stands among others: the 12th percentile is above 12 in every 100	2
planetary health	the health of people together with the natural systems they depend on	12
planetary health diet (reference diet)	the EAT–Lancet Commission's diet meant to be healthy for people and within the planet's limits	12
polygenic score	a number that adds up a person's risk variants, each weighted by its effect in a GWAS	6
professional society	a body of people in one field	16
public procurement	a government body buying goods or services under its financial rules; for the Union government's offices, the General Financial Rules 2017	14
public sentence (the)	the sentence "That is outside what I can assess, and here is who can.", said in public after the part you can answer and before the owner	1
rare-variant burden test	adding up the rare changes in one gene across people and testing them together against a trait	6
reach (of a campaign)	the estimated number of people in the audience who will see the message	15
recall test	asking a sample of people what they remember of an advert, with cues (aided) or without (unaided)	11
reply	what the owner sends back	5
responsive (reply)	a reply you can use for the decision the question served, because it passes the five checks: asked, how sure, own field, references, decision	5
risk of bias	flaws in how the studies were run that push the estimate one way	7
route (a question)	notice that a question has left what you can assess, name the person or office whose job it is to answer it, and send it to them as a question they can answer	1

Term	Plain words	Section
routed question	a question written in five parts (decision, context, question, form, deadline) so that its owner can answer it in a form you can use	4
self-assessment	your own judgement of how good you are at something	2
service rules	the rules that set a government post's pay, leave, conduct and the rest	14
single-cell atlas	a map of a tissue's kinds of cell, made by reading which genes each cell, or its nucleus, is using	6
statistical genetics	finding, with statistics on many people's DNA, which variants go with a trait and which gene they act through	6
statutory accounts	accounts a law or a rule requires a body to keep	14
statutory commission	a body a statute sets up	9
syndemic	epidemics that occur together in time and place, interact, and share underlying causes	12
trademark	a brand's name or mark	10
transcriptome-wide association study (TWAS)	testing whether a gene's predicted activity goes with a trait	6
TRIPS Agreement	the WTO's agreement on intellectual property, which its members must give effect to in their own legal systems	10
variant (genetic)	a place where people's DNA differs, often by one letter	6
vignette (case vignette)	a written patient case given to doctors to diagnose, standing in for a real patient	2
wage penalty	lower pay for one group than for otherwise similar workers	11
Wards Committee	a committee for one ward or several, which the Constitution requires in a municipality of three lakh people or more; for one ward, the ward's councillor chairs it	3

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 11.

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2	Mathematics for modelling and inference · Rung 1	done
3	Qualitative and mixed methods · Rung 1	done
4	Food systems, value chains and Indian food policy · Rung 1	done
5	Policy process, framing and advocacy craft · Rung 1	done
6	R, reproducibility engineering and data management · Rung 1	done
7	Question selection and research strategy · Rung 1	done
8	Teaching, mentorship and coalition building · Rung 1	done
9	Scientific writing, visualisation and public communication · Rung 1	done
10	Epistemics: philosophy of science and calibration · Rung 1	done
11	**Adjacent specialist domains: recognise and route · Rung 1 ◀ you are here**	done
12	Probability and statistical inference · Rung 1	done
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OBESITY EXPERTISE · BOOK 11

Adjacent specialist domains: recognise and route · Rung 1

A short book about the edge of your own competence. It shows why confident improvising is a hazard at that edge, how to notice mid-conversation that a question has left you, how to write a question a specialist can answer, and how to judge their reply without being able to give it yourself. It then walks the adjacent fields an obesity specialist in India meets, from circuit neuroscience and statistical genetics to trade law, town planning, Ayush, public procurement and media buying, naming for each who owns it, where to find them and what to ask. You finish with a contact list of real people and a sentence you can say in public without embarrassment.

Book 11 of the series' 196 books, free to read at drharshmaheshwari.com.



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Version 1.0 · 16 October 2026

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