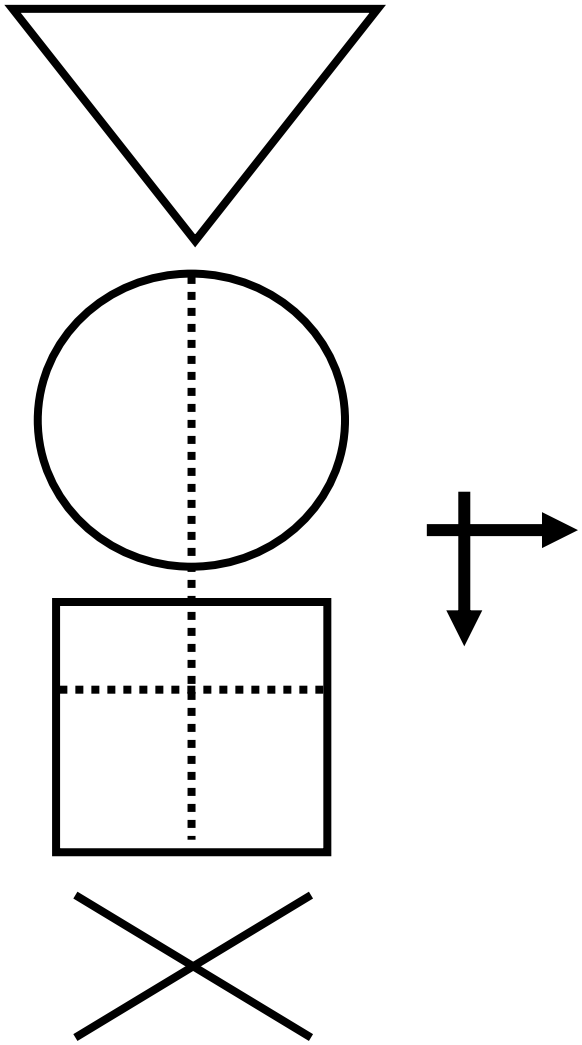
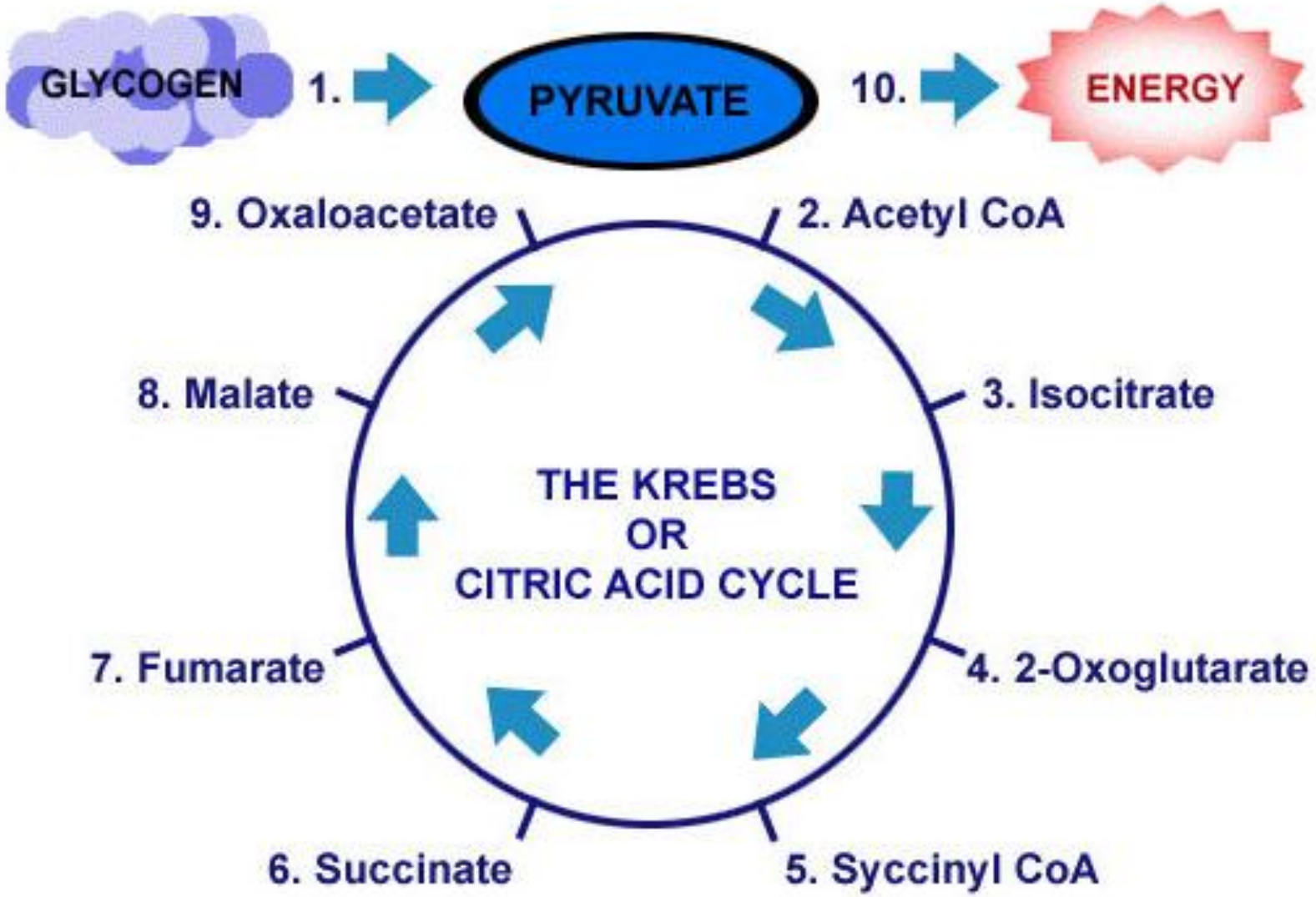
GATE: Graphic Approach To Epidemiology



1 picture, 2 formulas & 3 acronyms

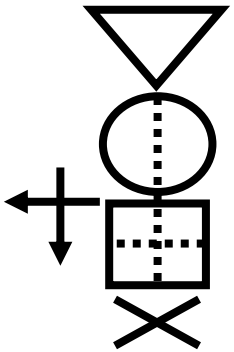
The Krebs Cycle



The GATE frame:

- *Graphic Appraisal Tool for Epidemiological studies – a framework for appraising studies*

- *Graphic Architectural Tool for Epidemiological studies – a framework for designing studies*

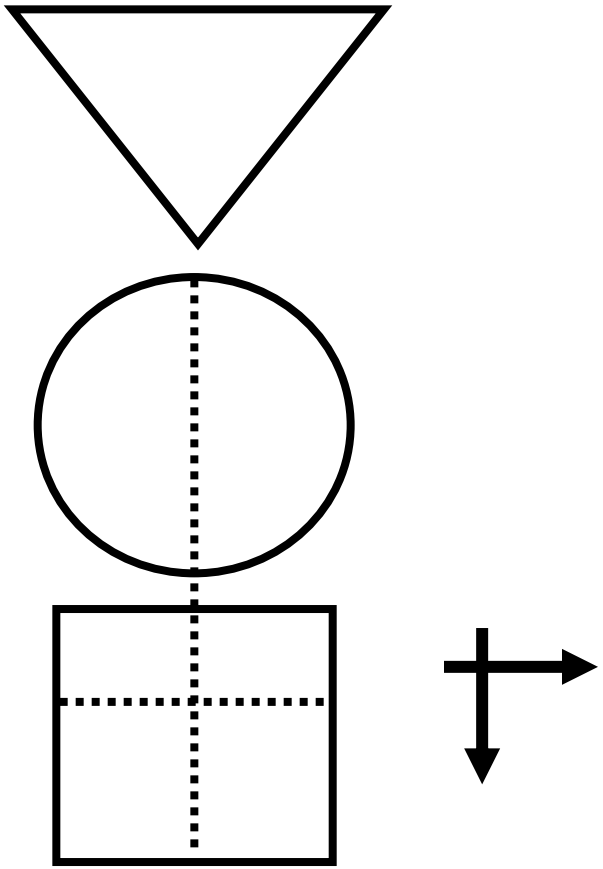


Presentation outline

1. a framework for study design
2. a framework for study analysis
3. a framework for study error
4. a framework for practicing EBP

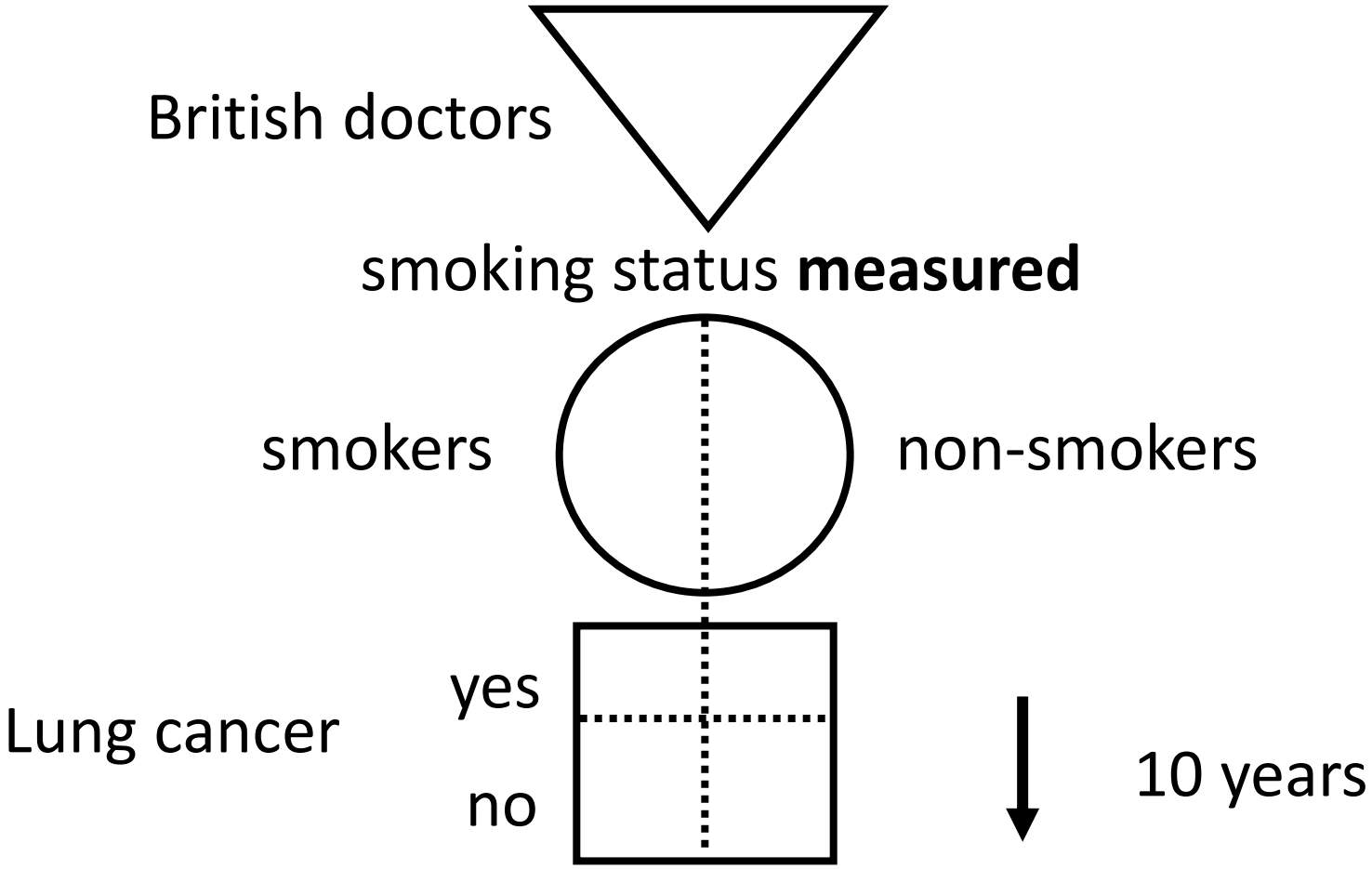
1 picture, 2 formulas & 3 acronyms

1. GATE: design of epidemiological studies: ***the picture & 1st acronym: PECOT***



every epidemiological study can be hung on the GATE frame

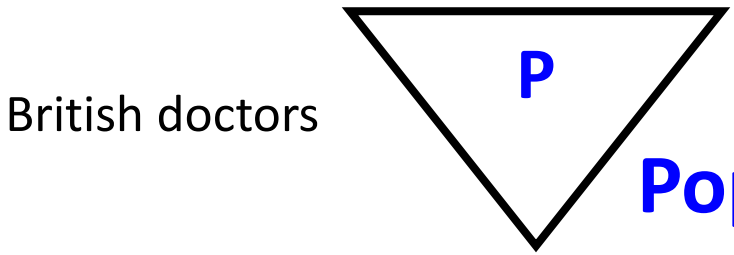
GATE Frame ***picture***



Longitudinal (cohort) study

Observational studies: allocated by measurement

1st acronym: PECOT



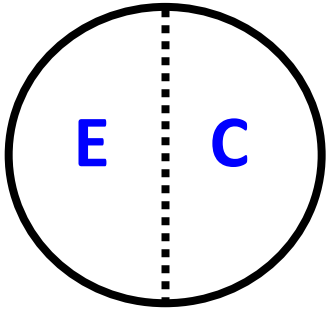
British doctors

Population/Participants

smoking status measured

Exposure

smokers

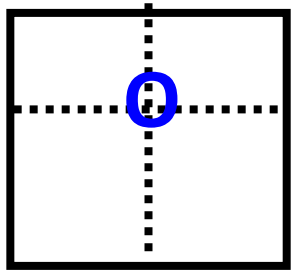


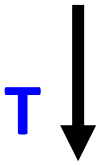
Comparison

non-smokers

Outcomes

Lung cancer

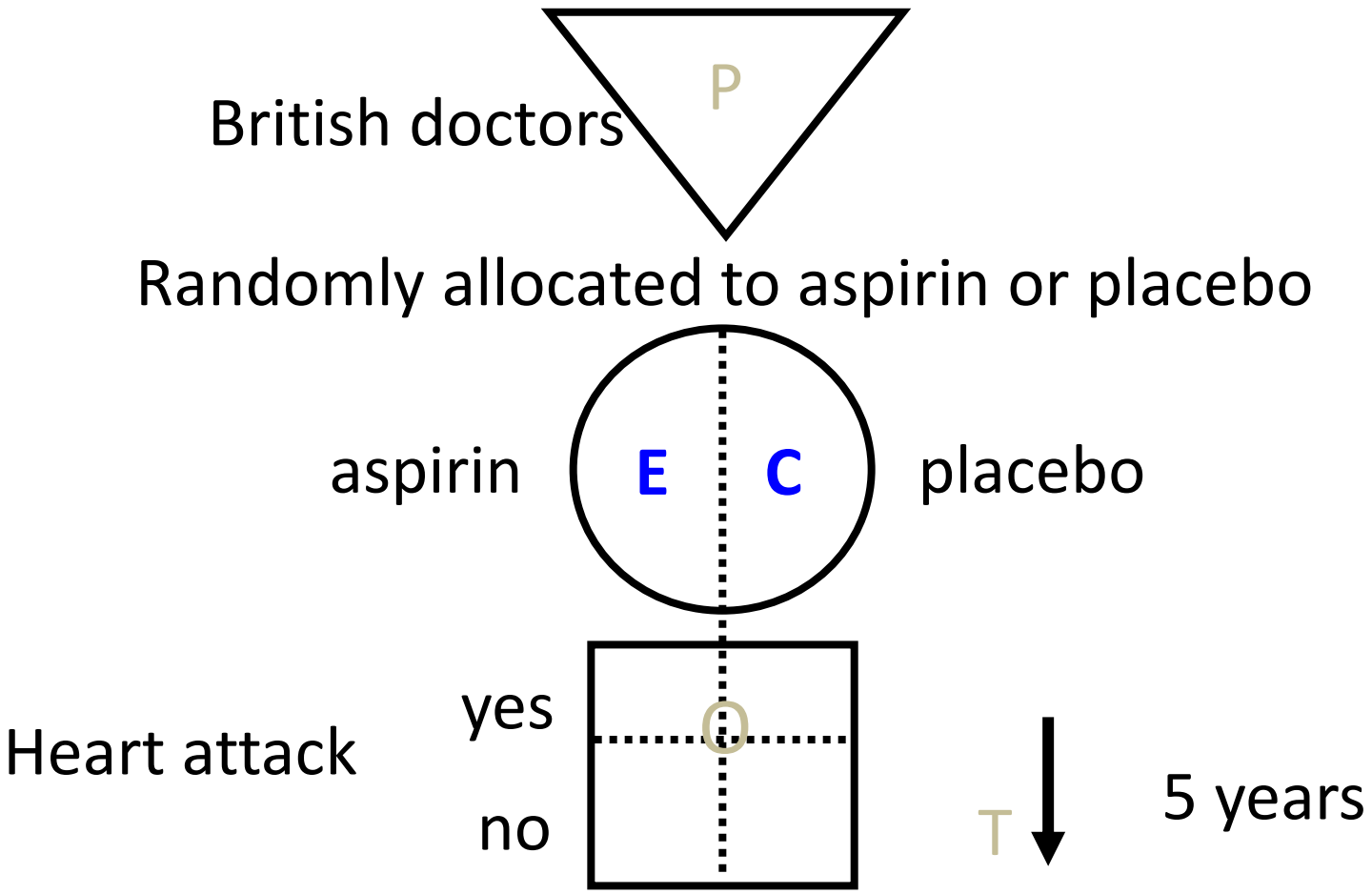




Time

10 years

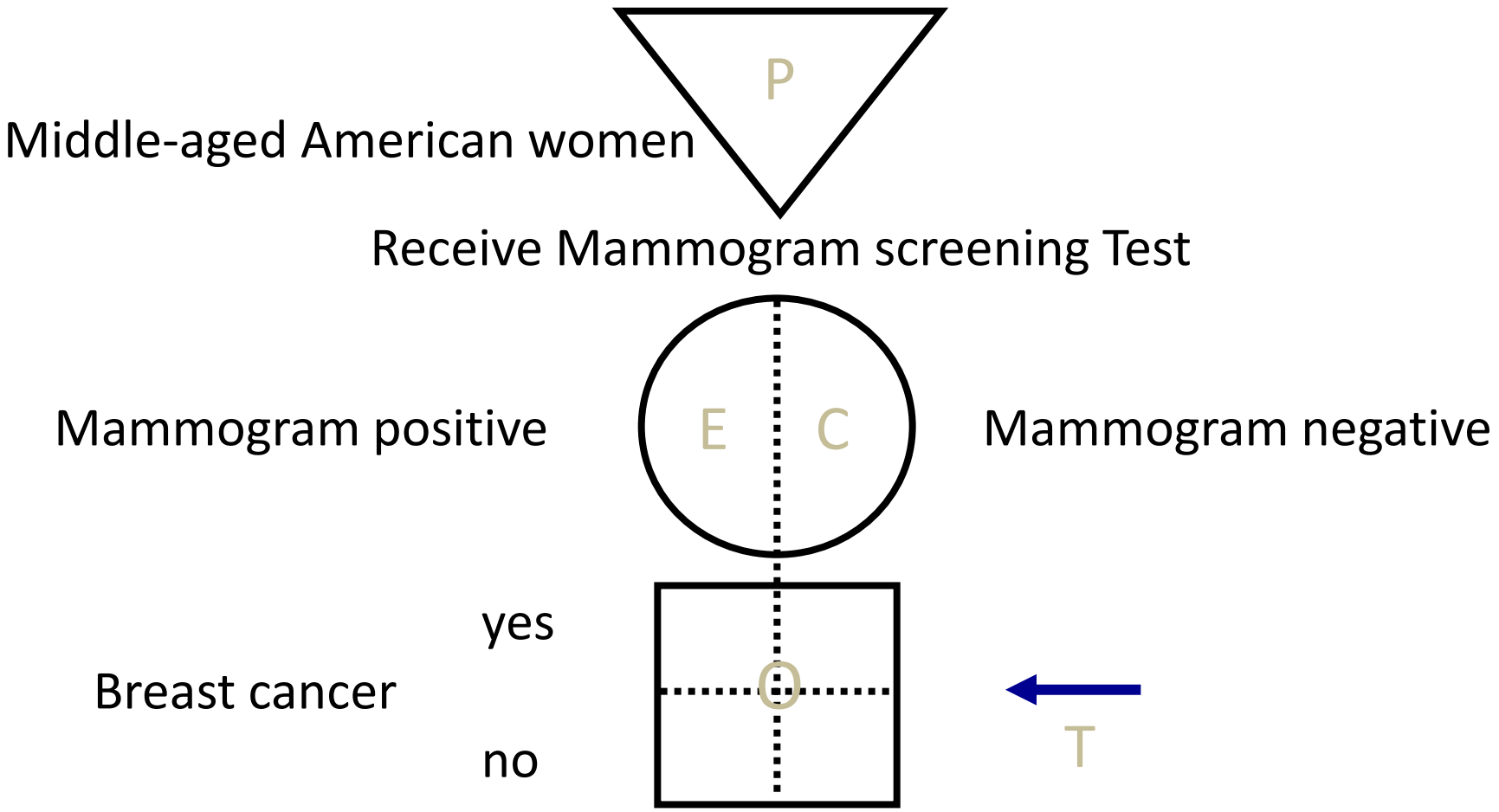
GATE Frame *picture & 1st acronym*



Randomised Controlled Trial

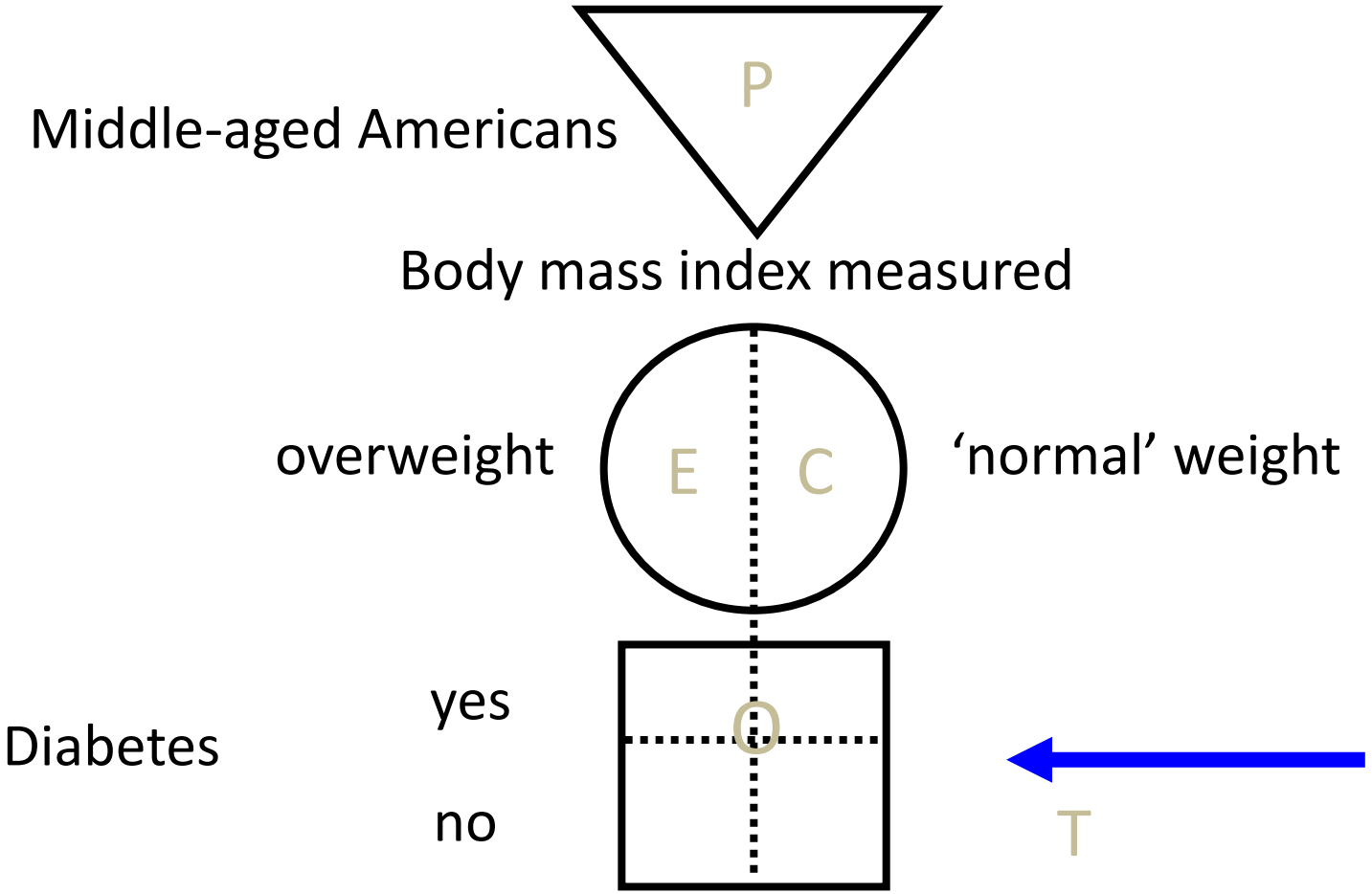
RCT: allocated to E & C by randomisation process

GATE Frame ***picture & 1st acronym***



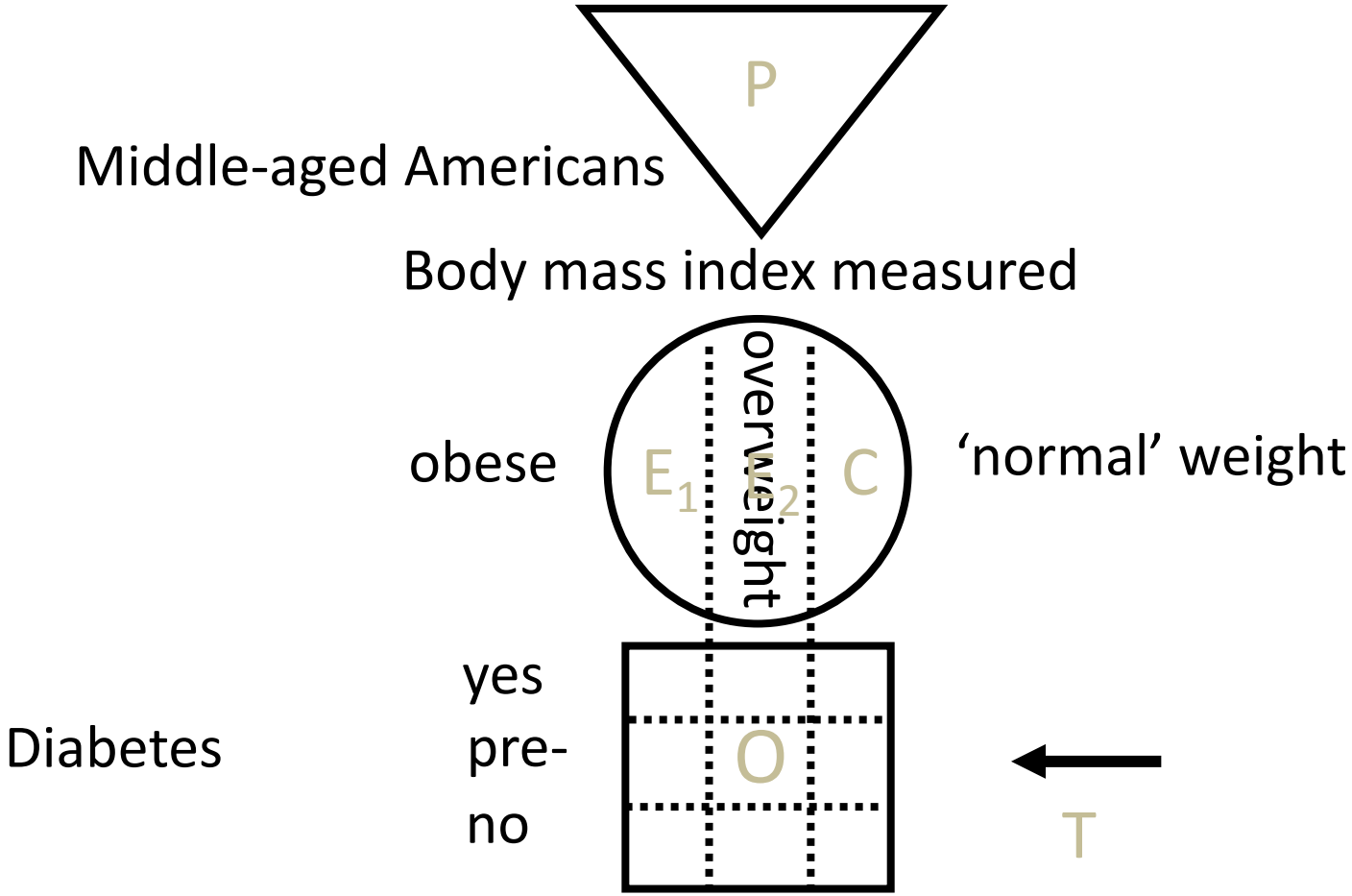
Diagnostic (prediction) study

GATE Frame ***picture & 1st acronym***



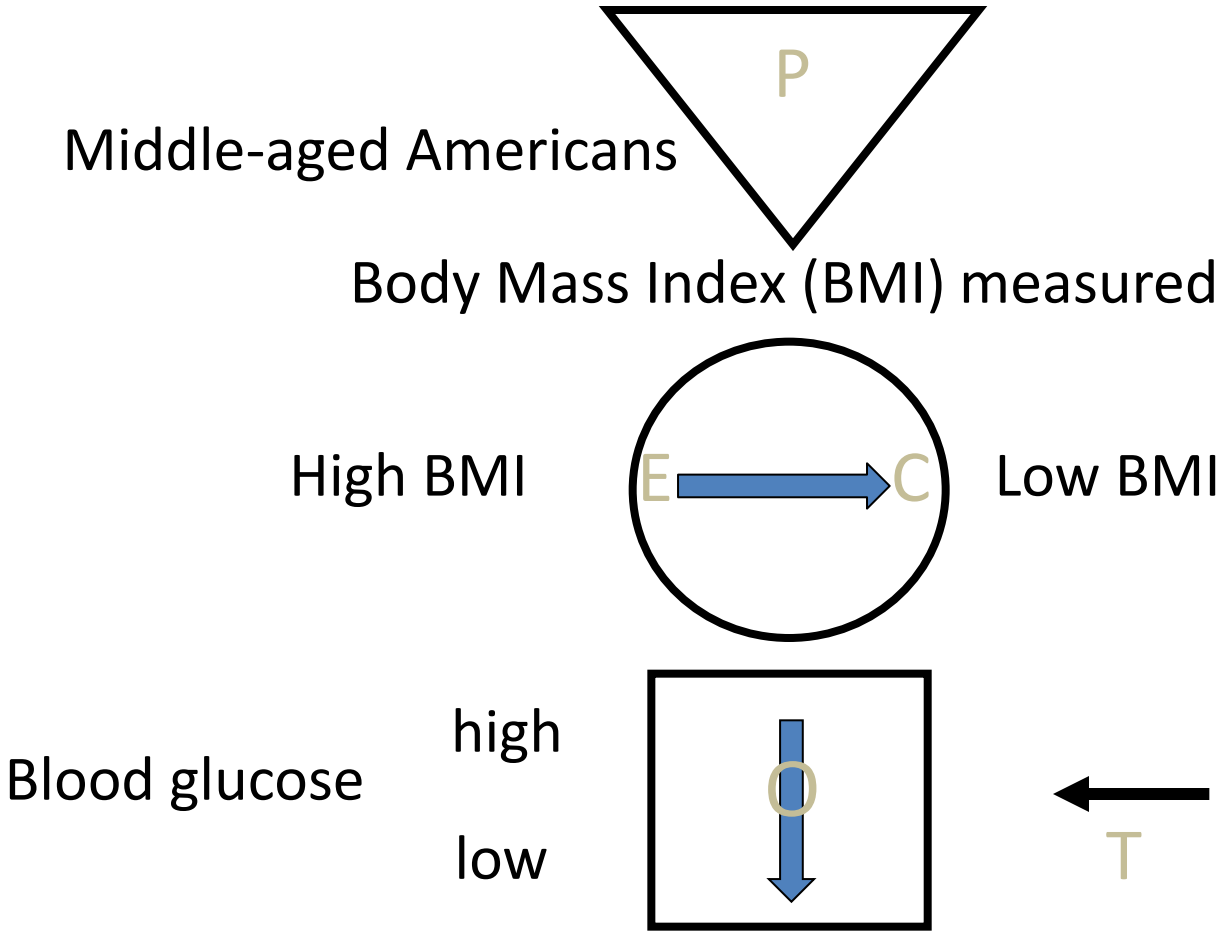
Cross-sectional (prevalence) study

GATE Frame *picture & 1st acronym*



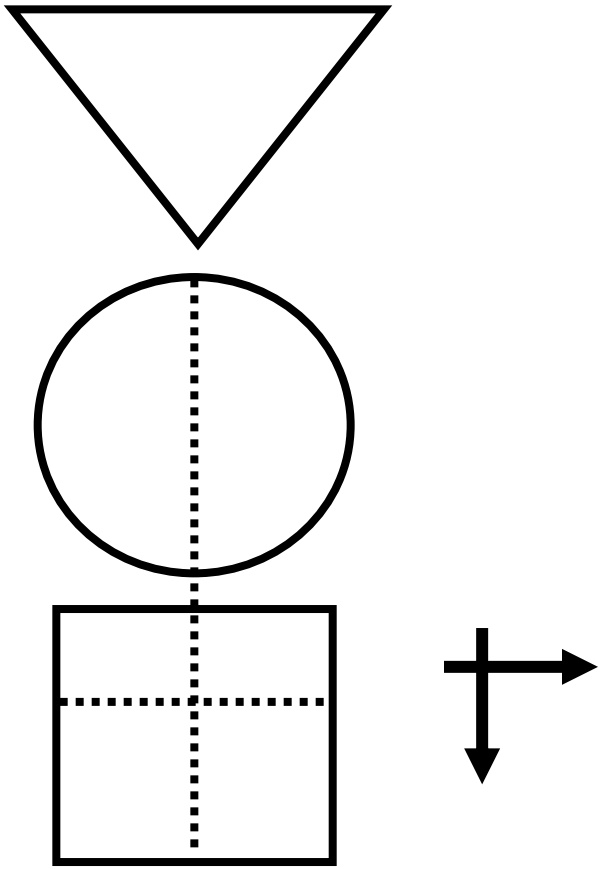
Cross-sectional study

GATE Frame *picture & 1st acronym*



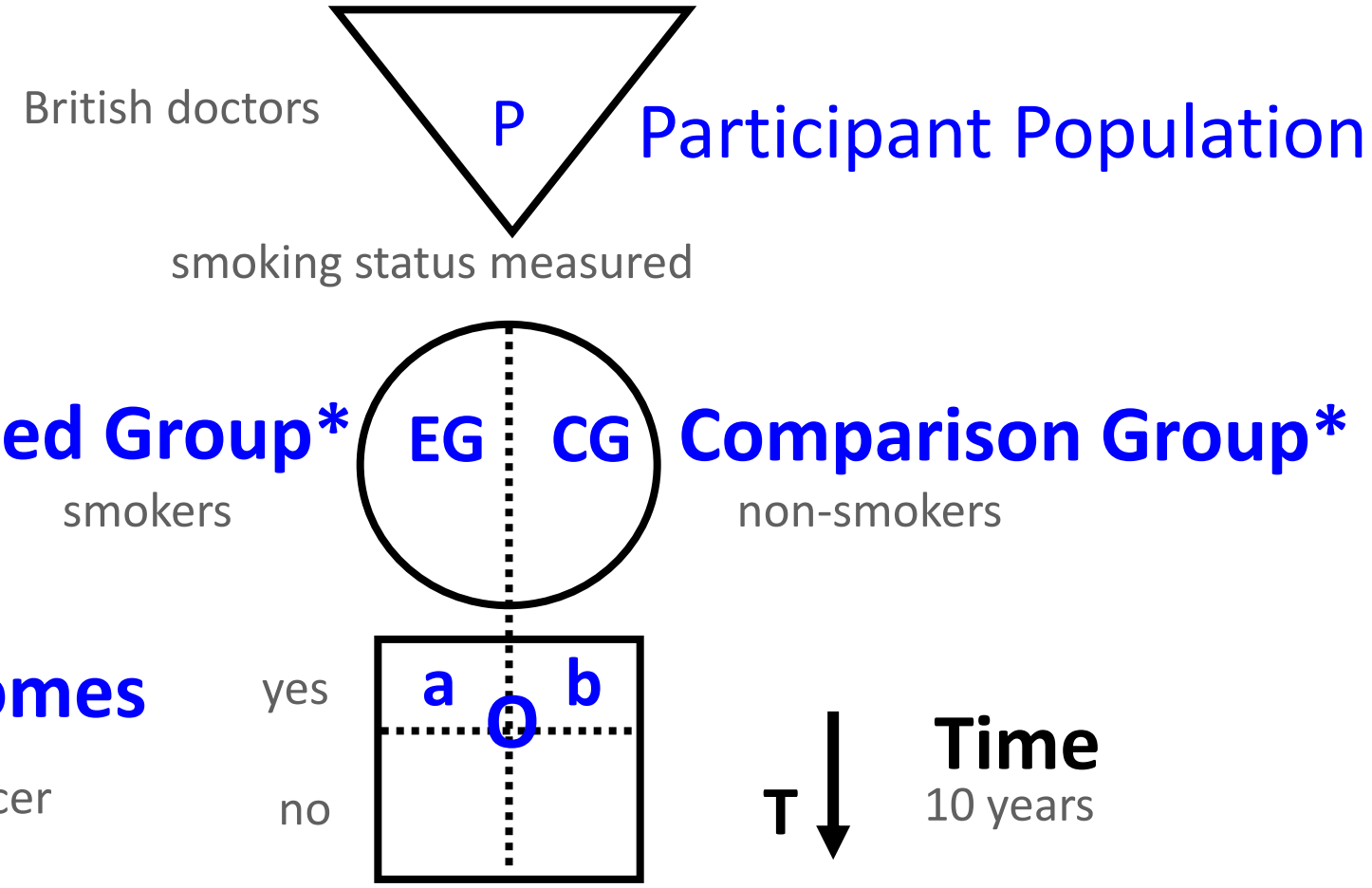
Cross-sectional study

2. GATE: analysis of epidemiological studies: ***the 1st formula: outcomes ÷population***



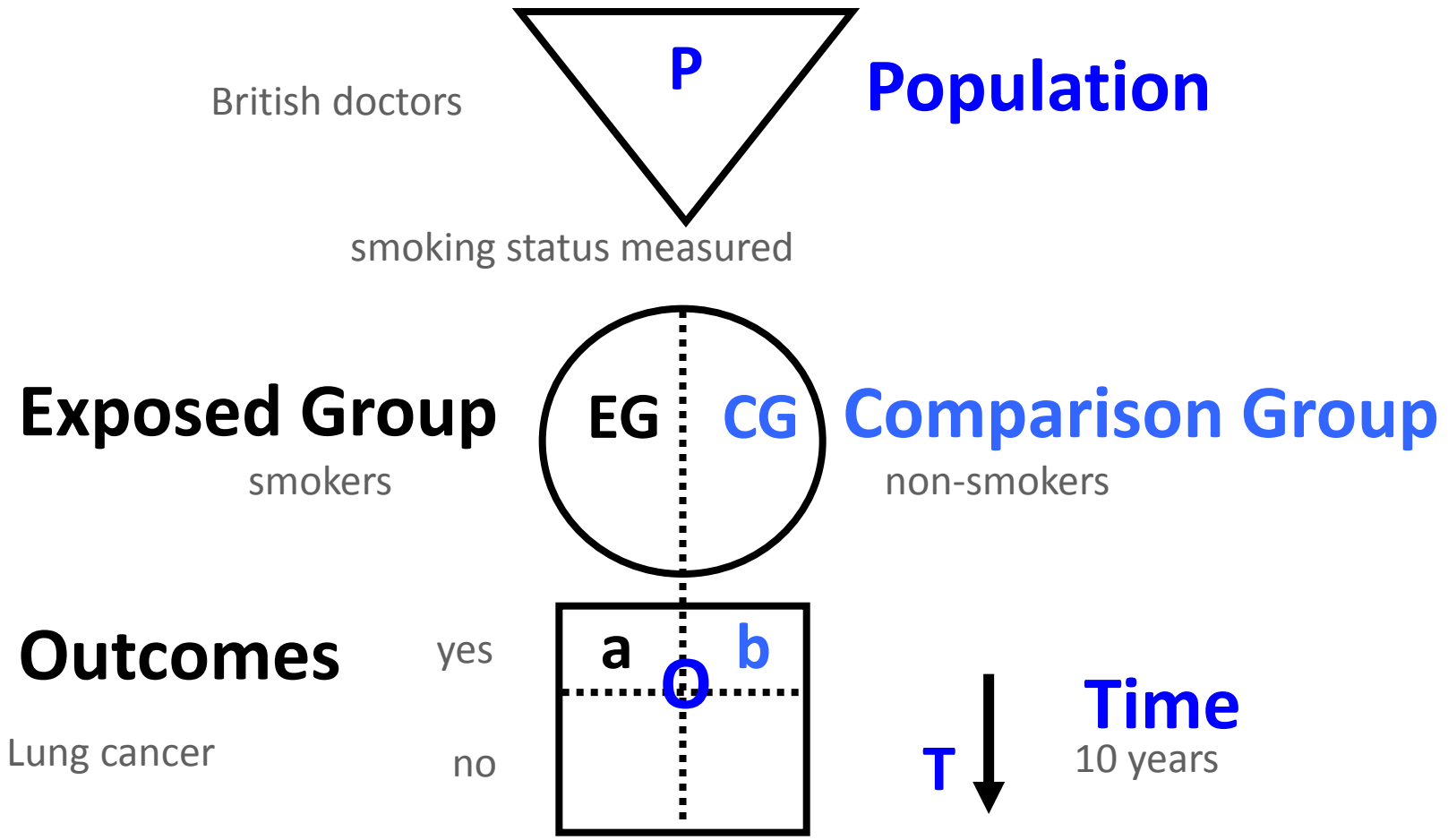
The numbers in every epidemiological study can be hung on the GATE frame

1st formula: the Occurrence of outcomes = number of outcomes ÷ number in the population



* a Group is a sub-population

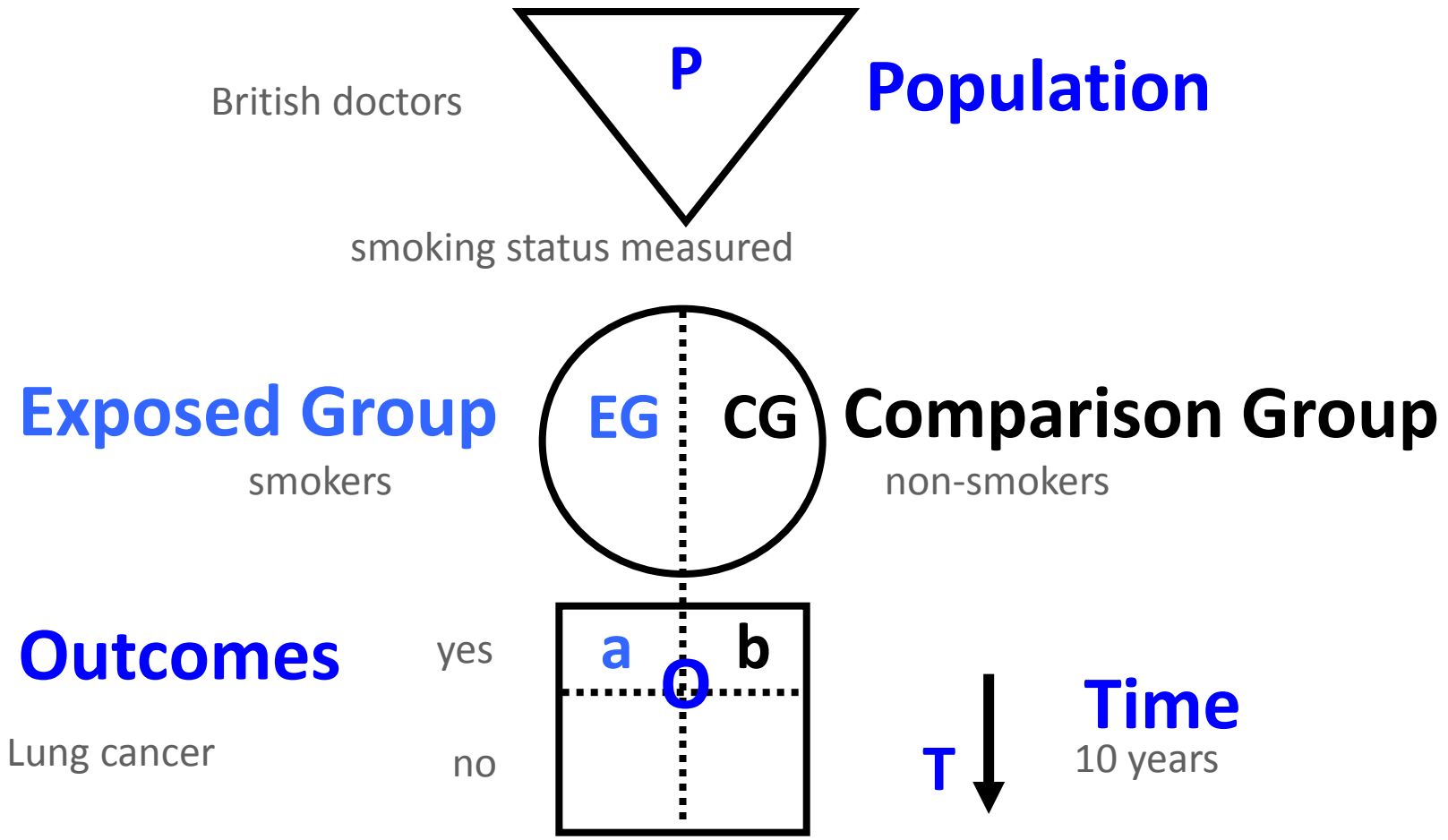
1st formula: occurrence = outcomes ÷ population



Exposed Group Occurrence (EGO) = a/EG

= number of outcomes (a) ÷ number in exposed population (EG)

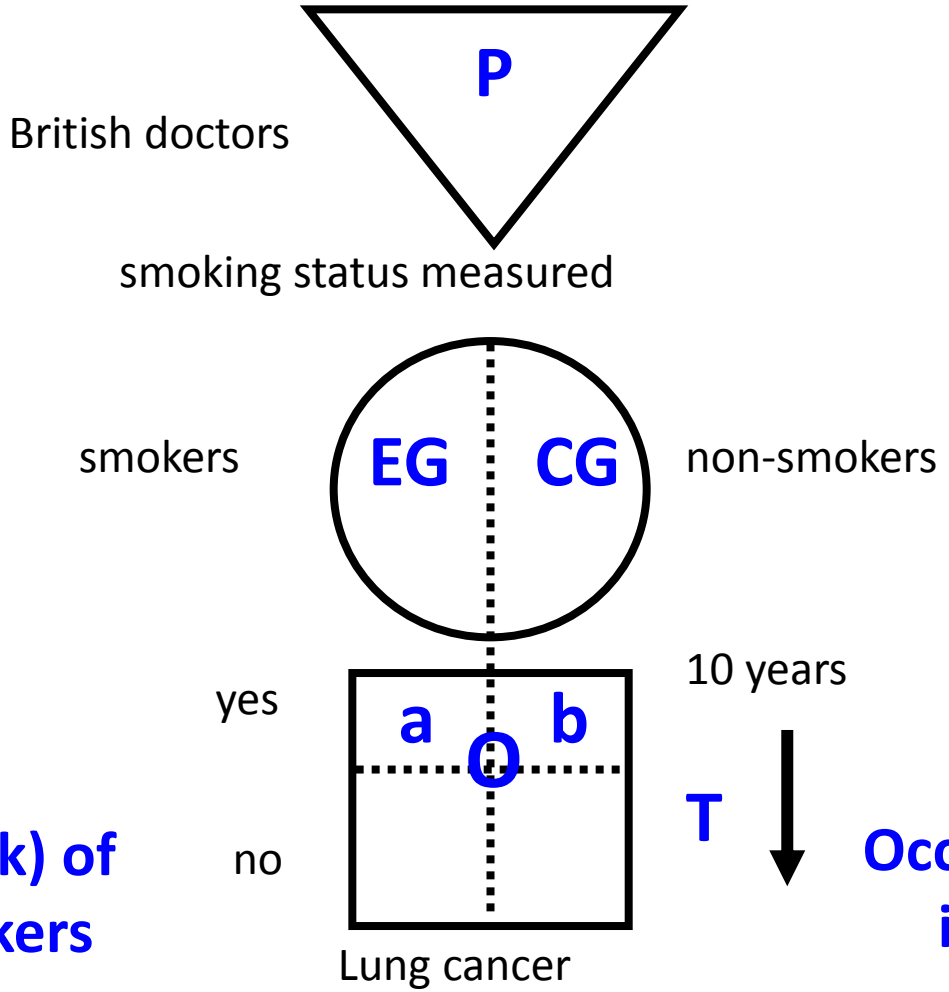
1st formula: occurrence = outcomes ÷ population



Comparison Group Occurrence (CGO) = b/CG

= number of outcomes (b) ÷ number in comparison population (CG)

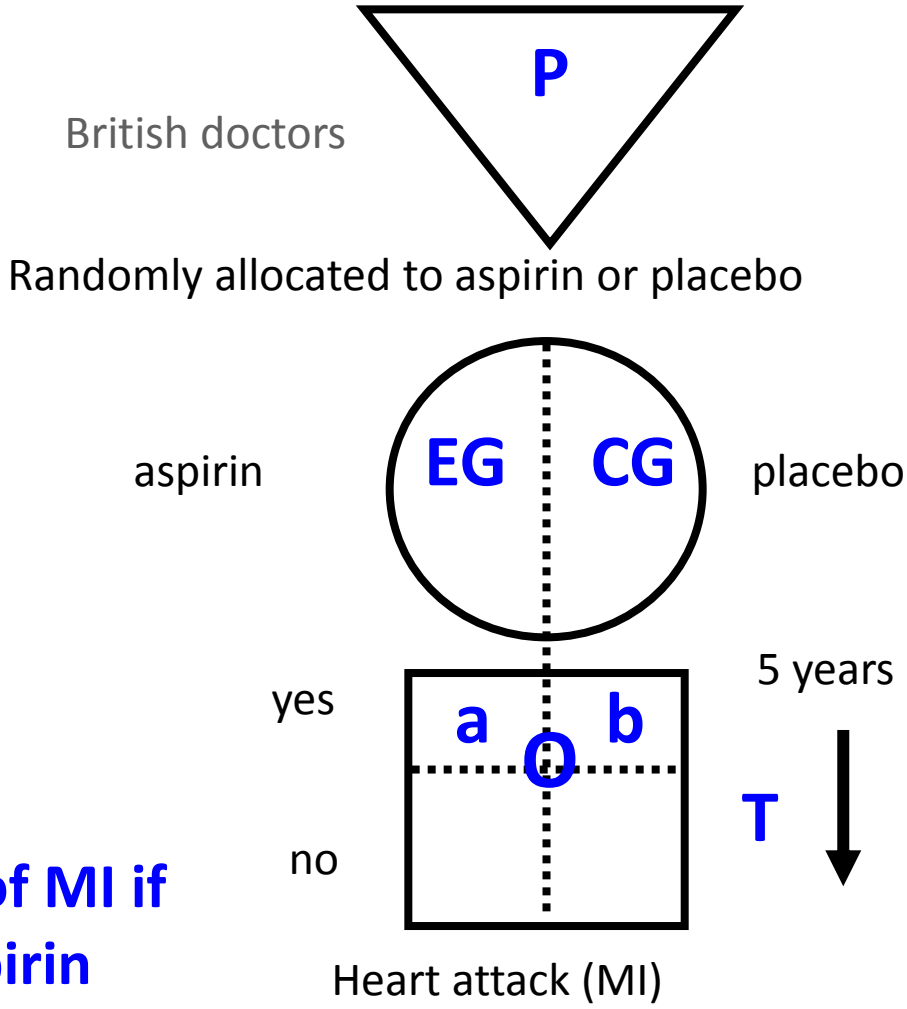
*The goal of all epidemiological studies is to measure (& compare) the occurrence of outcomes in (different) populations (**EGO compared with CGO**)*



EGO:
Occurrence (risk) of cancer in smokers

CGO:
Occurrence of cancer in non-smokers

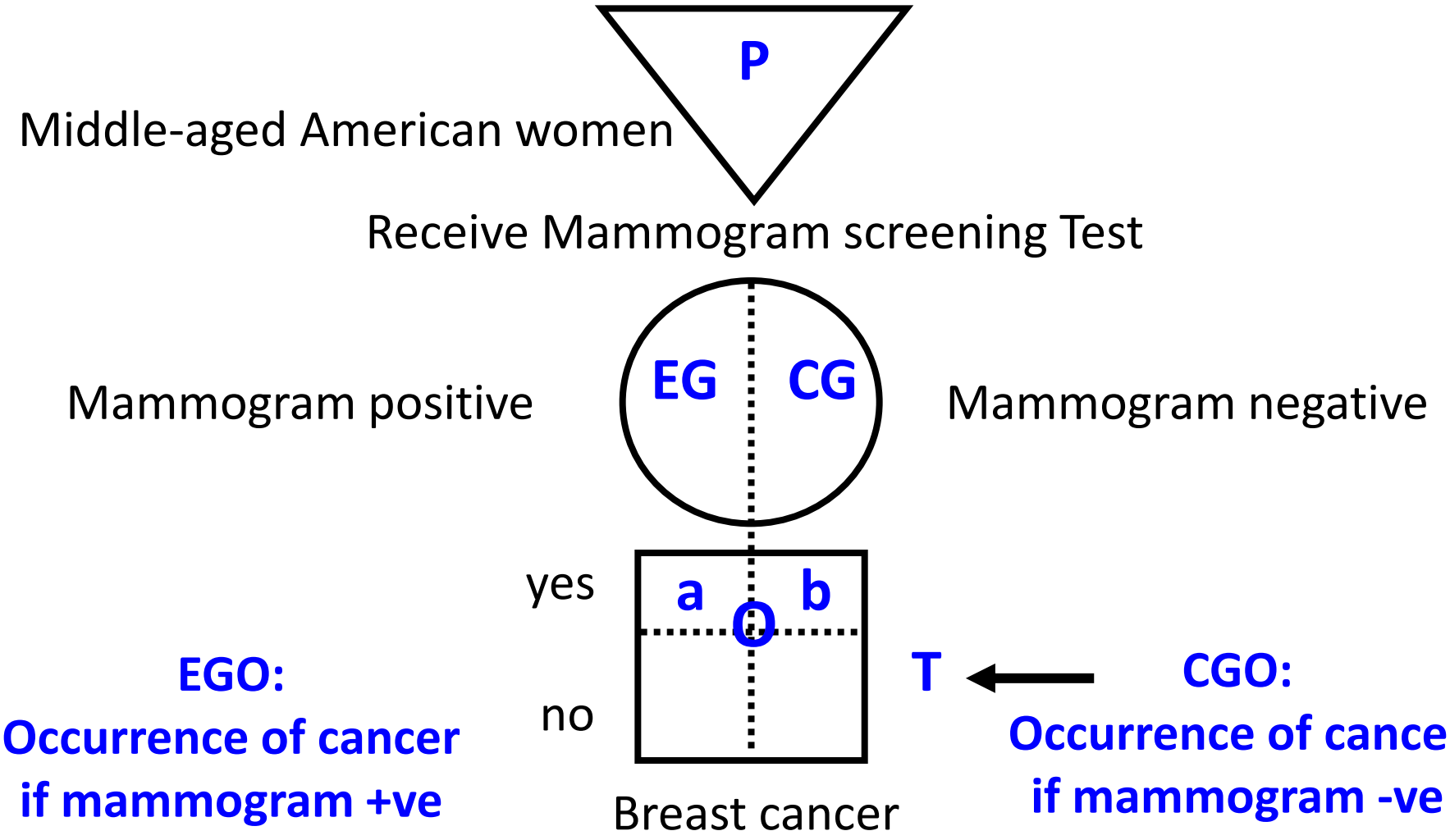
*The goal of all epidemiological studies is to measure (& compare) the occurrence of outcomes in (different) populations (**EGO compared with CGO**)*



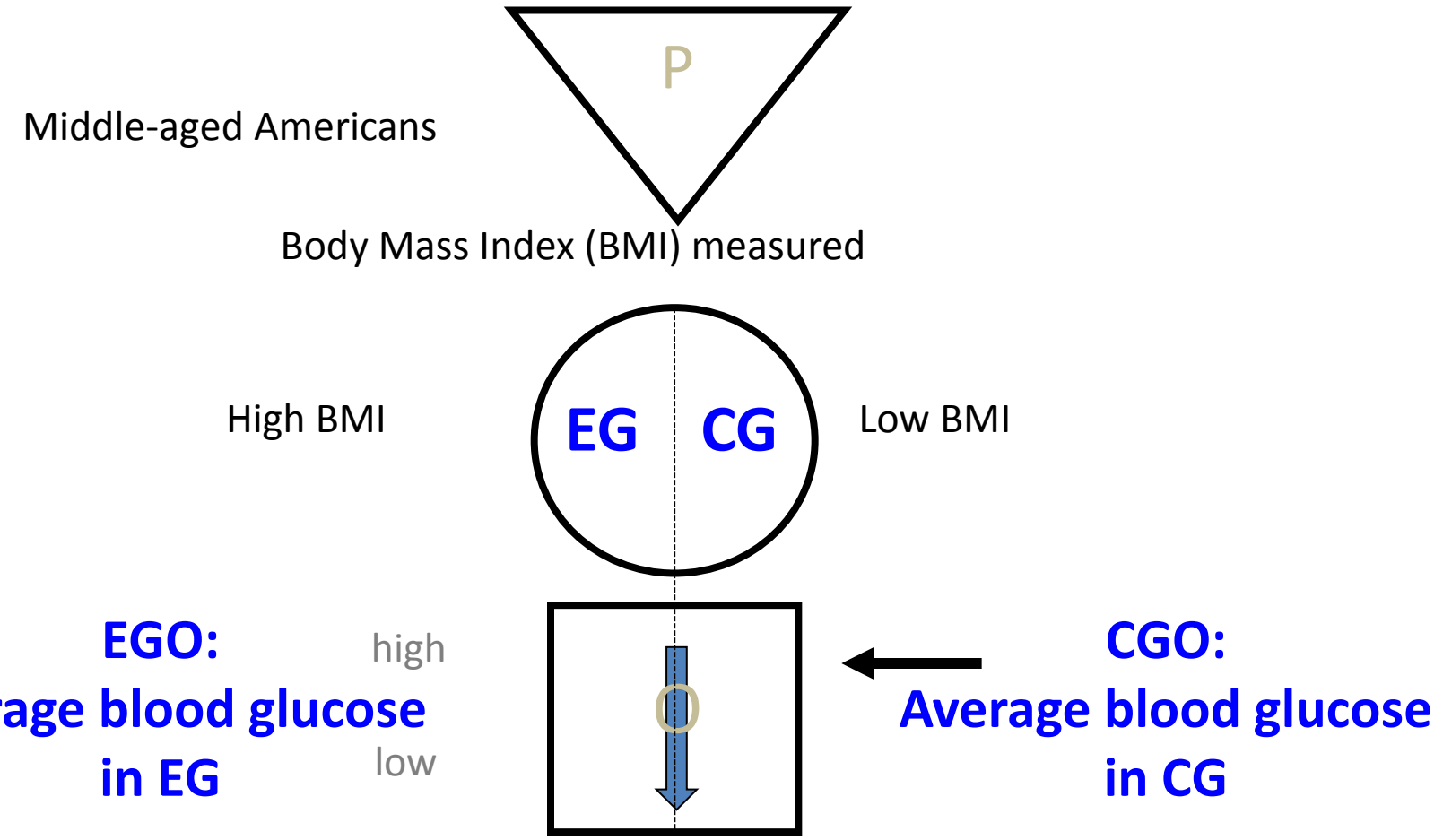
EGO: Occurrence of MI if taking aspirin

CGO: Occurrence of MI if not taking aspirin

*The goal of all epidemiological studies is to measure (& compare) the occurrence of outcomes in (different) populations (**EGO compared with CGO**)*



*The goal of all epidemiological studies is to measure (& compare) the occurrence of outcomes in (different) populations (**EGO compared with CGO**)*



EGO = sum of all glucose levels in EG ÷ number in EG

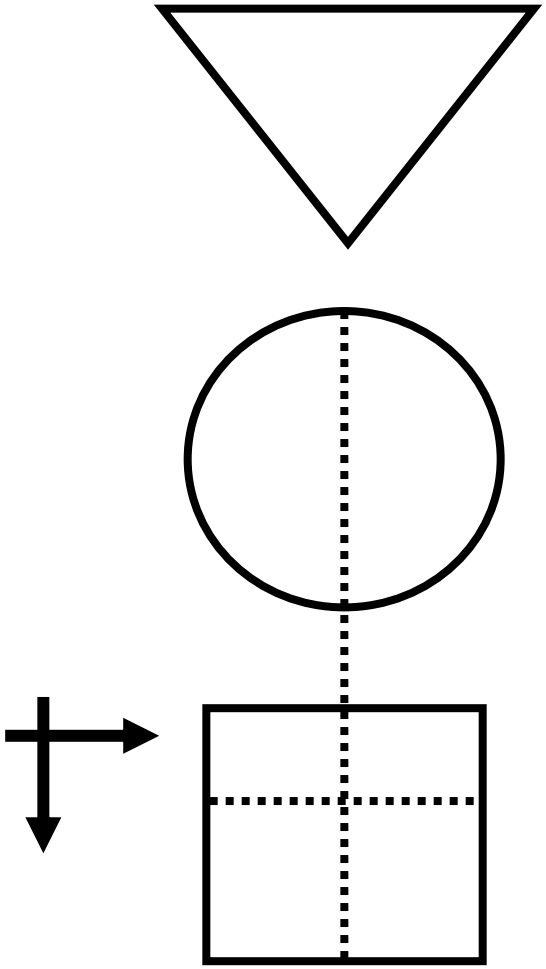
Comparing EGO & CGO

- Risk Ratio or Relative Risk (RR) = EGO ÷ CGO
- Risk Difference (RD) = EGO – CGO
- Number Needed to Treat/'expose' (NNT) = 1 ÷ RD

its all about EGO and CGO

Measures of occurrence include: risk; rate; likelihood; probability; average; incidence; prevalence

3. GATE: identifying where errors occur in epi studies: ***the 2nd acronym: RAMboMAN***



Recruitment

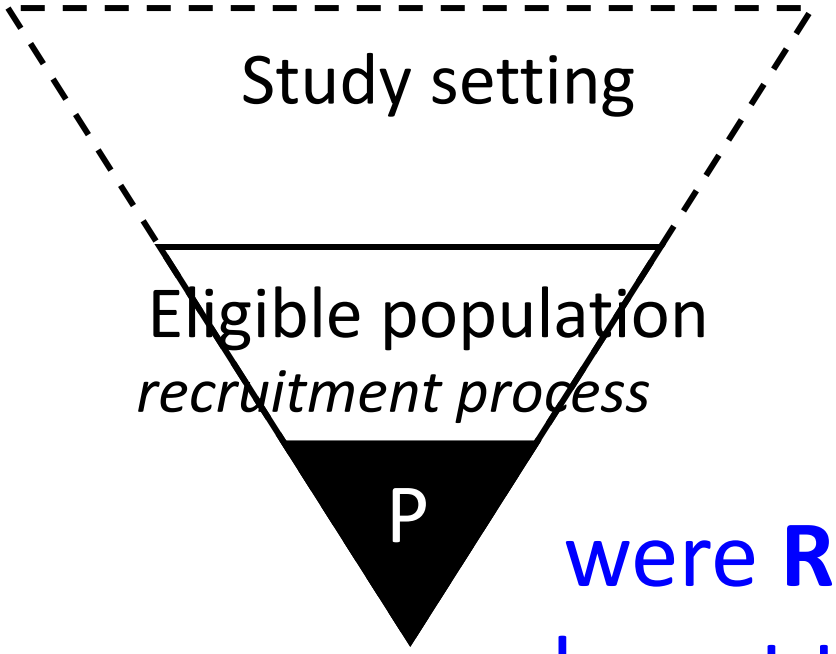
Allocation

Maintenance

blind
objective
Measurements

ANalyses

the GATE frame with RAMboMAN can be used to identify risk of error in most/all epidemiological studies



RAMboMAN

were **Recruited** participants relevant to the study objectives?

who are the findings applicable to?

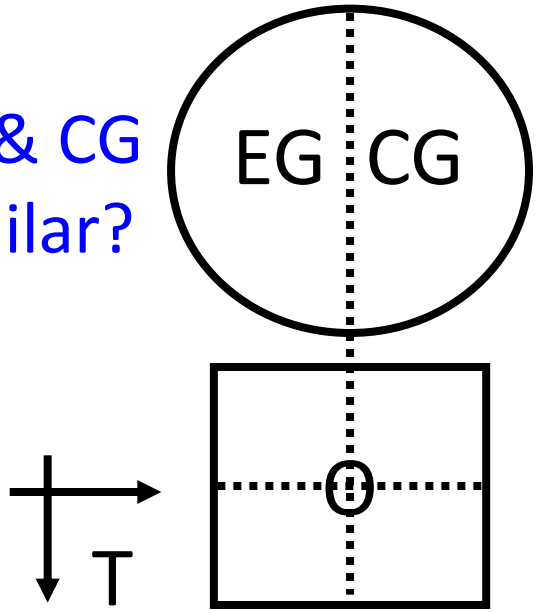
RAMboMAN: how well were participants **Allocated** to exposure & comparison groups?

Was **Allocation** to EG & CG successful?

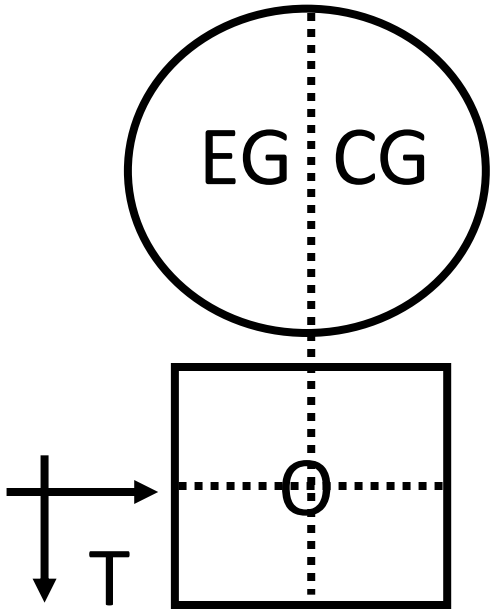
RCT: Allocated by **randomisation** (e.g to drugs)

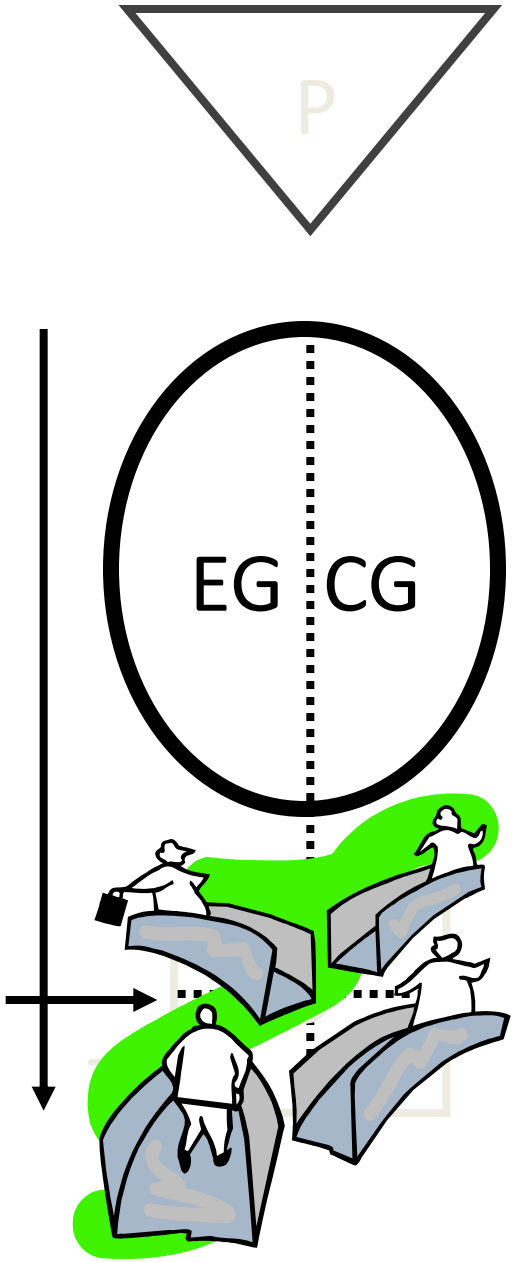
Cohort: Allocated **by measurement** (e.g. smoking)

EG & CG similar?



E & C measures accurate?





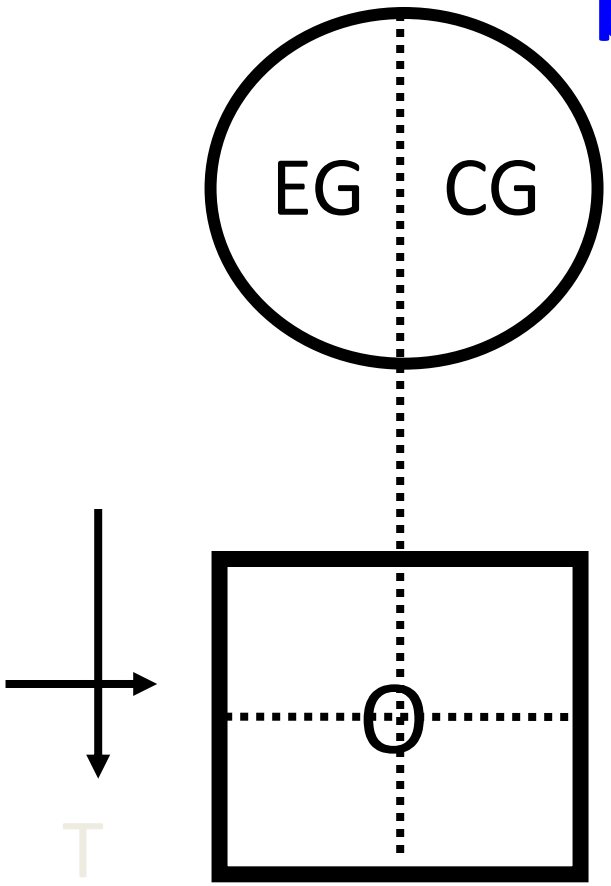
RA**M**boMAN

How well were Participants **Maintained** in the groups they were allocated to (i.e. to EG & CG) throughout the study?

Compliance
Contamination
Co-interventions
Completeness of follow-up

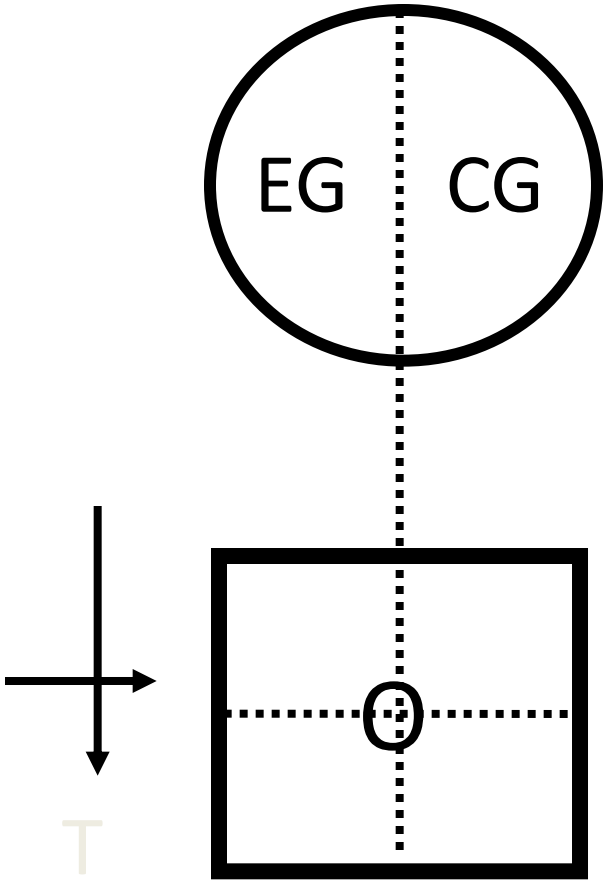
RAMboMAN

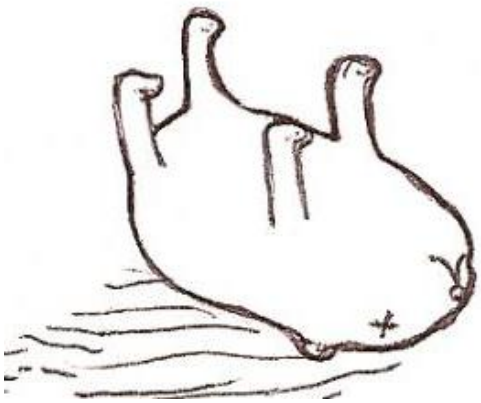
Were outcomes measured **blind** to whether participant was in EG or CG ?

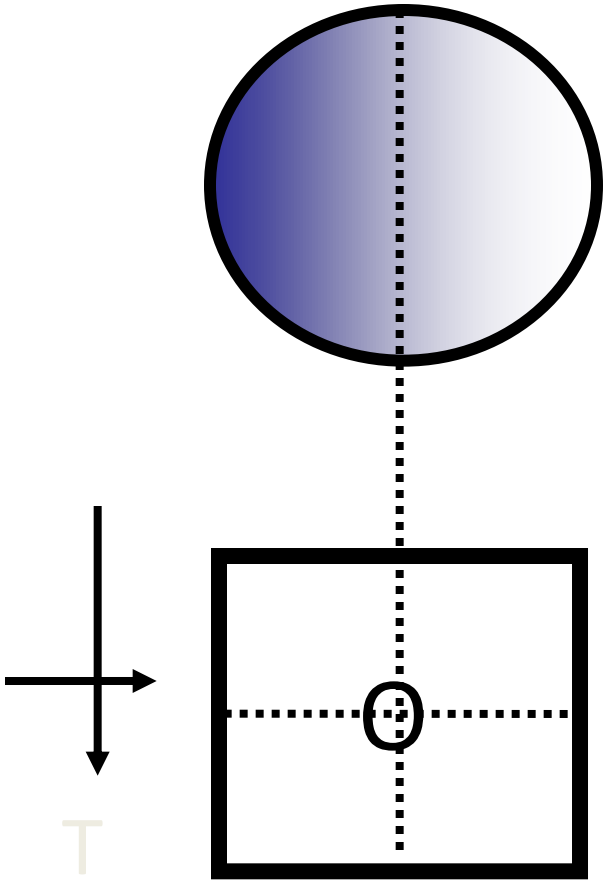


RAMb**OM**AN

Were outcomes measured **Objectively**?



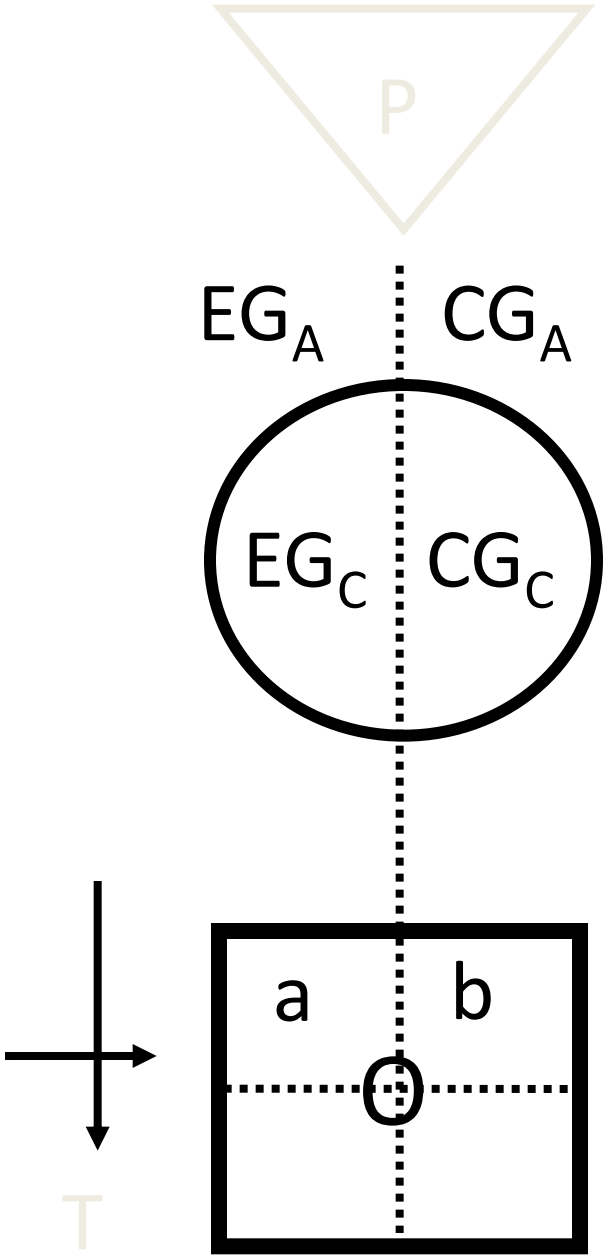




RAMBOM**AN**

Were the **Analyses** done appropriately?

Adjustment for confounding

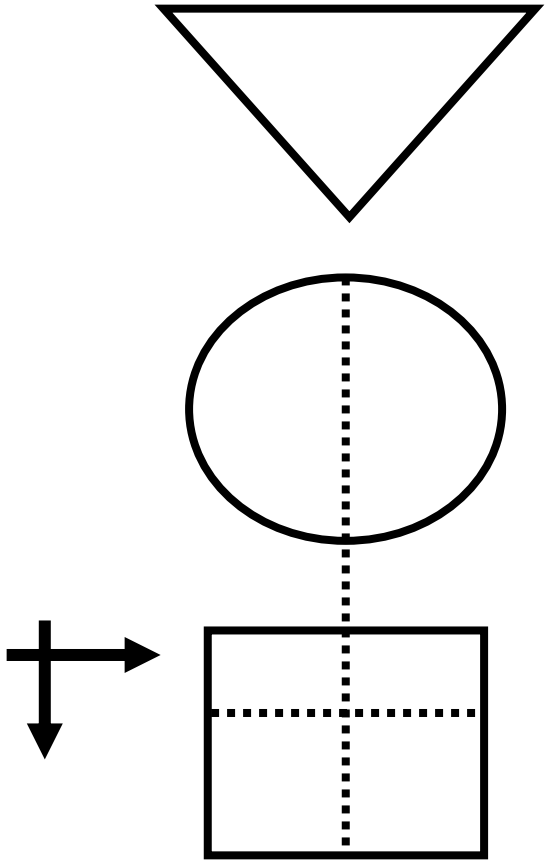


RAMBOM**AN**

Were the **Analyses** done appropriately?

Intention to treat?

the 2nd formula:
random error = 95% confidence interval



EGO ± 95% CI

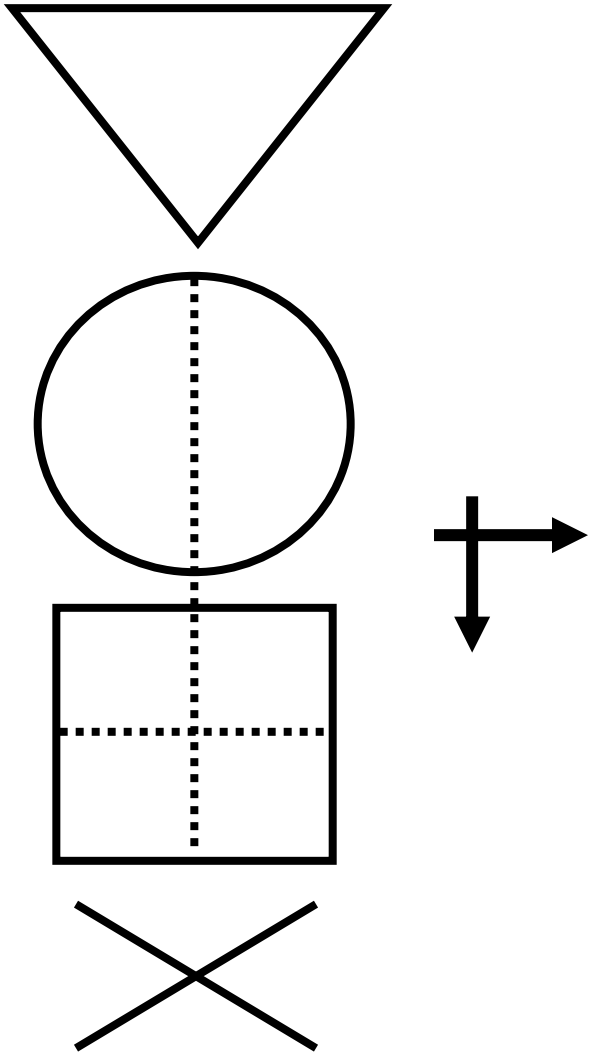
CGO ± 95% CI

There is about a 95% chance that the true value of EGO & CGO (in the underlying population) lies somewhere in the 95% CI (assuming no non-random error)

the 3rd acronym: FAITH
Critically appraising a systematic review

- **Find** – were all potentially relevant studies found?
- **Appraise** – were studies appraised for validity?
- **Include** – were only appropriate studies included in the final analyses?
- **Total-up** – were studies pooled appropriately?
- **Heterogeneity** – were studies too heterogeneous (i.e. too different) to pool?

4. GATE : a framework for the 4 steps of EBP



The steps of EBP:

1. Ask

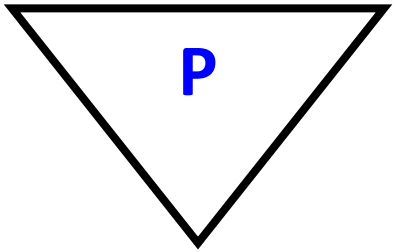
2. Acquire

3. Appraise

4. Apply

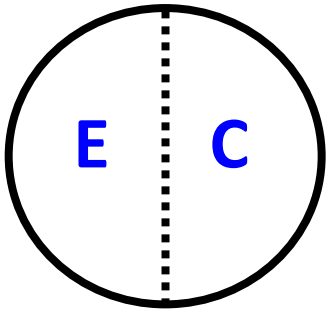
[5. AUDIT your practice**]**

EBP Step 1: ASK - turn your question into a focused 5-part **PECOT** question



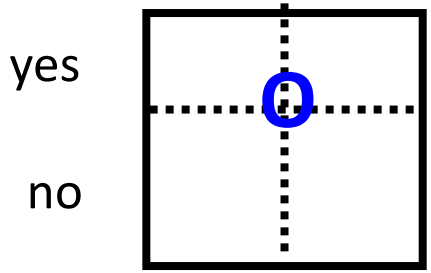
1. Participants

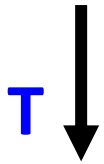
2. Exposure



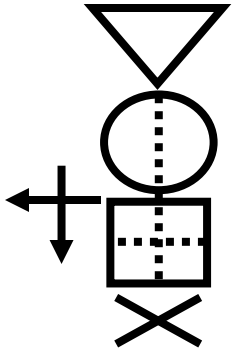
3. Comparison

4. Outcomes



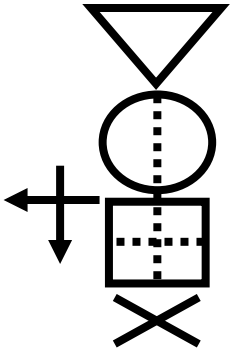


5. Time

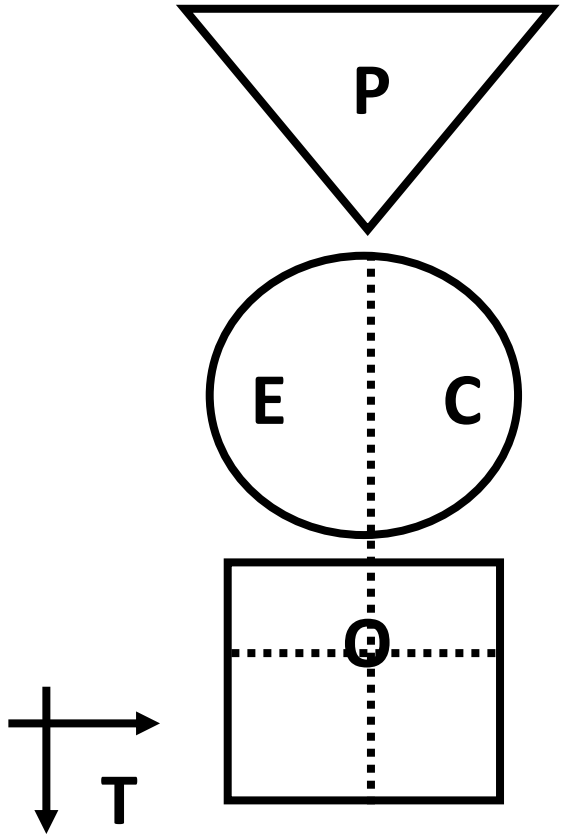


EBP Step 2: **ACQUIRE** the evidence – use **PECOT** to help choose search terms

1. **Participants**
2. **Exposure**
3. Comparison
4. **Outcome**
5. Time frame



EBP Step 3: **APPRAISE** the evidence – with the picture, acronyms & formulas



Recruitment

Allocation

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blind

objective

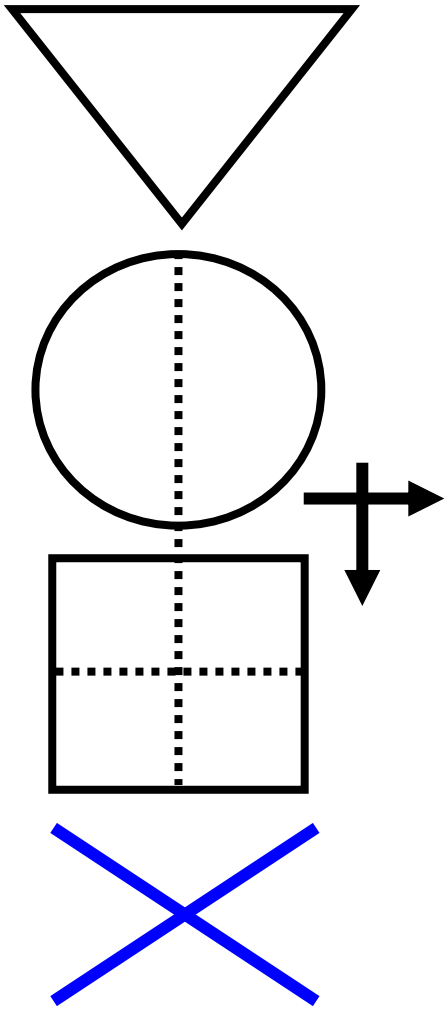
Measurements

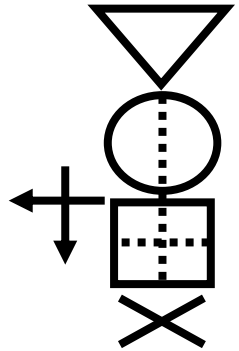
ANalyses

Occurrence = outcomes ÷ population

Random error = 95% Confidence Interval

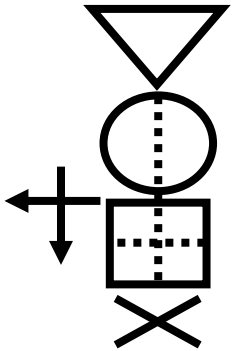
EBP Step 4: **APPLY** the evidence by AMALGAMATING the relevant information & making an evidence-based decision:' **the X-factor**






SONY
PlayStation
START
ANALOG

X-factor: making evidence-based decisions



person

family

community

practitioner

Epidemiological evidence

Values & Preferences

System features

economic

legal

political

Case circumstances

social

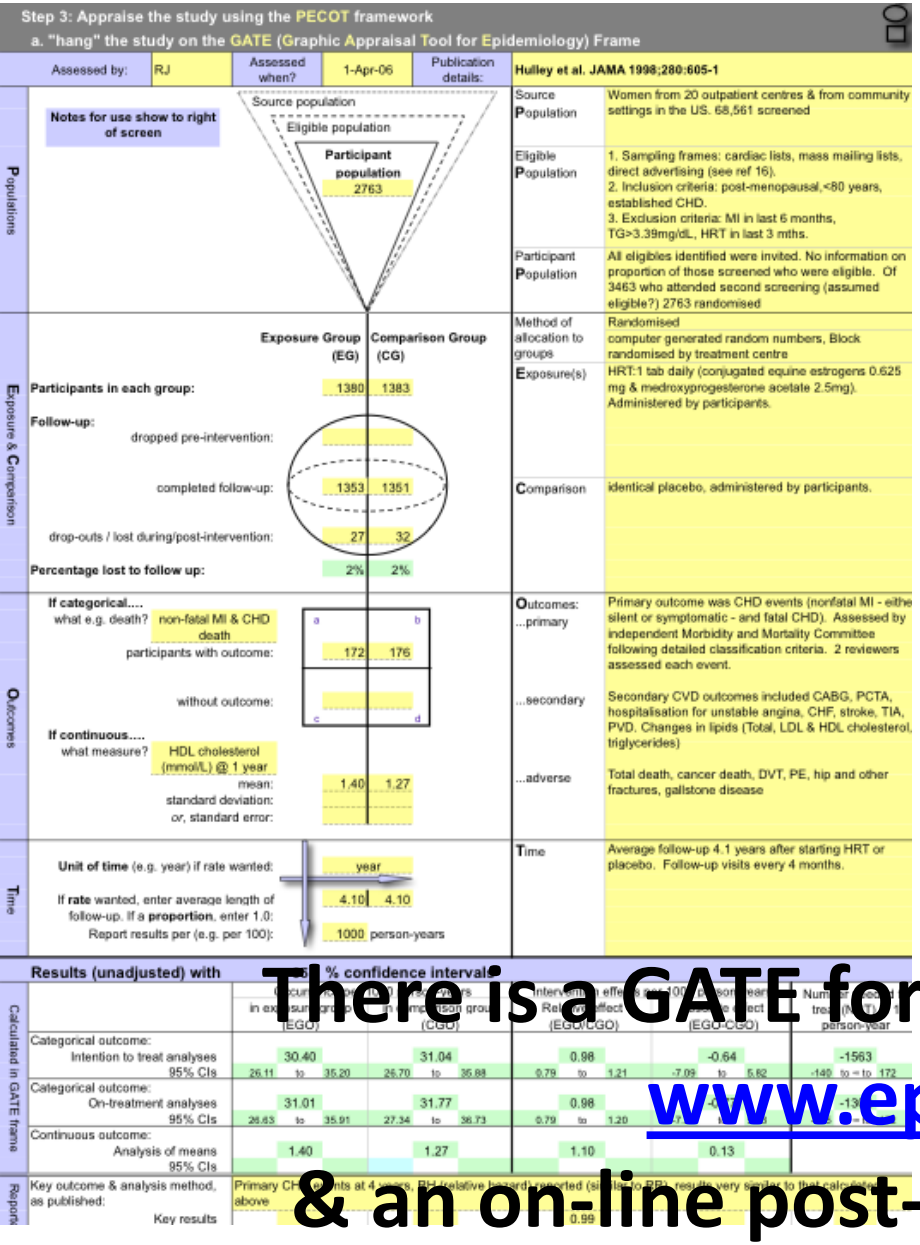
psychological

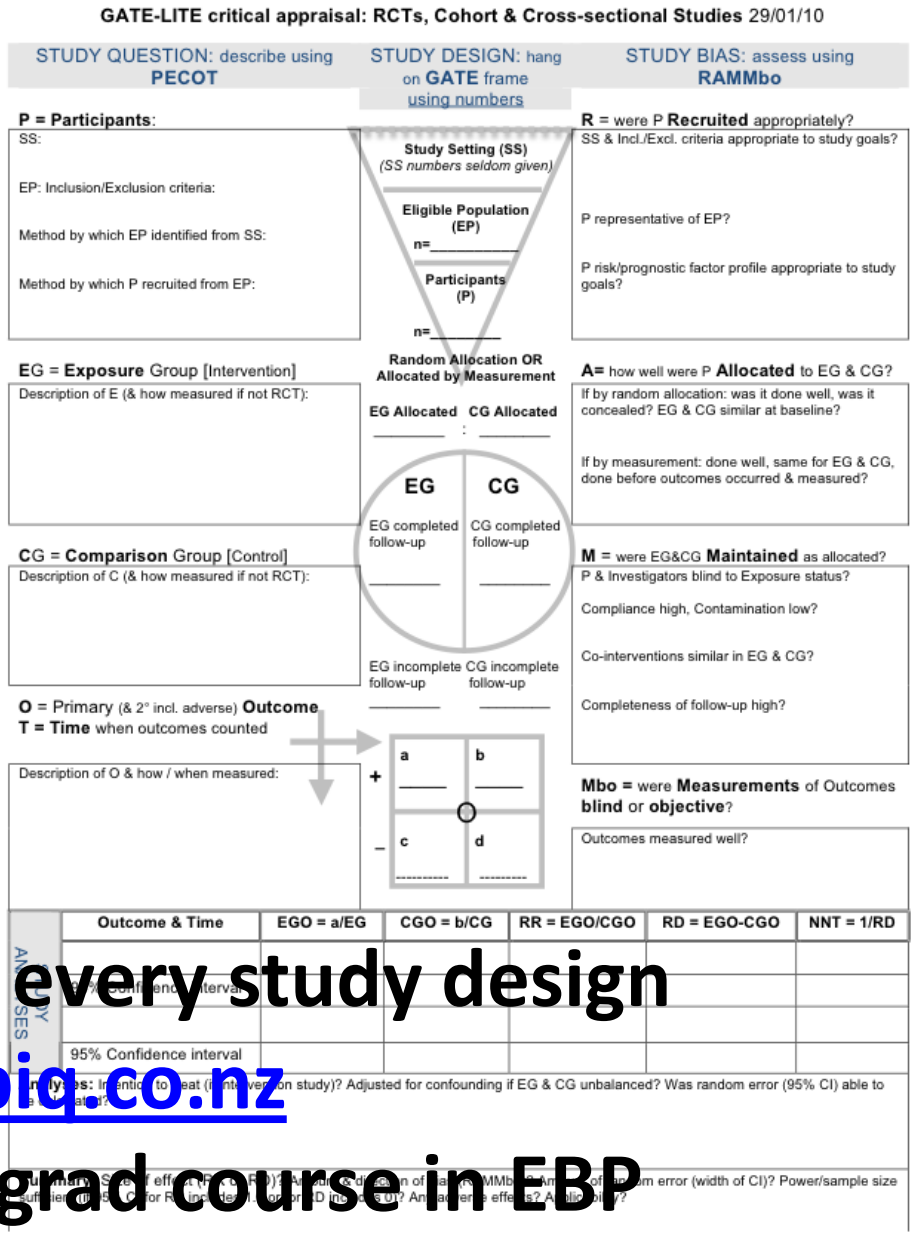
physical health

Practitioner eXpertise: 'putting it all together' - the art of practice

Clinical expertise in the era of evidence-based medicine and patient choice. EBM 2002;736-8 (March/April)

Excel CATs & pdf Gate-lites

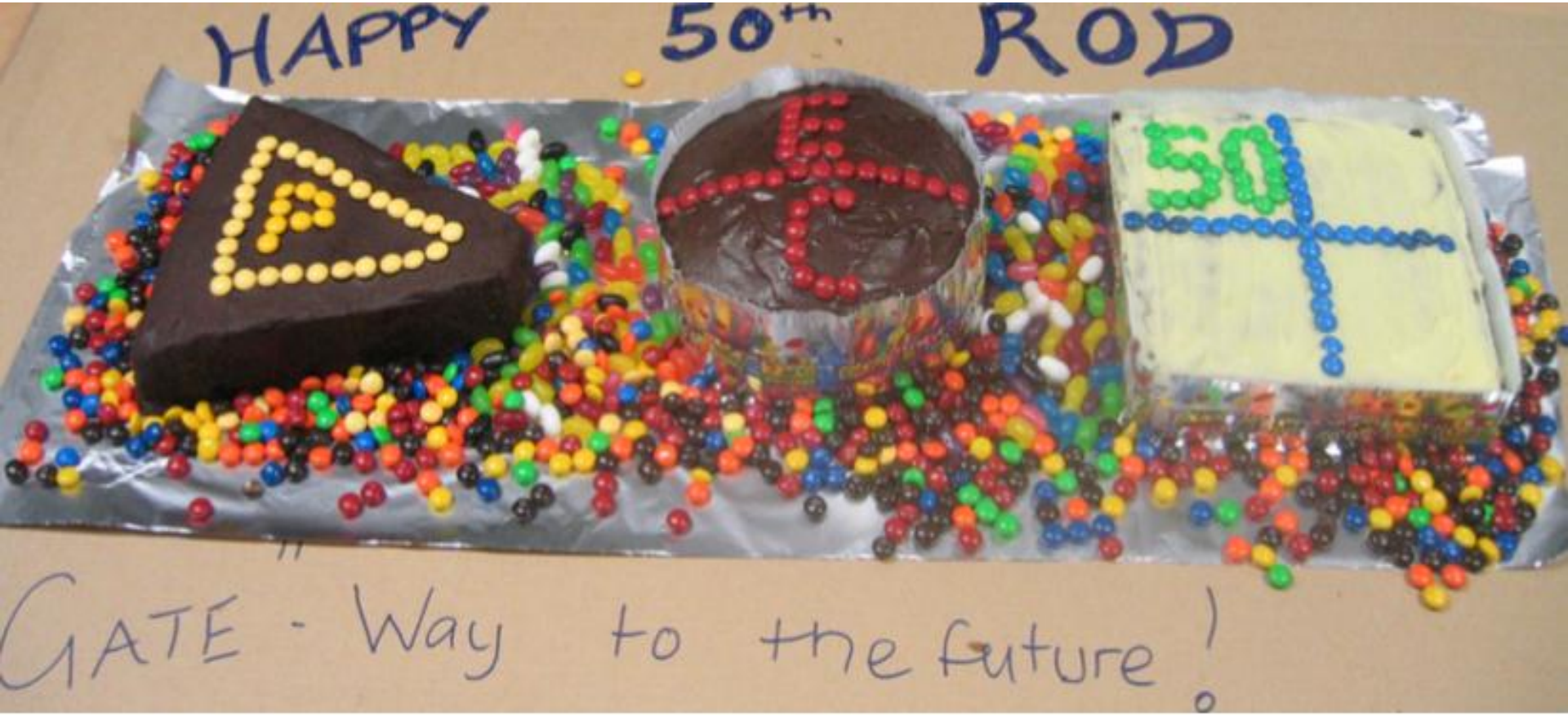




There is a GATE for every study design

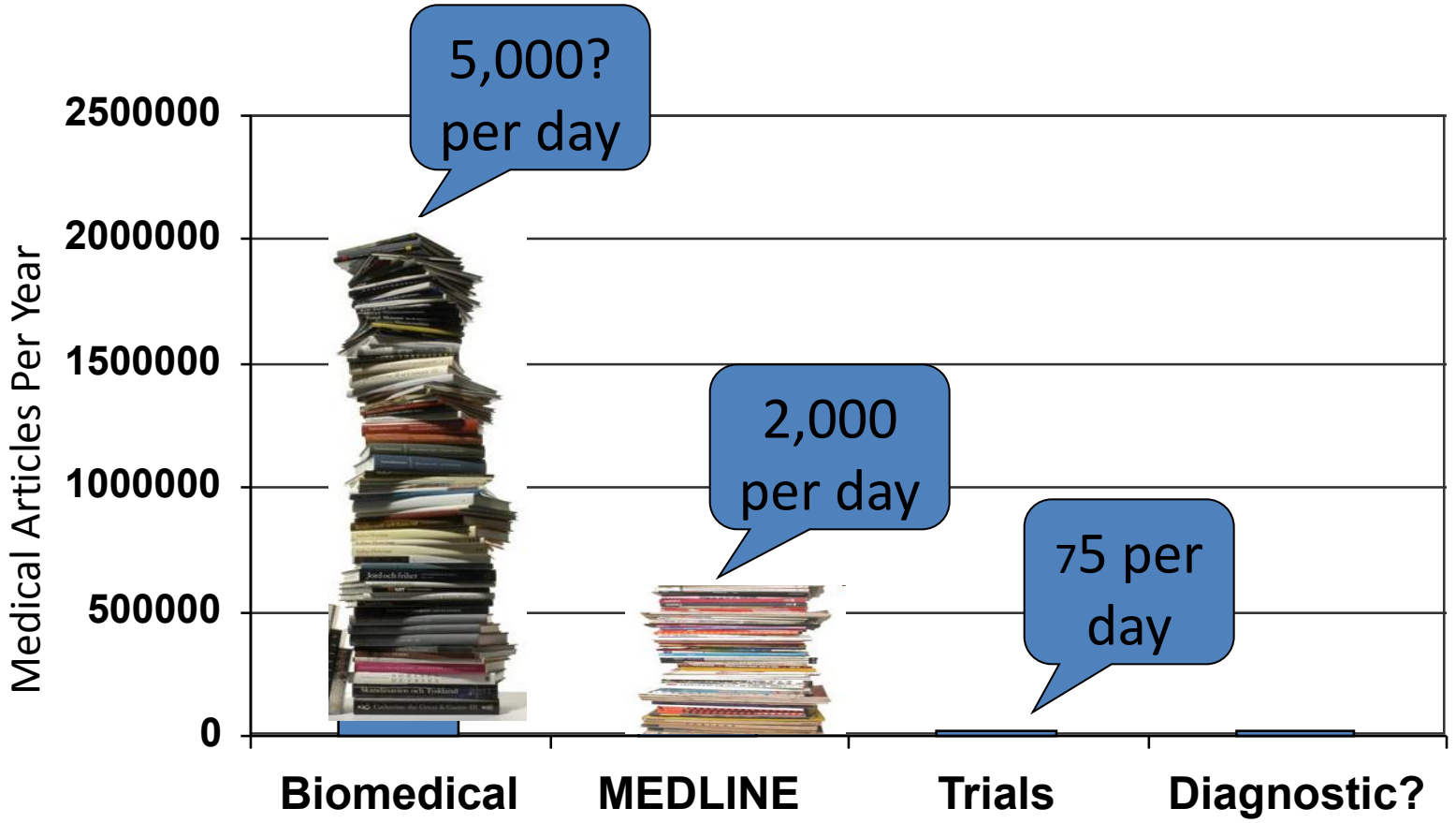
www.epiq.co.nz

& an on-line post-grad course in EBP

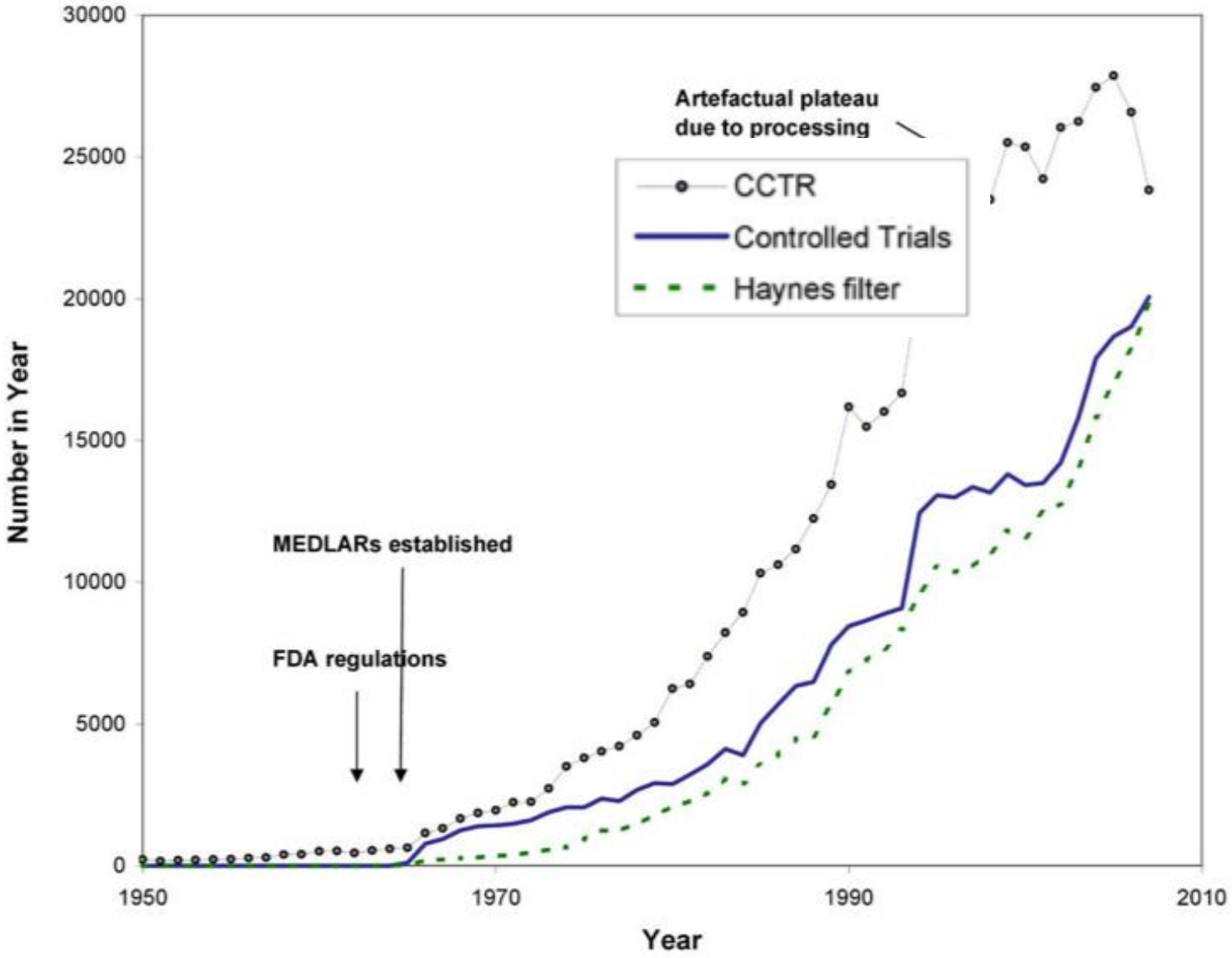

HAPPY 50th ROD
50
GATE - Way to the future!

Extra slides

Why do we need to use evidence efficiently?



The epidemic of evidence



Bastian, Glasziou, Chalmers PLoS 2010 Vol 7 | Issue 9 | e1000326

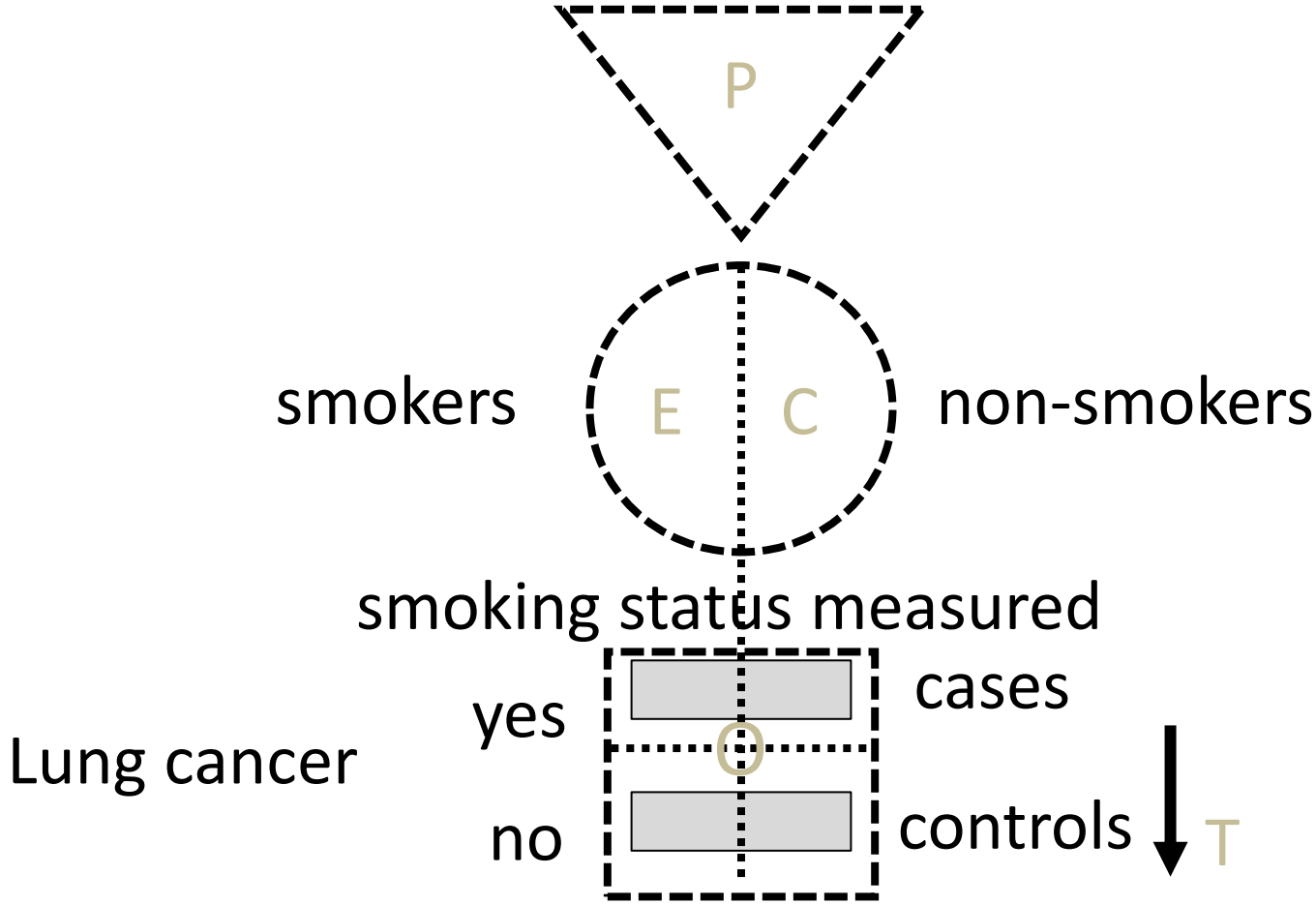
About 1/2 of ‘valid’ evidence today is out of date in 5 years

About 1/2 of valid evidence is not implemented

"...and, as you go out into the world, I predict that you will, gradually and imperceptibly, forget all you ever learned at this university."

ScienceCartoonsPlus.com

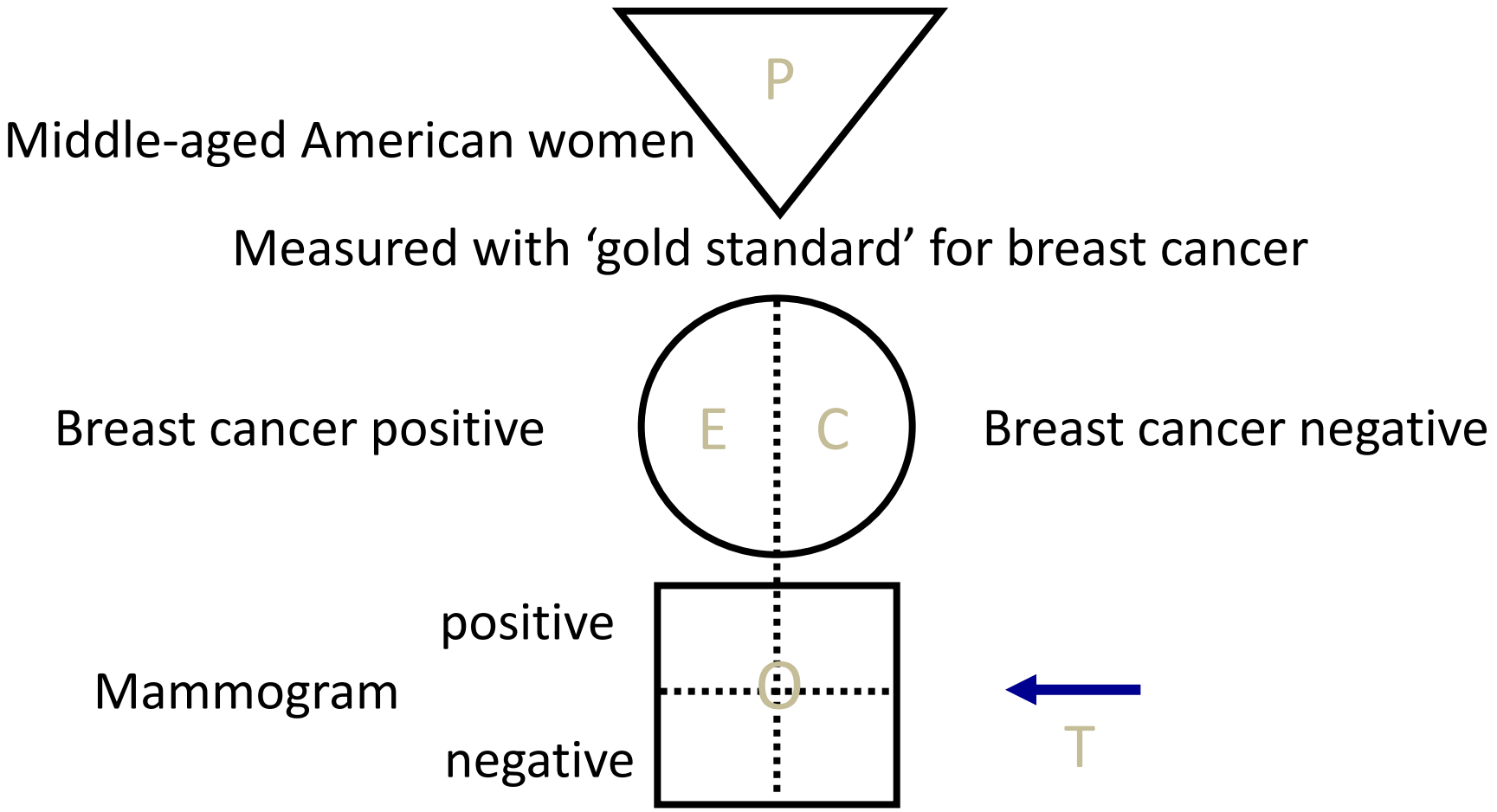
GATE Frame ***picture & 1st acronym***



Case-control study

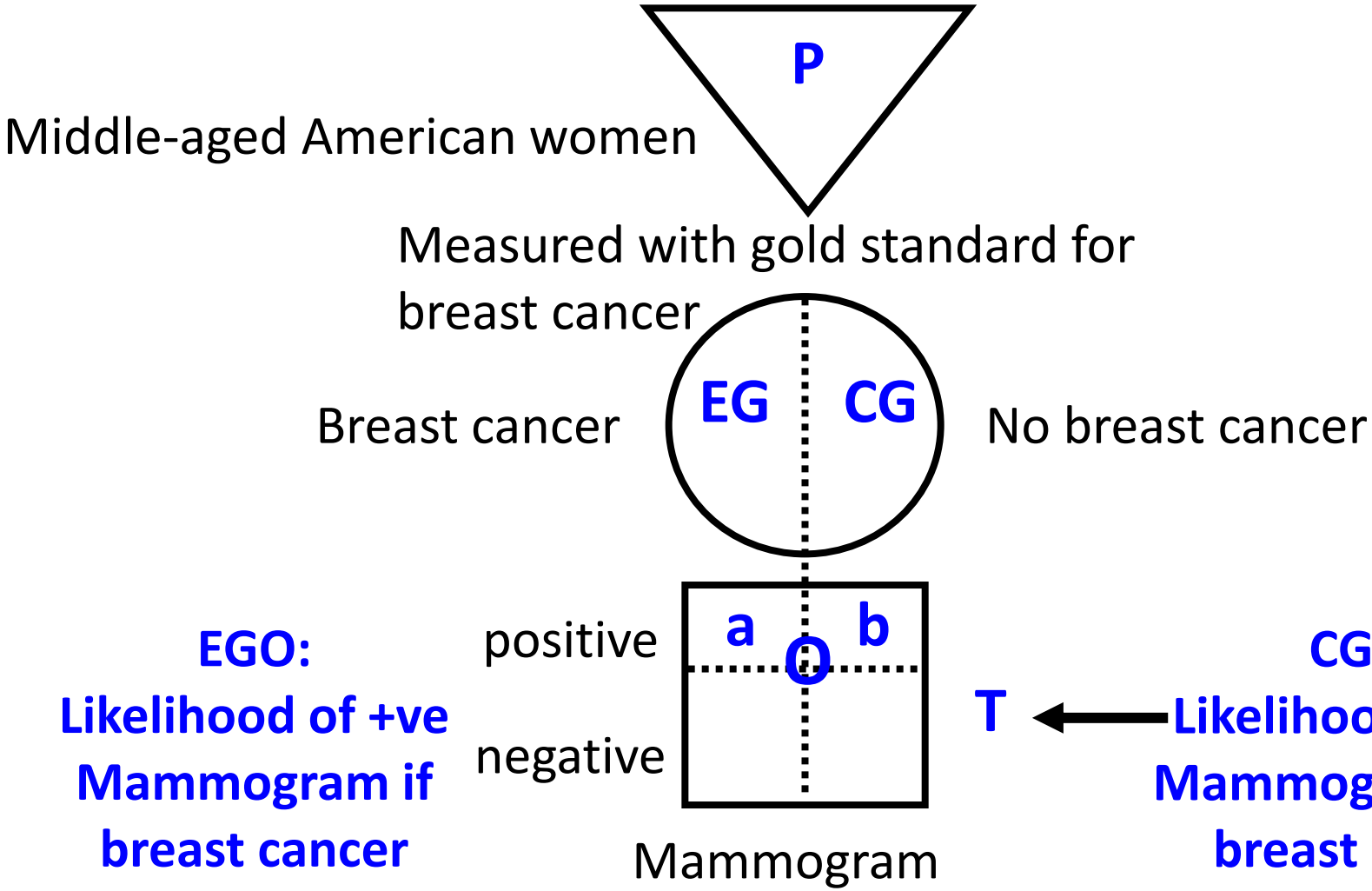
Observational study: allocated by measurement

GATE Frame ***picture & 1st acronym***

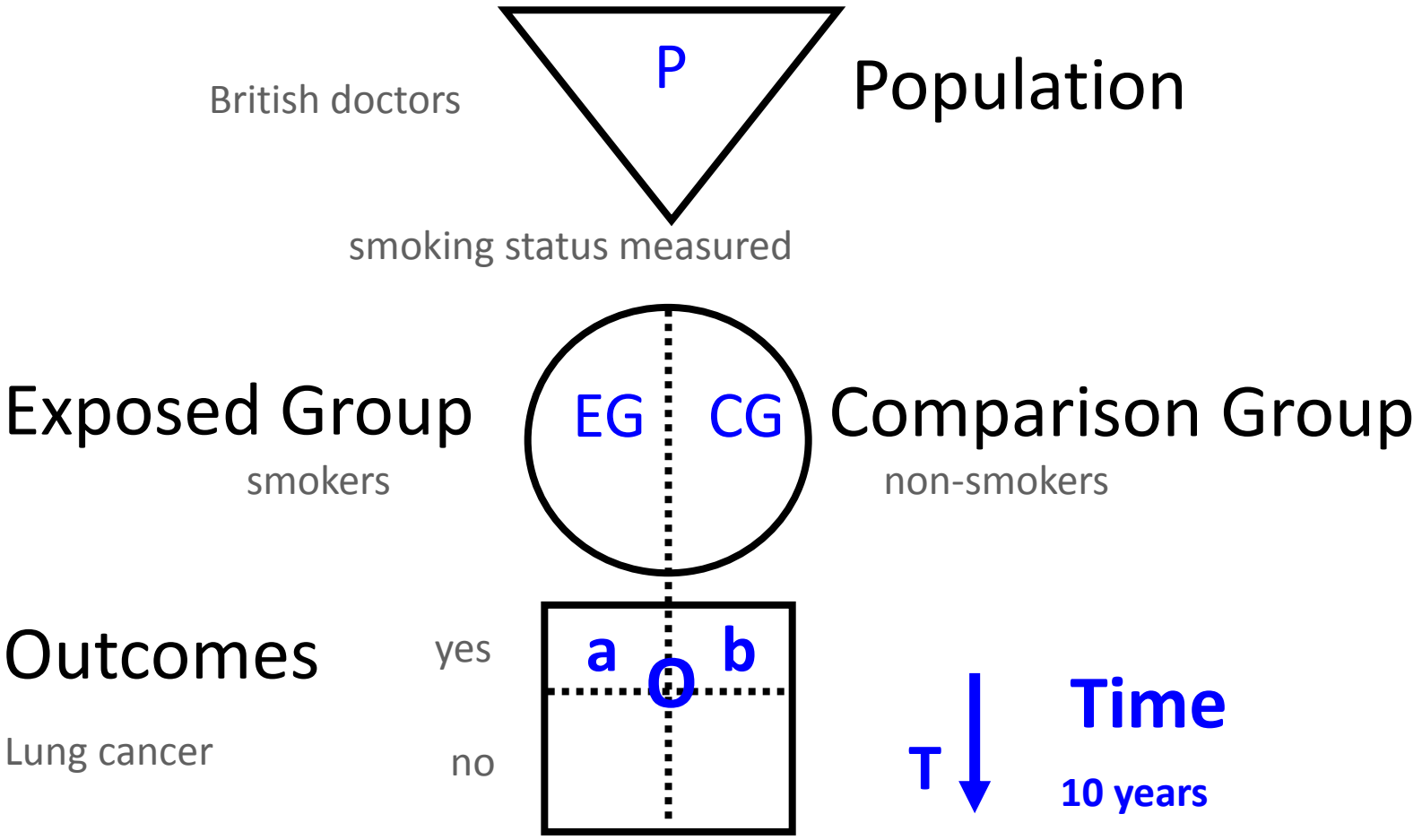


Diagnostic test accuracy study

*The goal of all epidemiological studies is to measure (& compare) the occurrence of outcomes in (different) populations (**EGO compared with CGO**)*



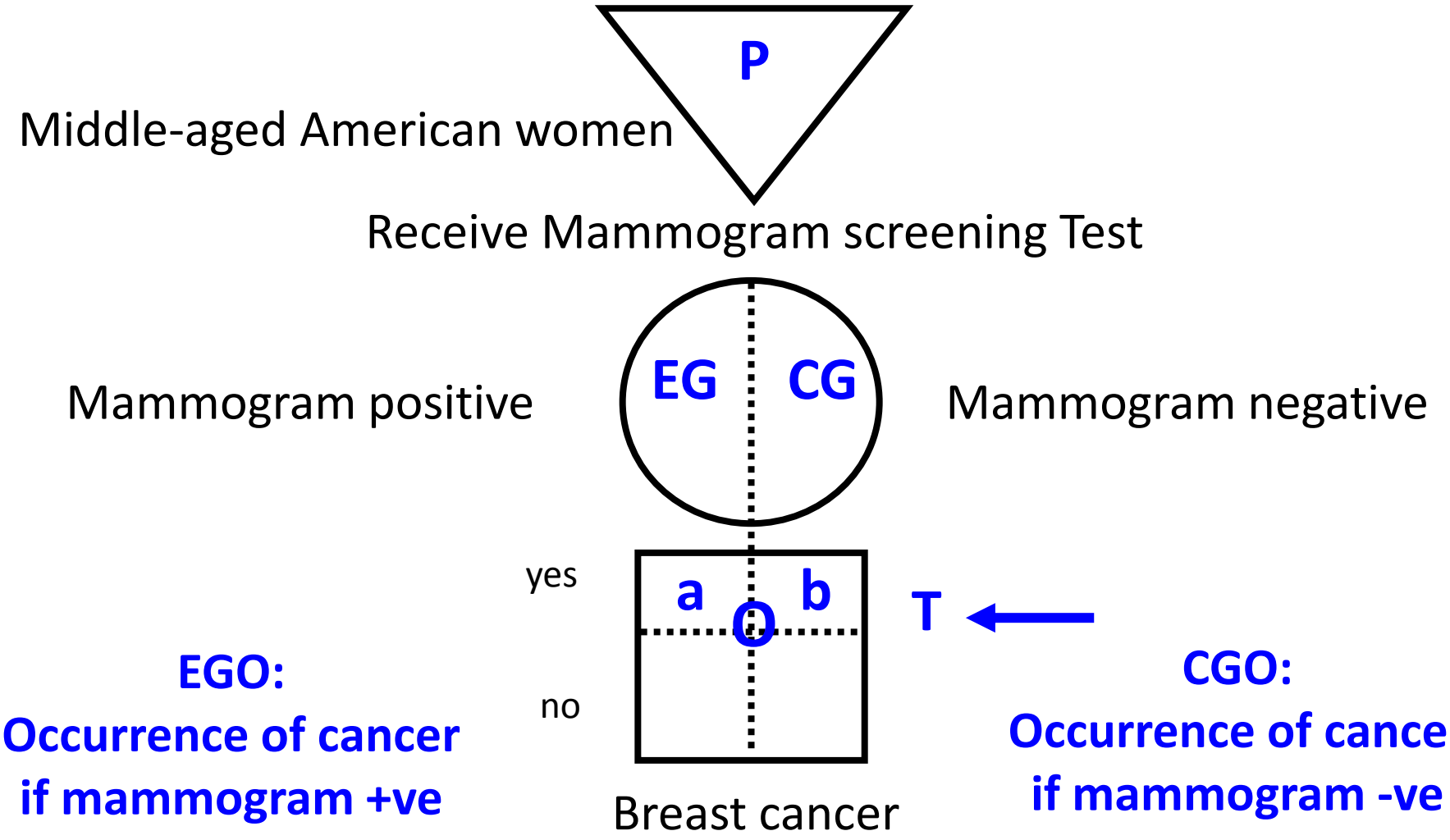
1st formula (with time):
*occurrence = (outcomes ÷ population) ÷ **Time***



EGO = (a ÷ EG) during time T *(a measure of cumulative incidence)*

EGO = (a ÷ EG) ÷ T *(a measure of incidence rate)*

1st formula (with time):
*occurrence = (outcomes ÷ population) ÷ **Time***



EGO = (a ÷ EG) at time T *(a measure of prevalence)*