Mortality in relation to smoking: 50 years' observations on male British doctors (BMJ, 2004)

HLTH 8090 – Epidemiology Study Design (Cohort)
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Smokers Lung vs. Healthy Lung

Smokers Lung

- Grey or Black in Color
- Inflated
- Inflamed

Healthy Lung

- Pink in Color
- Normal Size
- No Inflammation

LUNG
CANCER CENTER

Study objective

Compare hazards of cigarette smoking versus lifelong non-smoking, and quantify benefits of cessation, with focus on cause-specific mortality including lung cancer.

Study design

- Prospective cohort study (1951-2001).
- Repeated mailed questionnaires on smoking (1951 baseline; follow-ups in 1957, 1966, 1971, 1978, 1991, 2001).

Study population & eligibility

- Cohort: 34,440 male British doctors (female doctors and men <35 excluded at baseline).
- Eligibility: returned baseline smoking questionnaire with adequate data; resident physicians in UK.

Recruitment & comparison groups

- Recruitment: baseline questionnaire sent to all doctors in British Medical Register; follow-up mailings.

- Groups for comparison:

    By exposure: never vs former vs current smokers; intensity categories (e.g., cigarettes/day).

    By cessation timing: quit at ~30, 40, 50, or 60 years.
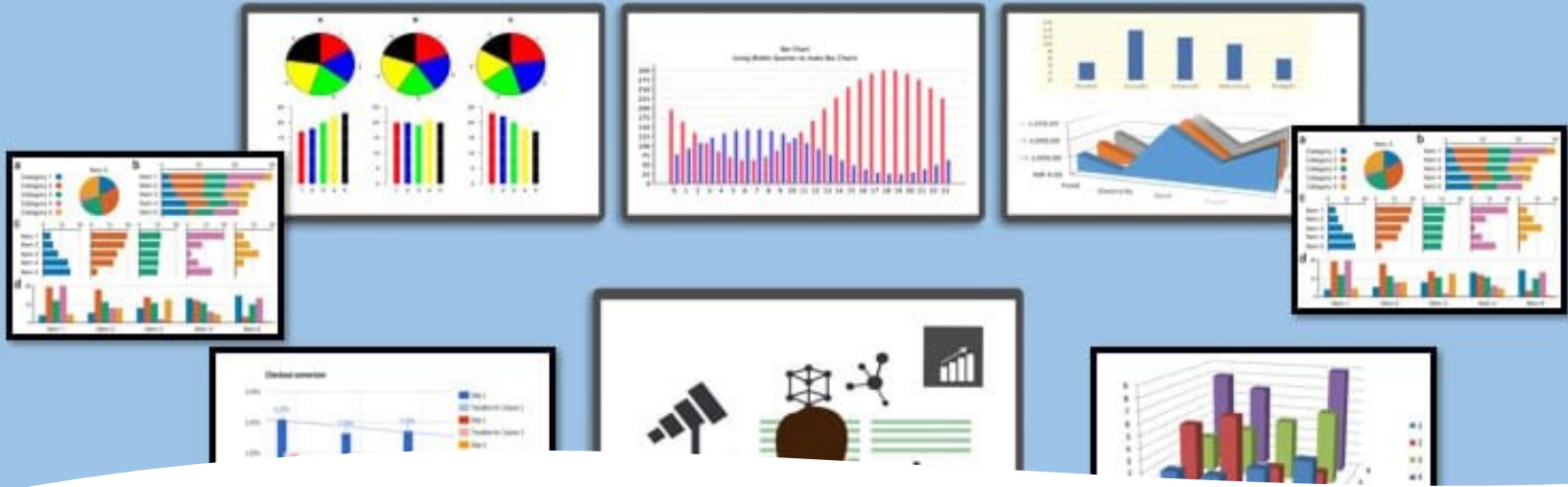
PARTICIPANTS NEEDED

Variables & measurement

Exposure: cigarette smoking status, intensity, duration; updates via repeated questionnaires.

Outcome: cause-specific mortality (incl. lung cancer) via national death registrations/records.

Covariates: age, calendar period; comparisons largely within age strata; consistent ascertainment across groups.
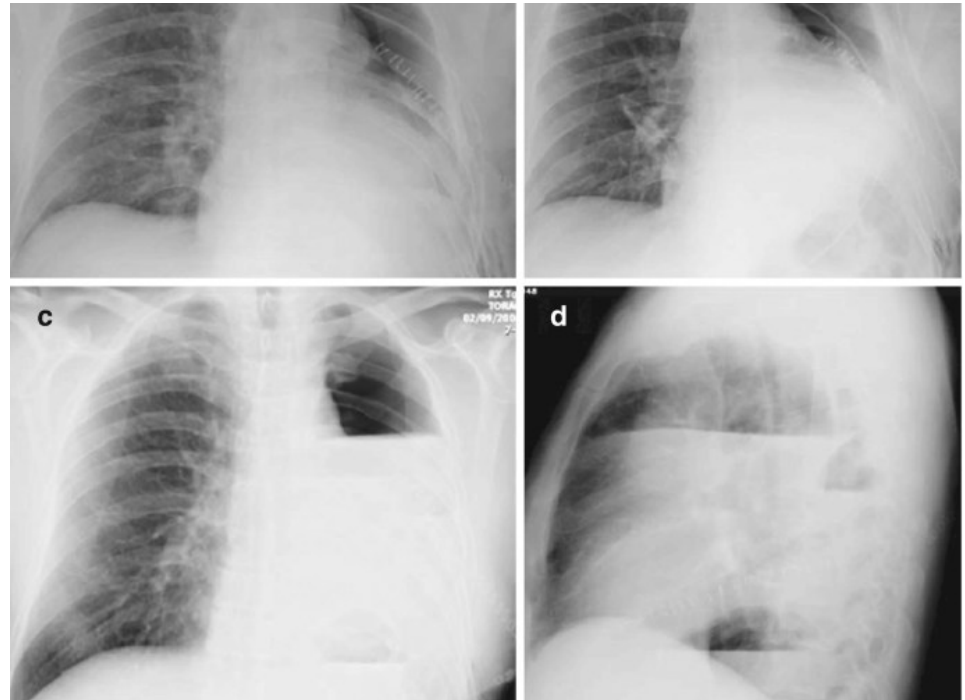
Statistical Analysis Types

Statistical approach (brief)

- Age-specific mortality rates and rate ratios, cause-specific analyses.
- Longitudinal follow-up: 50 years; analyses emphasize absolute risks, rate ratios, and life expectancy differences.

Main findings - headline

- Men who smoked cigarettes continuously died ~10 years younger than lifelong non-smokers.

- Cessation gains in life expectancy: stop at 60/50/40/30 → +3/+6/+9/+10 years.

- Excess mortality concentrated in vascular, neoplastic (incl. lung cancer), and respiratory diseases.
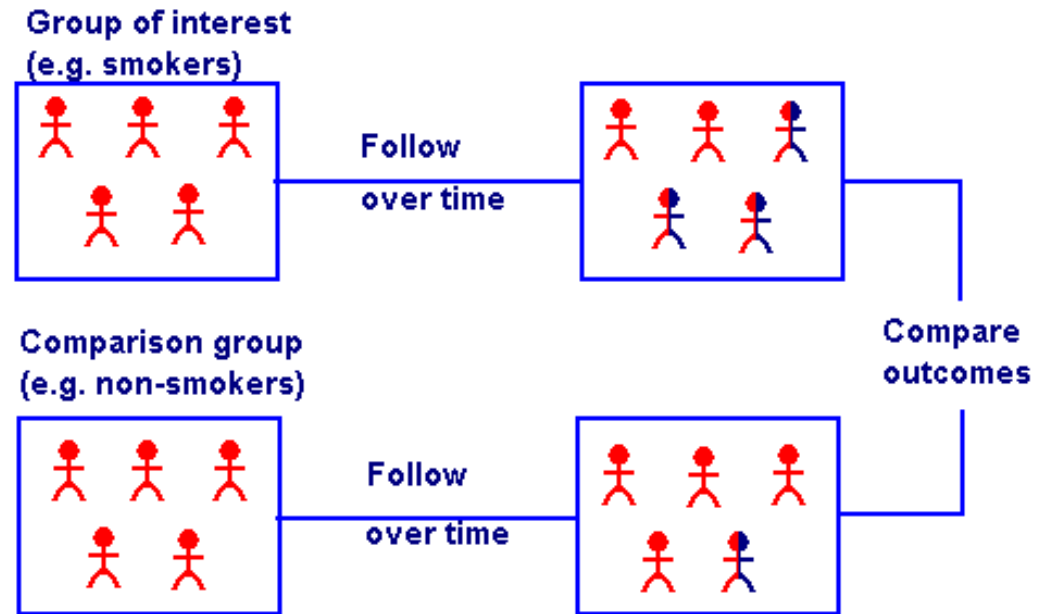
Lung cancer results (selected)

- Markedly higher lung-cancer mortality in current smokers vs never-smokers; strong dose-response with intensity/duration.

- Risk decreased substantially after cessation; earlier quitting → larger risk reduction.

Was this design appropriate?

Group of interest
(e.g. smokers)

Follow over time

Comparison group
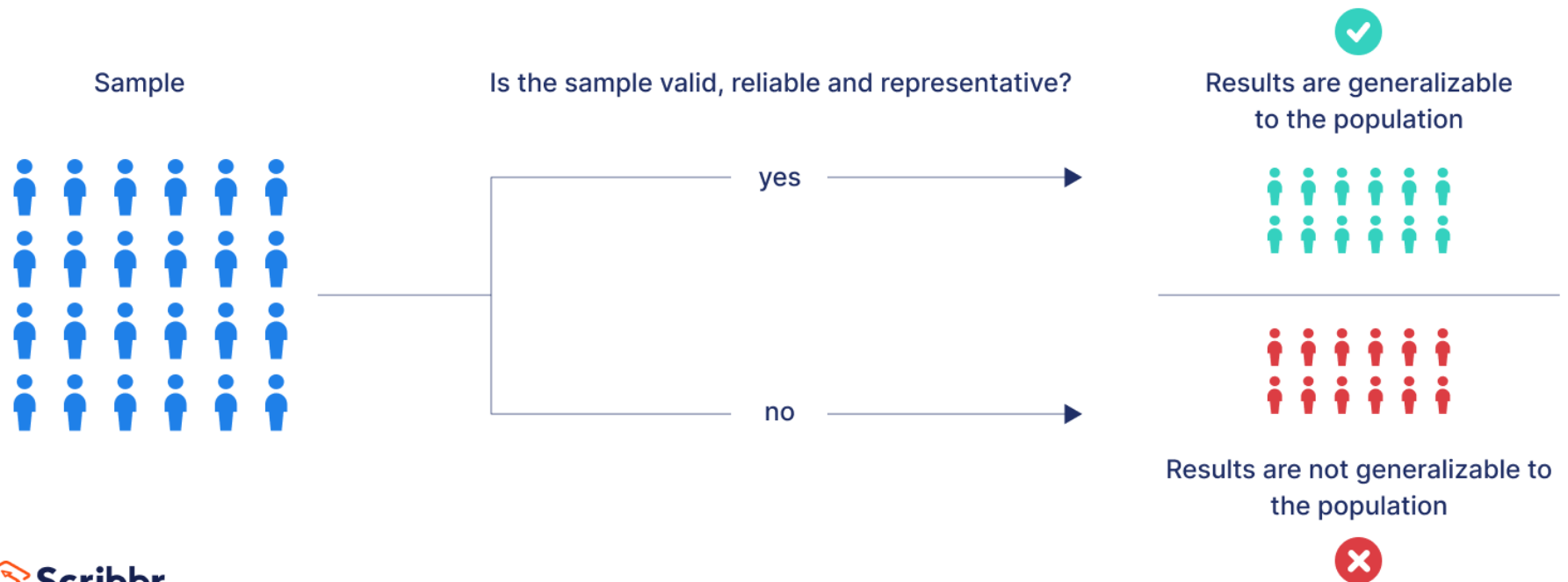(e.g. non-smokers)

Follow over time

Compare outcomes

- Yes: Prospective cohort establishes temporality (smoking → death), supports dose-response and cessation effects.
- 50-year follow-up captures latency for lung cancer and chronic diseases.
- Large, homogenous professional cohort → strong internal validity (but see generalizability).
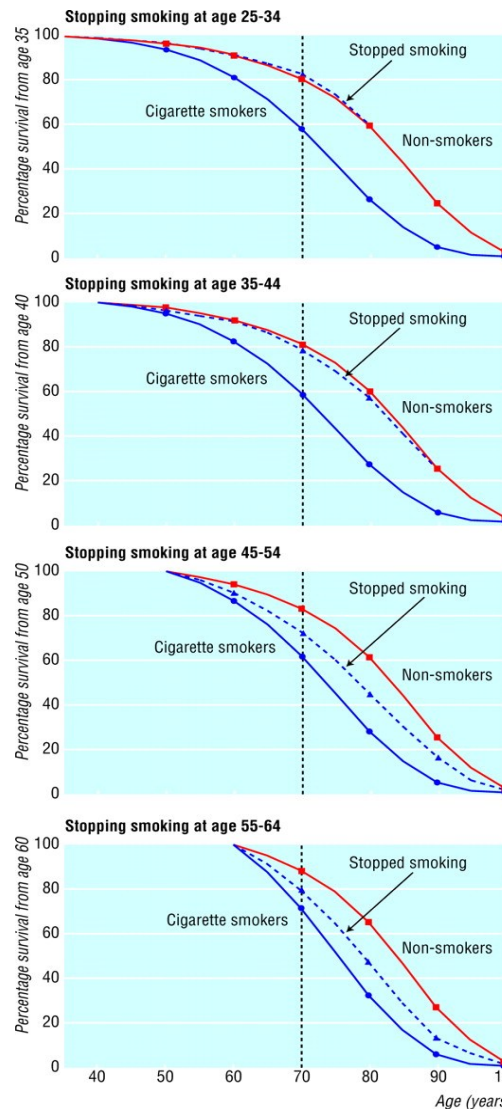
Strengths & limitations

- Strengths: prospective design; repeated exposure updates; complete long-term follow-up; cause-specific outcomes.
- Limitations: generalizability (male physicians, UK); self-reported smoking; residual confounding; changes in treatment/diagnostics over decades.

Generalizability

Sample

Is the sample valid, reliable and representative?

yes → Results are generalizable to the population

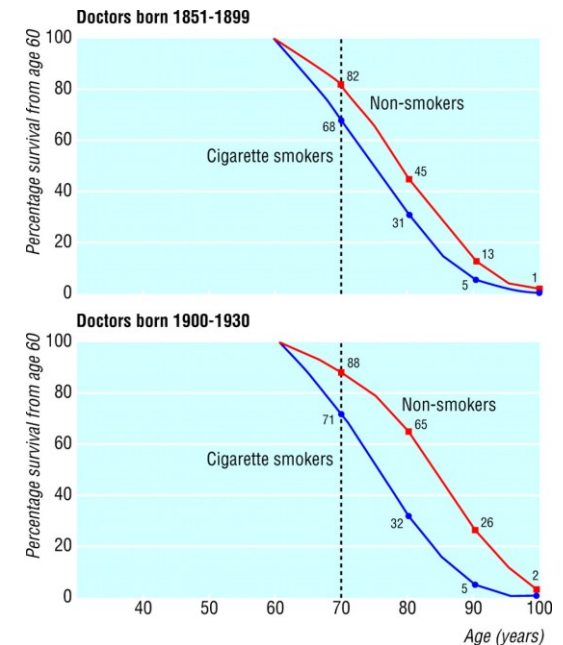no → Results are not generalizable to the population

Take-home points

- Cohort evidence shows smoking greatly increases lung-cancer mortality; quitting works at any age.

- Smokers lose ~10 years of life on average; earlier cessation recovers most of this loss.

- Design choice (cohort) was ideal for this research question in this context.

Effects on survival of stopping smoking cigarettes at age 25-34 (effect from age 35), age 35-44 (effect from age 40), age 45-54 (effect from age 50), and age 55-64 (effect from age 60)

Survival from age 60 for continuing cigarette smokers and lifelong non-smokers among UK male doctors born 1851-1899 (median 1889) and 1900-1930 (median 1915), with percentages alive at each decade of age

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