How to improve the Quality of Comparison

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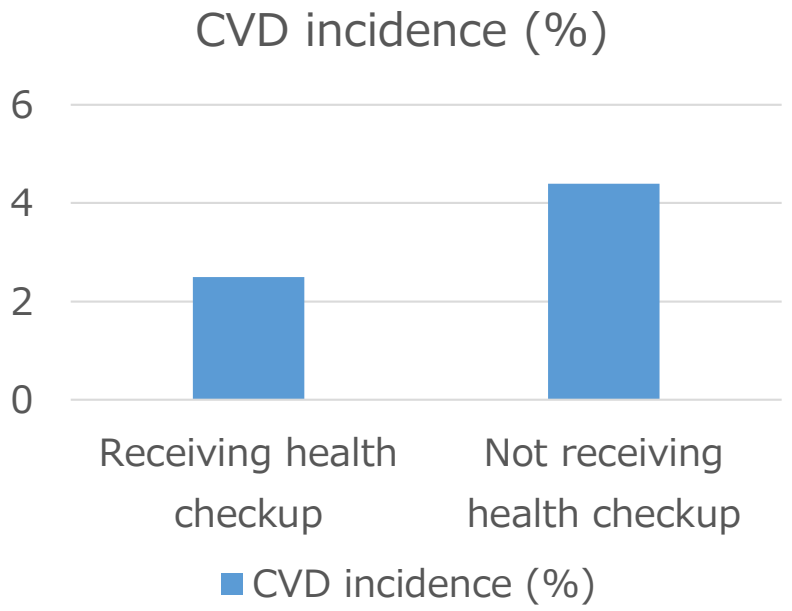
What is a high-quality comparison?

"Participants receiving health checkup had lower incidence of cardiovascular, compared with those not receiving health checkup."

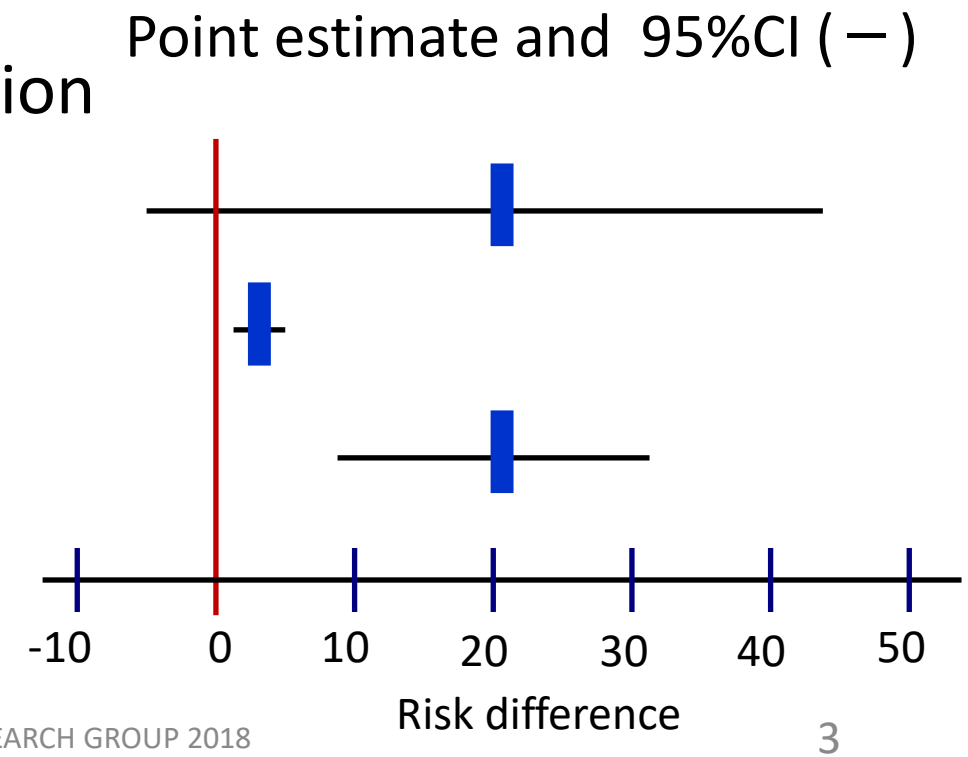


1. The results are not due to chance →**random error**
2. Measured data is accurate→**bias**
3. No 3rd factors affect the comparison→**confounding**

Random error

- To show the variation of results and data （One of the main role of statistical analysis）

- How to show that variation
  - Mean＋SD
  - Median＋range
  - Point estimate＋95%CI



Interpretation of the results

Wide CI and none significance

At first, you should check the accuracy of statistical method.

How about Interpretation of the result?

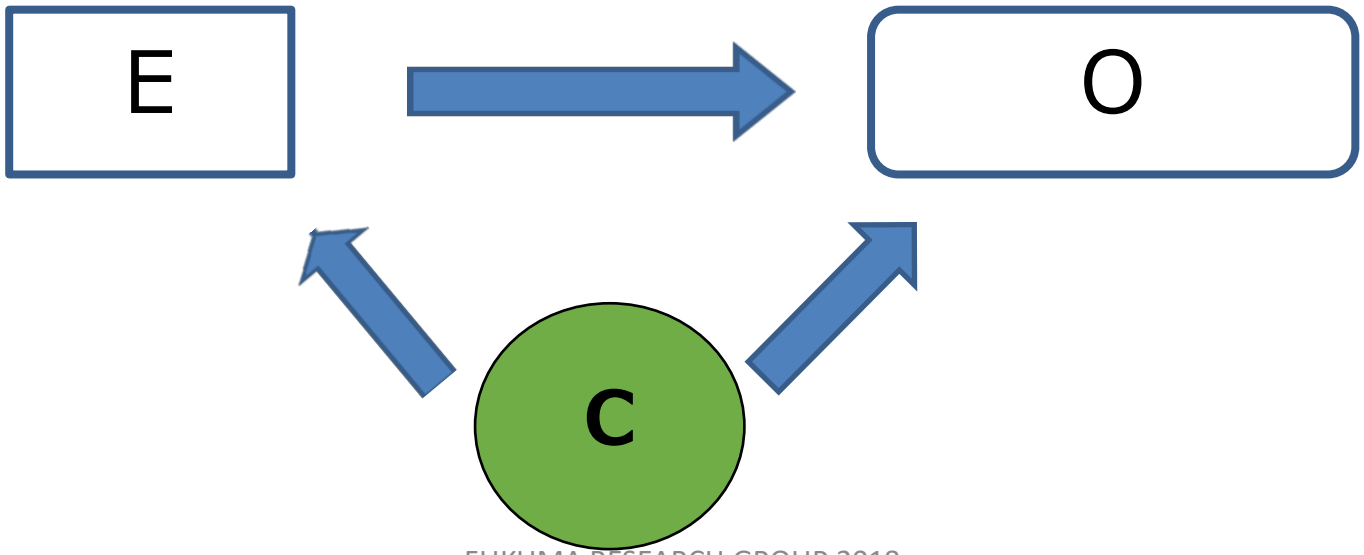
1. Weak association
2. Small sample size

What is the simplest way to obtain short CI?

→To include many participants in the study

Confounding factors

- The most important thing is to find confounding factors before conducting study and measure them.
- Confounding factors have 3 criteria
  - Affect O, Associated with E, Not between E and O



How to treat confounding factors

- Prevention before measurement
  - Restriction
  - Randomization
  - Matching
- Adjustment after measurement
  - Stratification
  - Regression model

Restriction

- If presence of DM is confounding,

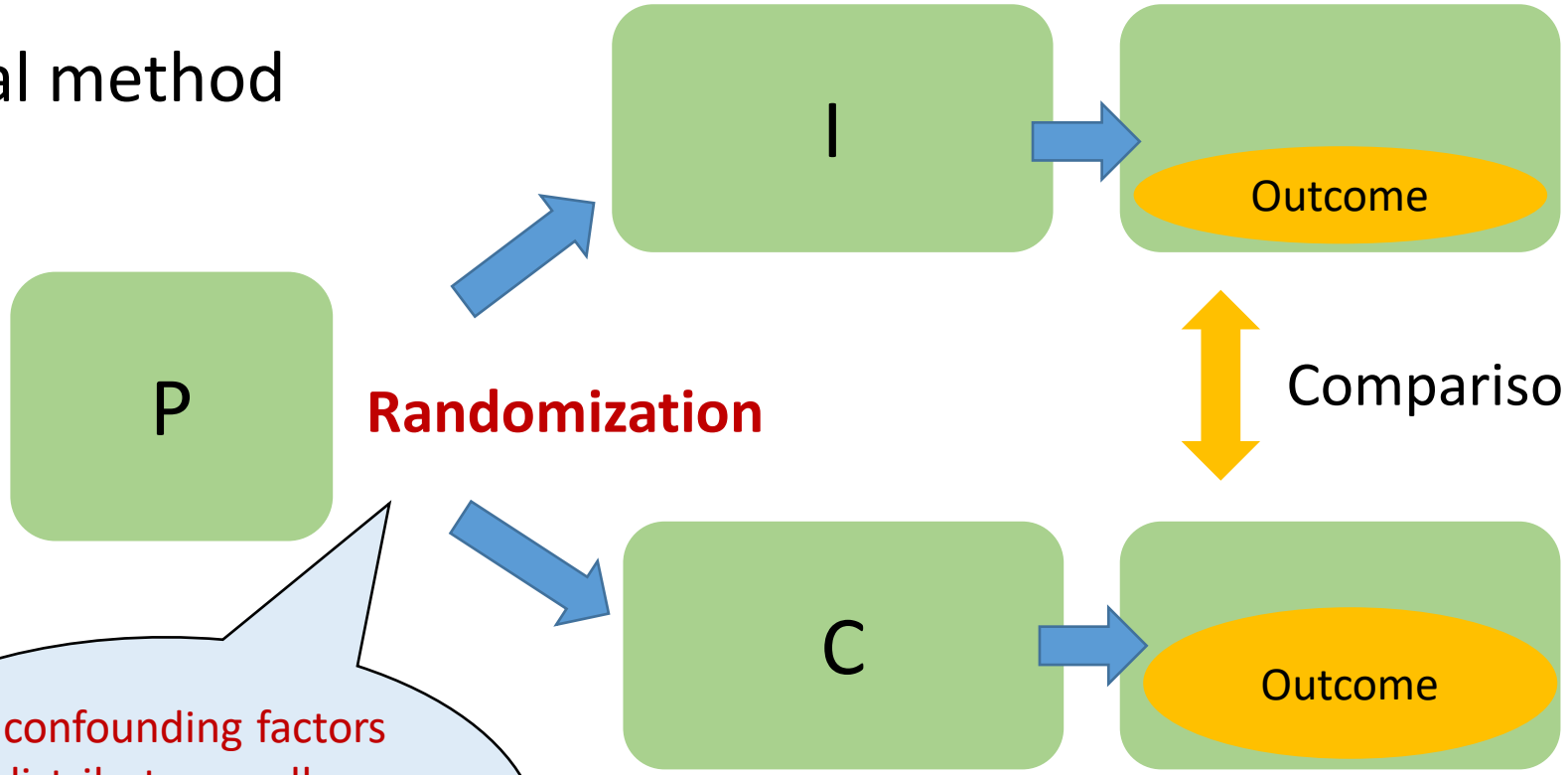
⇒Restrict to the subgroup which Do Not have DM

Limitation

- Lose information of some participants
  - We do not know the results from the group which have DM（Decrease in generalizability）

Randomization

Ideal method



All confounding factors distribute equally between I and C. (including unmeasured factors)

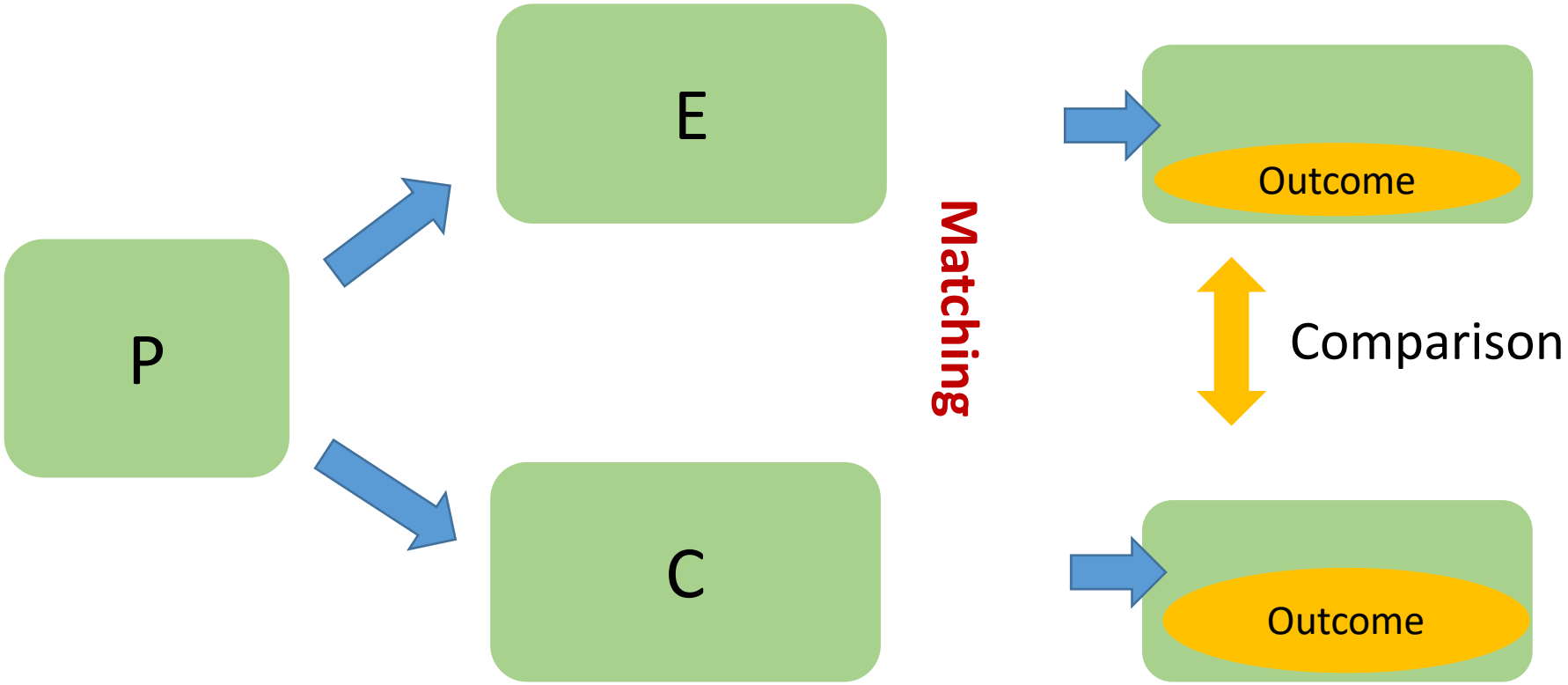
Limitation

- Feasibility

(Large scale interventional study)

Matching

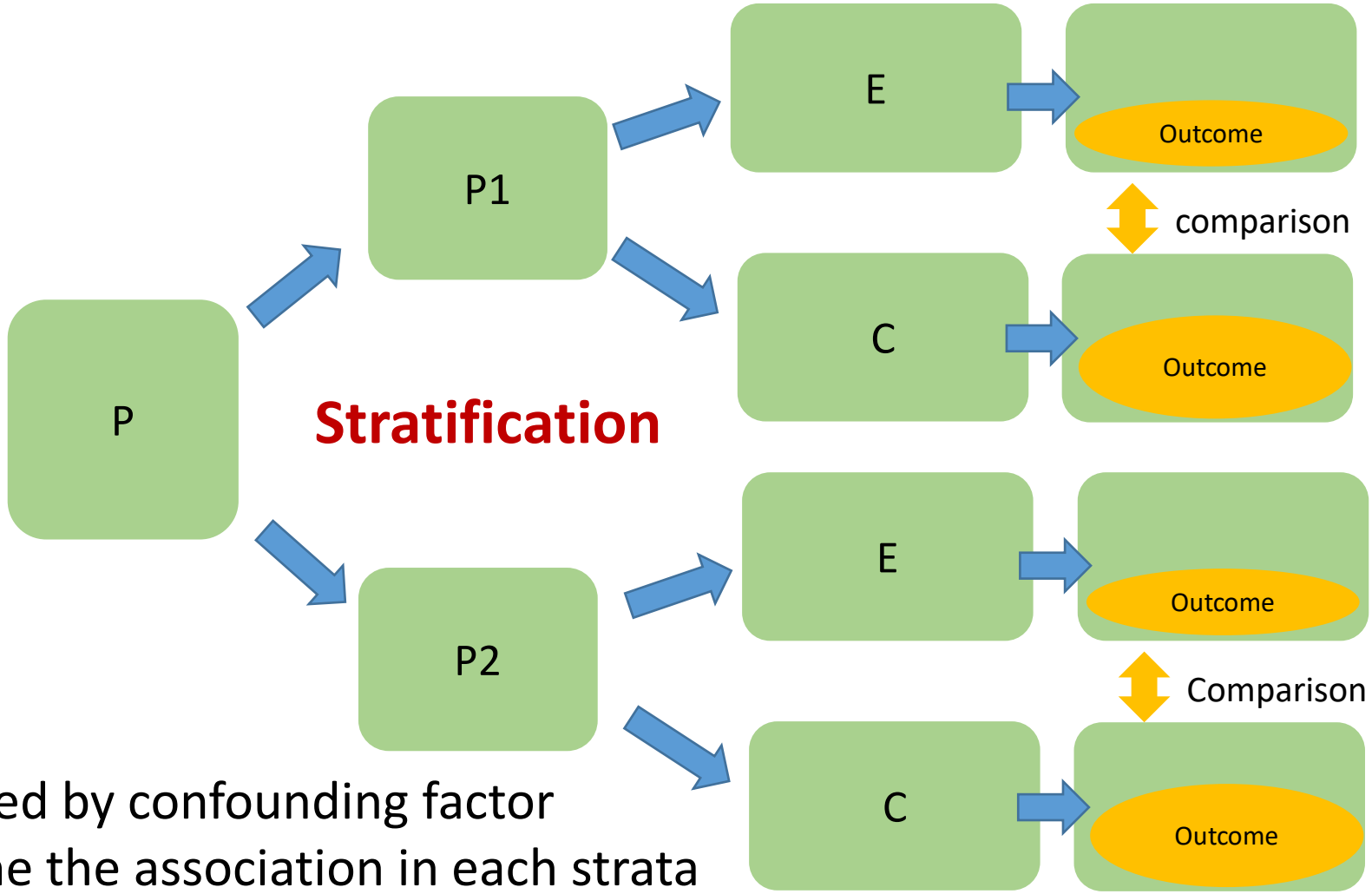
- Make pairs which have similar characteristics



Limitaion

- Lose information of patients not included in the pairs

Stratification



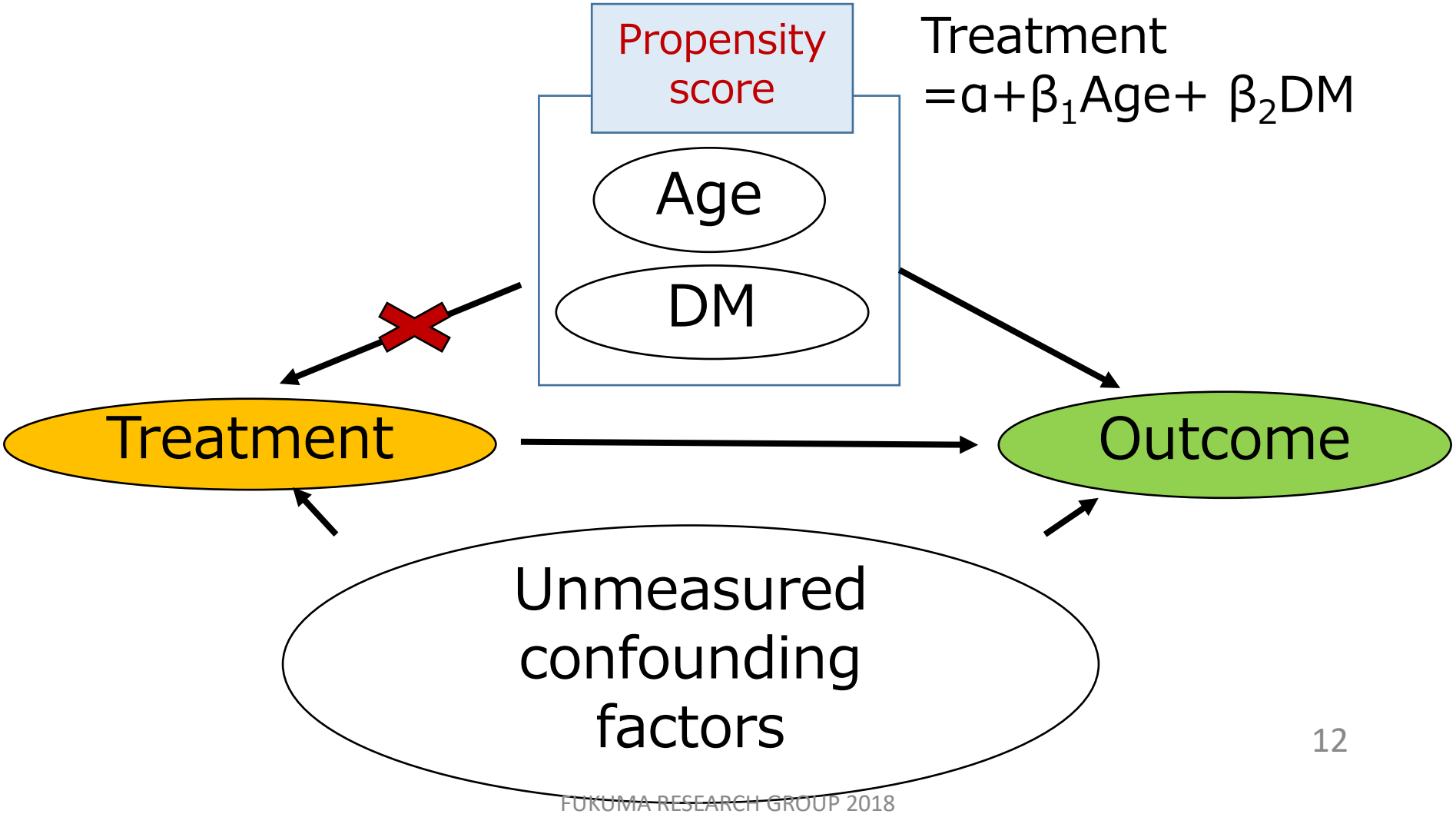
Stratified by confounding factor
Examine the association in each strata
Combine the results from each strata

Regression model

- Adjust for multiple confounding factors at once
- Different models according to the types of outcome
  - Linear regression: continuous
  - Logistic regression: binary
  - Cox regression: time to event
- Selection of models and interpretation of results

Propensity score

Propensity score= probability to be in Exposure group



Prevention of Bias

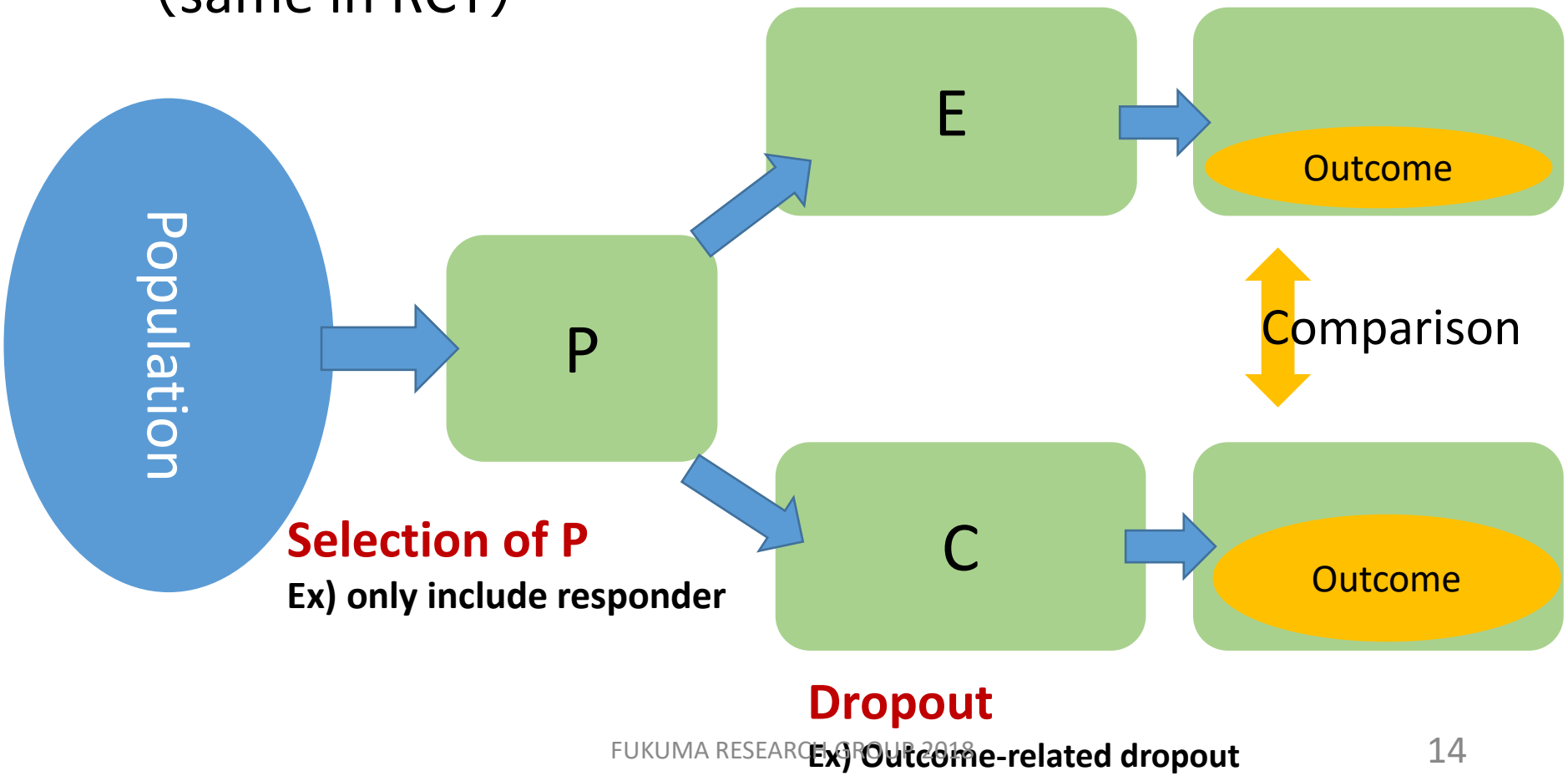
- The most important thing is to find the possibility of bias before measurement and prevent it.
- We can Not treat Bias after measurement.

- Two check points

1. Selection of Patients
2. Measurement of Exposure and Outcome

Check points of Bias

- Cohort study
  (same in RCT)



Selection of Patients

- Check the difference between population and sample
  - Characteristics (age, gender…)
  - Frequency of outcome
  - Distribution of exposure
- Inclusion criteria and setting
  - Balance between Generalizability and Comparability
  - Too strict inclusion criteria decrease feasilibity

Measurement of E and O

- What kind of scale
- How to use the scale
  - When, who, where, and how
- Designing measurement before measurement
  - Especially, patient reported outcome and physician diagnosed outcome
  - Use validated scale appropriately

Prevention of dropout

- Outcome related dropout

- Tips of good Follow-up
  - Good questionnaire: Easy to answer, less than 15 minutes
  - Reminder
  - Incentive for participants
  - Tenacity 執念!?

Main points of today's lecture

1. How to treat random error
   We just describe variations.
2. How to treat confounding factors
   Before measurement: restriction, randomization, matching
   After measurement: stratification, regression
3. How to treat bias
   Prevention before measurement: selection and measurement