§5.3 Compliance classes

- Principal stratification according to potential treatment. (Complier, always taker, never taker, defier)
- Population causal effects and local causal effects

§5.3.1 Potential value of treatment

A^0	A^1	label (Subpopulation)
0	0	never takers
0	1	Compliers
1	0	Defiers
1	1	always takers

(1) Never-takers: Encouragement does not work.

✗ We can not learn any thing about the effect of treatment in this subpopulation, because there is no variation in treatment received (A). We would never observe an outcome under treatment for anyone in this subpopulation.

(2) Compliers: treatment received is equal to treatment assignment. (based on treatment)

在Compliers这个群体 assignment ⟹ is randomized

中可以实现 treatment received 的 randomization.

(3) Defiers: Do ~~dep~~ opposite of what they are encouraged to do.

在Defiers这个群体中，A (treatment received) 仍然是 randomized，只不过跟 assignment 刚好相反.

- 通常假设这个群体在 whole population 中不存在，我们不希望有这样的人做违反 assignment 的 treatment.
- 如果这种群体存在的话，通常也会假设这部分人很少 很少.

(4) Always-takers: Always take treatment.

No variation in treatment received, no information about causal effect.

§5.3.2 Causal effects

理想: Causal effect ⟵ whole population

- 当存在 unmeasured confounding 的时候，很难获得 whole population 的 causal effect.

☆ IV methods 的 motivation: unmeasured confounding

如果存在 unmeasured confounding，cannot marginalize over all confounders via matching, iptw, etc.

☆ IV methods do not focus on the average causal effect for the whole population.

IV methods 的目的是在存在 unmeasured confound 的情况下估计出一个有效的 causal effect (要看针对的是哪个群体，但肯定不是 whole population 了)

☆ IV methods focus on a local average treatment effect.

§5.3.3 Local average treatment effect

The target of inference is

$$E(Y^{Z=1} \mid A^0=0, A^1=1) - E(Y^{Z=0} \mid A^0=0, A^1=1)$$

Tip: Mean difference of potential outcome in the same subpopulation of people, is a valid causal effect.

注意到上述的 "the same subpopulation" 就是 Compliers 于是 $E(Y^{Z=1} \mid A^0=0, A^1=1) - E(Y^{Z=0} \mid A^0=0, A^1=1)$

$$= E(Y^{Z=1} - Y^{Z=0} \mid \text{Compliers})$$

$$= E(Y^{A=1} - Y^{A=0} \mid \text{Compliers})$$

- 如何理解 local？

local 表示 an inference about a subpopulation, and the subpopulation happens to be compliers.

Local average treatment effect (LATE)

= complier average causal effect (CACE)

§5.3.4 Observational data.

实际上我们只能观察到 Z 和 A，而不是 A^0, A^1.

Z	A	A^0	A^1	Class
0	0	0	?	Complier or Never taker
0	1	1	?	Always taker or defier
1	0	?	0	Never taker or defier
1	1	?	1	Complier or always taker.

- 给定 observational data，我们只能把 each subject 限定在两种可能的 subpopulation 中. 要是能说
- 除非给出 additional assumption，否则不能确切知道 each subject 属于哪