

CACE – Complier-average Causal Effect using Mplus: theoretical and practical issues

Hugo Cogo-Moreira – Federal University of Sao Paulo
Department of Psychiatry

Traditional analysis in Randomized Clinical Trials (RCT)

- ▶ Standard Intention-to-treat (ITT) – estimates treatment effect in the presence of noncompliance
 - ▶ **Overall average** treatment effect
- ▶ ITT does not represent treatment efficacy under noncompliance (non-adherence)



Subpopulation in RCT

- ▶ Four potential compliance status (Angrist et al., 1996)
 - ▶ **Compliers** receive treatment only if they are assigned to the treatment condition;
 - ▶ **Never-takers** do not receive the treatment even if they are assigned to the treatment condition
 - ▶ **Defiers** do the opposite of what they are assigned to do.
 - ▶ **Always-takers** always receive the treatment no matter which condition they are assigned to.



Where to apply? How does CACE work?

- ▶ **??Where??**

- ▶ To estimate the effect of treatment when it is actually received

- ▶ **Assumptions for CACE**

- ▶ Monotonicity (Imbens & Angrist, 1994);

- ▶ No defiers

- ▶ Exclusion restriction assumption (Angrist 1996)

- ▶ Never-takers and (always-taker*) receive identical treatment regardless of which treatment condition they are assigned to

- ▶ Treatment effects are estimates for complier and fixed at zero for the rest.

- ▶ ****Unrealistic in some situations****

- ▶ Dichotomize individuals as low compliers and high compliers



Creating groups (training data)

- ▶ c_1 and c_2 (dummy variable) which contain information on class membership.
 - ▶ C_1 = complier class
 - ▶ C_2 = non-complier class

Intervention (complier)	Intervention (Non-complier)
Control (complier)	Control Non-complier)

$c_1=1$	$c_2=1$	Control Group
$c_1=1$	$c_2=0$	Complier
$c_1=0$	$c_2=1$	Non-Complier



An Example

- ▶ Children with reading difficulties
- ▶ Intervention – Music Education three times per week in
- ▶ Sampling: 10 schools (5 intervention vs. 5 control) 24 children per school;
- ▶ Outcomes:
 - ▶ Primary: reading skills (eg., rate of correct read words per minute) (Pre and post-test)
 - ▶ Secondary: academic achievement in Portuguese subject. (four equidistant evaluation)



In Cluster RCT...

- ▶ Traditional way ITT (Standard hierarchical Model)
- ... Or in case of noncompliance
- ▶ Adjustment for the design effect or multilevel analysis techniques
 - ▶ 30-50 clusters for multilevel modeling.
 - ▶ Alternatively, we can create a set of dummy variables to take into account the non-independence of observations due to clustering.



Modelling the input...

```
usevariables = gender age SAPT IQ_T nchild_class vis_acu  
accu_tx0 ACU_tx_2 interven_status c1 c2;
```

```
classes = c (2);
```

```
training = c1 c2;
```

```
cluster = school;
```

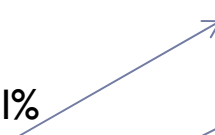


```
analysis: type = complex mixture;
```

```
Algorithm=integration;
```


```
estimator = mlr*;
```



Continuing input...

- ▶ Model:
- ▶ %overall%  Post-test
- ▶ acu_tx_2 ON acu_tx0other independent variables interven_status; 
- ▶ c#1 ON variables which would explain the complier/non-complier status (eg, age gender motivation); 

- ▶ %C#1% (Latent Group – complier)
- ▶ [acu_w_2];
- ▶ acu_tx_2 on interven_status;

- ▶ %C#2% (Latent Group Non-Complier)
- ▶ [acu_w_2];
- ▶ acu_tx_2 on interven_status @0; 
- ▶ Output: tech1 tech8;
 (exclusion restriction assumption)



But...in case of longitudinal studies...

%OVERALL%

```
i s | port1 @0 port2 @1 port3 @2 port4 @3;  
i s on interven_status port1;
```

```
%c#1%
```

```
i;s;  
s on interven_status;
```

```
%c#2%
```

```
l;s;  
s on interven_status @0;
```

Output: sampstat stand (stdyx)tech1 tech8;



Thanks

- ▶ Email contact: hugocogobr@gmail.com or hugo.cogo@lshtm.ac.uk

