Untitled

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2024-02-18

The primary research questions are as follows: 1. Do asthmatics have steeper rates of decline (slope) or lower levels of lung function (FEV1) than non-asthmatics, independent of smoking history? regress fev on time for non-asthmatics

```
family_asthma_long %>%
lmer(fev ~ year + year:asthma + asthma + (1 | family) + ( year || id) , data = .) %>%
tbl_regression(estimate_fun = partial(style_ratio, digits = 3),
               style_pvalue = function(x) style_pvalue(x, digits = 2),
               conf.int = FALSE) %>%
  add_global_p()
```

Characteristic	Beta	p-value
year	-0.030	<0.001
ever asthma	-0.098	0.2
year * ever asthma	0.005	0.2

2. Do asthmatic smokers have steeper rates of decline or lower levels of lung function than non-asthmatic smokers? Here you can explore three options 1) using the fixed effect variable ever smoke, 2) using the time dependent variable for smoking, or 3) using the current number of cigarettes per day. When using this I would suggest making it a categorical variable using quartiles etc.

```
var_label(family_asthma_long$smoke_ever) <- "Ever Smoked"

family_asthma_long %>%
  lmer(fev ~ year + year:asthma + asthma + smoke_ever +
       (1 | family) + (year || id) , data = .) %>%
  tbl_regression(estimate_fun = partial(style_ratio, digits = 3),
               style_pvalue = function(x) style_pvalue(x, digits = 2),
               conf.int = FALSE) %>%
  add_global_p()
```

Characteristic	Beta	p-value
year	-0.030	<0.001
ever asthma	-0.098	0.2
Ever Smoked	0.252	<0.001
year * ever asthma	0.005	0.2

```
family_asthma_long %>%
  lmer(fev ~ year + year:asthma + asthma + smk +
       (1 | family) + (year || id) , data = .) %>%
  tbl_regression(estimate_fun = partial(style_ratio, digits = 3),
               style_pvalue = function(x) style_pvalue(x, digits = 2),
               conf.int = FALSE) %>%
  add_global_p()
```

Characteristic	Beta	p-value
year	-0.030	<0.001
ever asthma	-0.108	0.2
smoking status, initial q	-0.019	0.027
year * ever asthma	0.006	0.11

```
family_asthma_long %>%
  lmer(fev ~ year + year:asthma + asthma + smk +
       (1 | family) + ( 1 | id) , data = .) %>%
  tbl_regression(estimate_fun = partial(style_ratio, digits = 3),
               style_pvalue = function(x) style_pvalue(x, digits = 2),
               conf.int = FALSE) %>%
  add_global_p()
```

Characteristic	Beta	p-value
year	-0.032	<0.001
ever asthma	-0.117	0.2
smoking status, initial q	-0.017	0.040
year * ever asthma	0.006	0.008

Hints: 1. When random effects are nested, the order in which they are listed is important. The order in which they are specified (from left to right) is significant – xtmixed assumes that the second factor is nested in the first. In this data subjects (id) are nested within Families (family). 2. Subjects should be tested for a RCM with age but families should not, any adjustment for serial correlation with time done at the subject level would also remove it at the family level.

Notes:

1. Both subject (id) and subject by age, and family (family) should be considered as potential random effects (i.e. fit a RCM)
2. Be sure to select the optimal covariance pattern for your random effects.
3. Plot resulting mean curves whenever you can to demonstrate significant effects.
4. It is not necessary to test higher order polynomials in either the fixed or random effects.
5. Be sure to provide residual plots, normal probability plots for any random effects, and to test for serial correlation in residuals.
6. Lung function measures generally need to be adjusted for anthropometric measures height and sex.