

```

rm(list = ls())
setwd("~/Dropbox/Classes/Longitudinal Data Analysis")
wgt <- read.table("weightslong.csv", sep = ",", header = TRUE)
dems <- read.table("agegender.csv", sep = ",", header = TRUE)
plan <- read.table("plandiet.csv", sep = ",", header = TRUE)
dems$age.c <- dems$age - 49.094
data <- merge(wgt, dems, by = "ID")
data <- join(data, plan, by = c("ID", "wave"))

## Error in eval(expr, envir, enclos): could not find function "join"

data$gender[data$gender == 1] <- 0
data$gender[data$gender == 2] <- 1
library(tidyr)

## Warning: package 'tidyr' was built under R version 3.3.2

library(dplyr)

## Warning: package 'dplyr' was built under R version 3.3.2
##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##   filter, lag
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

library(plyr)

## -----
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
## -----
##
## Attaching package: 'plyr'
## The following objects are masked from 'package:dplyr':
##
##   arrange, count, desc, failwith, id, mutate, rename, summarise,
##   summarize

library(lubridate)

##
## Attaching package: 'lubridate'
## The following object is masked from 'package:plyr':
##
##   here
## The following object is masked from 'package:base':
##
##   date

library(ggplot2)

```

```
## Warning: package 'ggplot2' was built under R version 3.3.2
library(lme4)

## Loading required package: Matrix
##
## Attaching package: 'Matrix'
## The following object is masked from 'package:tidyr':
##
##     expand

library(reghelper)

## Warning: package 'reghelper' was built under R version 3.3.2
##
## Attaching package: 'reghelper'
## The following object is masked from 'package:base':
##
##     beta

library(MuMIn)

## Warning: package 'MuMIn' was built under R version 3.3.2
```

1 Graphing with Categorical Level 2 Predictors

```
# model with gender as a Level 2 predictor
mod1b <- lmer(weight ~ wave + gender + gender * wave + (wave | ID), data = data)
summary(mod1b)

## Linear mixed model fit by REML ['lmerMod']
## Formula: weight ~ wave + gender + gender * wave + (wave | ID)
## Data: data
##
## REML criterion at convergence: 23120.2
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.6273 -0.5696 -0.0630  0.4844  5.2610
##
## Random effects:
##   Groups    Name                Variance Std.Dev. Corr
##   ID        (Intercept) 2512.2950 50.1228
##           wave           0.1655  0.4068 -0.20
## Residual              14.4695  3.8039
## Number of obs: 3900, groups: ID, 139
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept) 253.7208   12.9461  19.598
## wave        -0.8067    0.1064  -7.583
```

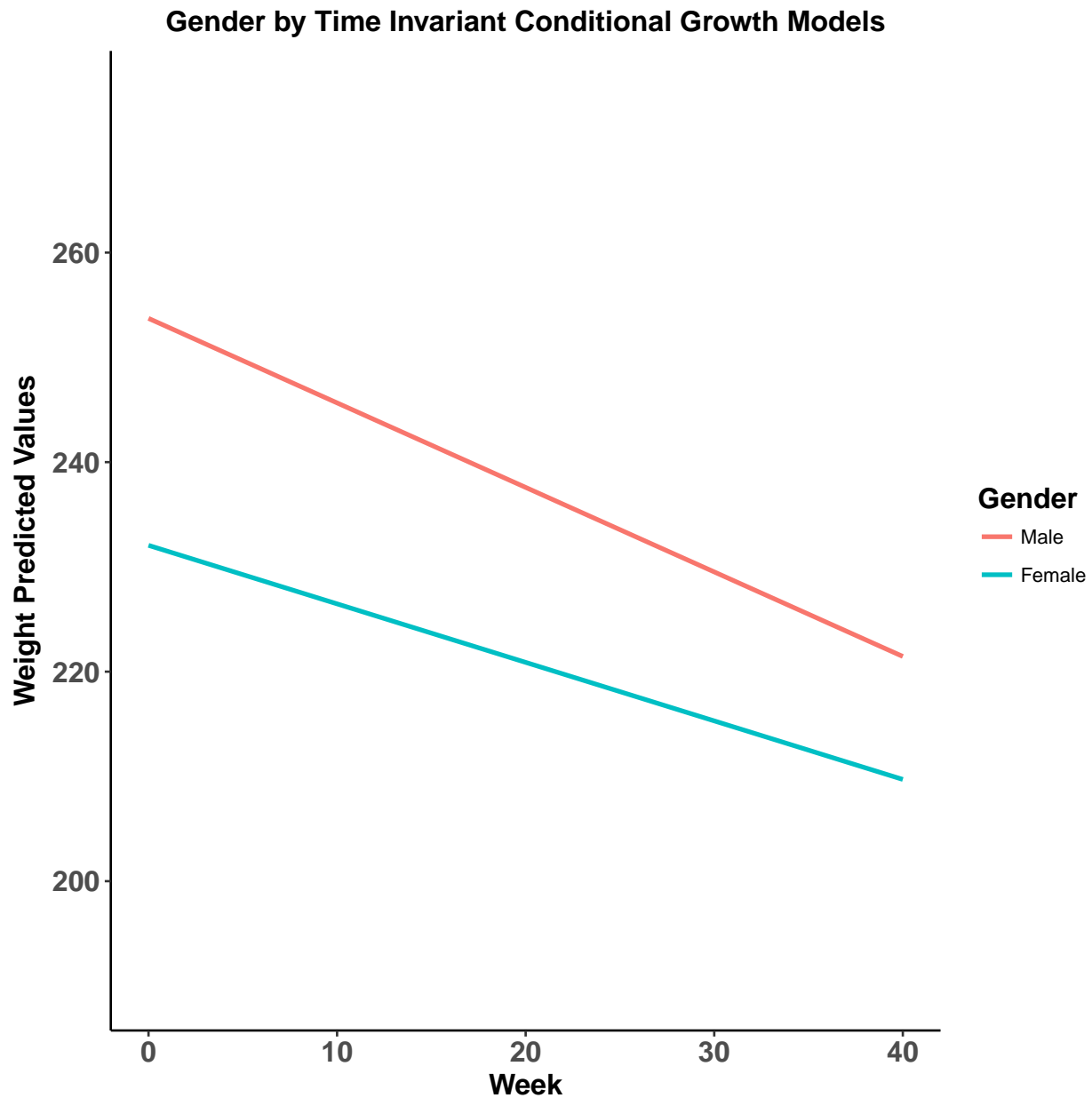
```

## gender      -21.6634    13.7068   -1.580
## wave:gender   0.2481     0.1130    2.195
##
## Correlation of Fixed Effects:
##              (Intr) wave   gender
## wave          -0.201
## gender        -0.944  0.190
## wave:gender   0.189 -0.941 -0.200

# plotting categorical predictors using the predict function
fixed.frame <- data.frame(expand.grid(wave = seq(0, 40, 1), gender = c(0, 1))) %>%
  mutate(pred = predict(mod1b, newdata = ., re.form = NA))

fixed.frame %>% mutate(Gender = factor(gender, levels = c(0, 1), labels = c("Male",
  "Female"))) %>% ggplot(aes(x = wave, y = pred, colour = Gender)) + geom_line(size = 1) +
  lims(y = c(190, 275)) + labs(x = "Week", y = "Weight Predicted Values",
  title = "Gender by Time Invariant Conditional Growth Models") + theme_classic() +
  theme(axis.text = element_text(face = "bold", size = rel(1.2)), axis.title = element_text(face = "bold",
    size = rel(1.2)), legend.title = element_text(face = "bold", size = rel(1.2)),
    plot.title = element_text(face = "bold", size = rel(1.2), hjust = 0.5))

```



2 Graphing with Continuous Level 2 Predictors

```
#model with age as a continuous predictor
mod2c <-lmer(weight ~ wave + age.c + age.c*wave + (wave|ID),data=data)
summary(mod2c)

## Linear mixed model fit by REML ['lmerMod']
## Formula: weight ~ wave + age.c + age.c * wave + (wave | ID)
## Data: data
##
```

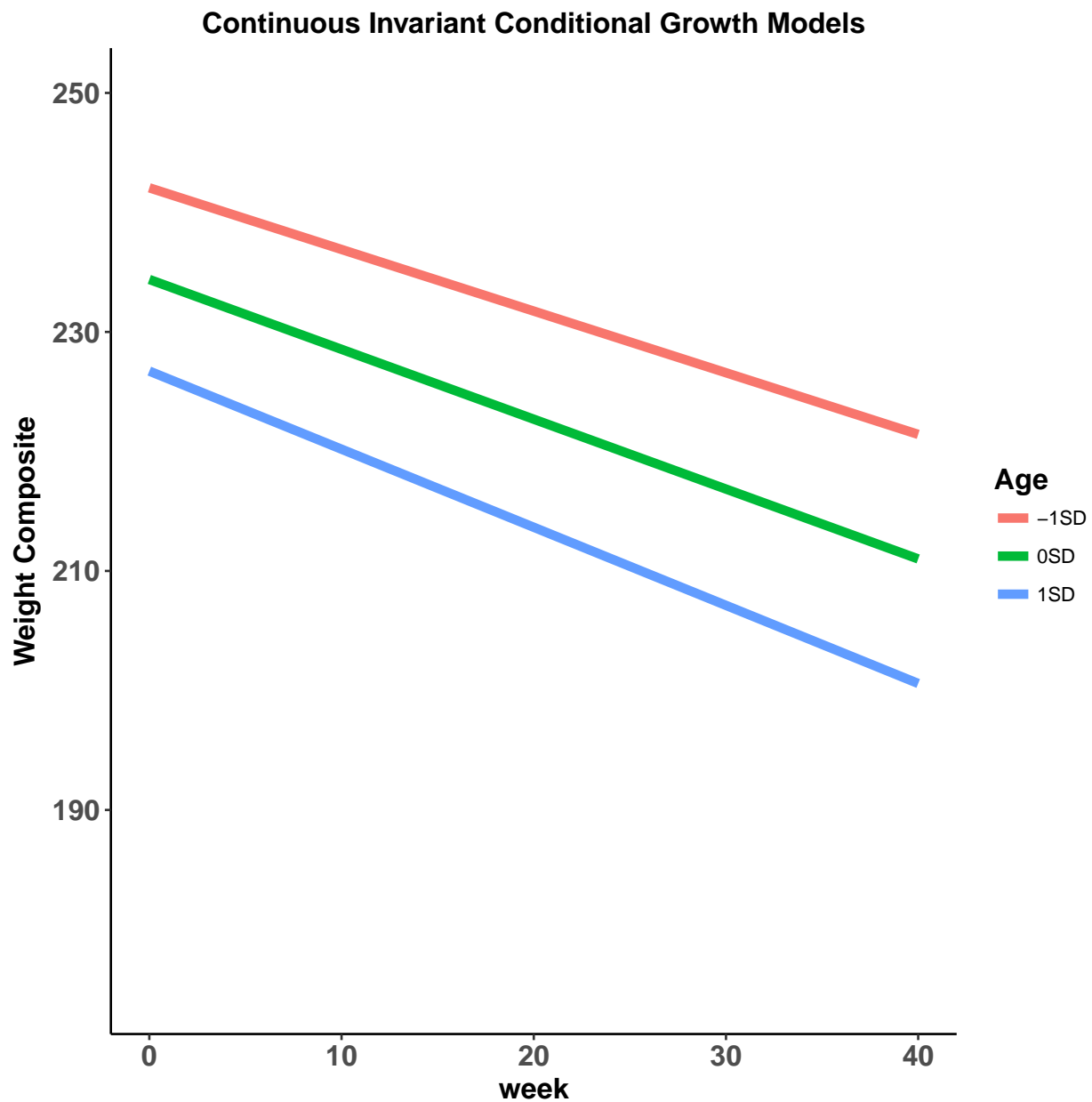
```
## REML criterion at convergence: 23131.3
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -5.6268 -0.5666 -0.0638  0.4828  5.2589
##
## Random effects:
##   Groups   Name                Variance Std.Dev. Corr
##    ID      (Intercept) 2498.7452 49.9875
##      wave              0.1677  0.4095 -0.25
## Residual              14.4677  3.8036
## Number of obs: 3900, groups: ID, 139
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept) 234.391903   4.241540   55.26
## wave        -0.584635   0.036183  -16.16
## age.c        -0.761723   0.421352   -1.81
## wave:age.c   -0.006835   0.003614   -1.89
##
## Correlation of Fixed Effects:
##              (Intr) wave   age.c
## wave        -0.249
## age.c         0.000  0.001
## wave:age.c   0.001 -0.035 -0.248

#graph of continuous predictors using the predict function
fixed.frame <- data %>%
  summarise(mean = mean(age.c, na.rm = T),
            sd = sd(age.c, na.rm = T))

fixed.frame <-
  data.frame(
    expand.grid(
      # here, you add values for your time variable and predictors
      wave = seq(0,40,1),
      age.c = c(fixed.frame$mean-fixed.frame$sd,
                fixed.frame$mean,
                fixed.frame$mean+fixed.frame$sd))) %>%
  mutate(pred = predict(mod2c, newdata = ., re.form = NA))

fixed.frame %>%
  mutate(Age = factor(age.c, levels = unique(age.c), labels = c("-1SD", "0SD", "1SD"))) %>%
  ggplot(aes(x = wave, y = pred, color = Age)) +
    geom_line(size = 2) +
    lims(y = c(175,250)) +
    labs(x = "week", y = "Weight Composite",
         title = "Continuous Invariant Conditional Growth Models") +
    theme_classic() +
    theme(axis.text = element_text(face = "bold", size = rel(1.2)),
```

```
axis.title = element_text(face = "bold", size = rel(1.2)),
legend.title = element_text(face = "bold", size = rel(1.2)),
plot.title = element_text(face = "bold", size = rel(1.2), hjust = .5))
```



3 Making a Table

```
## here's some code to make a table. You shouldn't need to modify anything
## here unless you add additional random effects terms fixed effects first ##
table_fun <- function(model) {
```

```

fixed <- broom::tidy(model) %>% filter(group == "fixed") %>% select(term,
  estimate)
## add random effects ##
rand <- broom::tidy(model) %>% filter(group != "fixed") %>% select(term,
  estimate)
## get confidence intervals ##
CI <- data.frame(confint.merMod(model, method = "boot", nsim = 10)) %>%
  mutate(term = rownames(.)) %>% setNames(c("lower", "upper", "term"))

## Get ICC & R2 values ##
ICC <- reghelper::ICC(model)
R2 <- MuMIn::r.squaredGLMM(model)

## format the fixed effects
fixed <- fixed %>% left_join(CI %>% filter(!grepl(".sig", term))) %>% mutate(type = "Fixed Parts")

rand <- rand %>% mutate(estimate = ifelse(grepl("cor", term) == T, estimate,
  estimate^2), term = mapvalues(term, unique(term), c("$\\tau_{00}$",
  "$\\tau_{11}$", "$\\tau_{10}$", "$\\hat{\\sigma}^2$"))) %>% left_join(CI %>%
  filter(grepl(".sig", term)) %>% mutate(term = mapvalues(term, unique(term),
  c("$\\tau_{00}$", "$\\tau_{10}$", "$\\tau_{11}$", "$\\hat{\\sigma}^2$")),
  lower = lower^2, upper = upper^2)) %>% mutate(type = "Random Parts")

mod_terms <- tribble(~term, ~estimate, ~type, "ICC", ICC, "Model Terms",
  "$R^2_m$", R2[1], "Model Terms", "$R^2_c$", R2[2], "Model Terms")

tab <- fixed %>% full_join(rand) %>% mutate(CI = sprintf("(%.2f, %.2f)",
  lower, upper)) %>% select(-lower, -upper) %>% full_join(mod_terms) %>%
  mutate(estimate = sprintf("%.2f", estimate)) %>% dplyr::rename(b = estimate) %>%
  select(type, everything())
return(tab)
}

# you can use this with papaja and the apa_table function pretty easily the
# trick is that if you are not using the papaja template, the proper LaTeX
# packages may not be loaded. You can get around this by attaching a .tex
# file calling the packages under 'in_header: header.tex' in your YAML
# header the YAML header of this .Rmd file contains the necessary syntax and
# the header.tex file with the proper packages

tab <- table_fun(mod2c)

## Warning: package 'bindrcpp' was built under R version 3.3.2
## Computing bootstrap confidence intervals ...
## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, : Model failed
to converge with max|grad| = 0.0396502 (tol = 0.002, component 1)
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints

```

```
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints
## Warning in norm.inter(t, alpha): extreme order statistics used as endpoints
## Joining, by = "term"
## Joining, by = "term"
## Joining, by = c("term", "estimate", "lower", "upper", "type")
## Joining, by = c("term", "estimate", "type")
## Warning: Column 'estimate' has different attributes on LHS and RHS of join
```

4 Time-Varying Covariate: Continuous (don't have any categorical)

```
#adding planning diet as main effect (question 13)
modTV1 <- lmer(weight ~ wave + plans + (wave|ID), data = data)

## Error in eval(expr, envir, enclos): object 'plans' not found

summary(modTV1)

## Error in summary(modTV1): object 'modTV1' not found

fixed.frame <- data %>%
  summarise(mean = mean(plans, na.rm = T),
            sd = sd(plans, na.rm = T))

## Error in mean(plans, na.rm = T): object 'plans' not found

fixed.frame <-
  data.frame(
    expand.grid(
      # here, you add values for your time variable and predictors
      wave = seq(0,40,1),
      plans = c(fixed.frame$mean-fixed.frame$sd,
                fixed.frame$mean,
                fixed.frame$mean+fixed.frame$sd))) %>%
  mutate(pred = predict(modTV1, newdata = ., re.form = NA))

## Error in predict(modTV1, newdata = ., re.form = NA): object 'modTV1' not found

fixed.frame %>%
  mutate(Plan = factor(plans, levels = unique(plans), labels = c("-1SD", "OSD", "1SD"))) %>%
  ggplot(aes(x = wave, y = pred, color = Plan)) +
    geom_line(size = 2) +
    lims(y = c(200,250)) +
    labs(x = "week", y = "Weight Composite",
         title = "Continuous Invariant Conditional Growth Models") +
    theme_classic() +
    theme(axis.text = element_text(face = "bold", size = rel(1.2)),
          axis.title = element_text(face = "bold", size = rel(1.2)),
          legend.title = element_text(face = "bold", size = rel(1.2)),
          plot.title = element_text(face = "bold", size = rel(1.2), hjust = .5))

## Error in factor(plans, levels = unique(plans), labels = c("-1SD", "OSD", : object 'plans'
not found
```


5 Time-Varying Covariate with interaction: Continuous (don't have any categorical)

```
#adding interaction
modTV2 <- lmer(weight ~ wave + plans + wave:plans + (wave|ID), data = data)

## Error in eval(expr, envir, enclos): object 'plans' not found

summary(modTV2)

## Error in summary(modTV2): object 'modTV2' not found

#interaction not significant
#planning does not moderate the time course of weight loss

fixed.frame <- data %>%
  summarise(mean = mean(plans, na.rm = T),
            sd = sd(plans, na.rm = T))

## Error in mean(plans, na.rm = T): object 'plans' not found

fixed.frame <-
  data.frame(
    expand.grid(
      # here, you add values for your time variable and predictors
      wave = seq(0,40,1),
      plans = c(fixed.frame$mean-fixed.frame$sd,
                fixed.frame$mean,
                fixed.frame$mean+fixed.frame$sd))) %>%
  mutate(pred = predict(modTV2, newdata = ., re.form = NA))

## Error in predict(modTV2, newdata = ., re.form = NA): object 'modTV2' not found

fixed.frame %>%
  mutate(Plan = factor(plans, levels = unique(plans), labels = c("-1SD", "0SD", "1SD"))) %>%
  ggplot(aes(x = wave, y = pred, color = Plan)) +
    geom_line(size = 2) +
    lims(y = c(200,250)) +
    labs(x = "week", y = "Weight Composite",
         title = "Continuous Invariant Conditional Growth Models") +
    theme_classic() +
    theme(axis.text = element_text(face = "bold", size = rel(1.2)),
          axis.title = element_text(face = "bold", size = rel(1.2)),
          legend.title = element_text(face = "bold", size = rel(1.2)),
          plot.title = element_text(face = "bold", size = rel(1.2), hjust = .5))

## Error in factor(plans, levels = unique(plans), labels = c("-1SD", "0SD", : object 'plans'
not found
```