Technical Appendix

CK

22/11/2018

```
# Import ATUS Summary file
ATUS.SUM <- import('atussum_0317.csv', setclass = "tibble")
# Import ATUS CPS File
ATUS.CPS <- import('atuscps_0317.csv', setclass = "tibble")
# Create a diary date column
ATUS.SUM$TUDIARYDATE <- as.Date(substr(ATUS.SUM$TUCASEID, 1, 8), "%Y%m%d")
# Add months as a column as a derivative of the TUCASEID variable
ATUS.SUM$month <- as.numeric(substr(ATUS.SUM$TUCASEID, 5, 6))
# Filter CPS down to just relevant variables. GEDSTFIPS is state, GEDIV is division and GEREG is region
ATUS.CPS.States <- select(ATUS.CPS, TUCASEID, GESTFIPS, GEDIV, GEREG)
# Create variables to be added to a data frame with relevant gender activities
Working <- ATUS.SUM[, grep("^t05", names(ATUS.SUM))]
House.Maintenance <- ATUS.SUM[, grep("^t0204", names(ATUS.SUM))]
Vehicle.Maintenance <- ATUS.SUM[, grep("^t0207", names(ATUS.SUM))]
Housework <- ATUS.SUM[, grep("^t0201", names(ATUS.SUM))]
Food.Prep <- ATUS.SUM[, grep("^t0202", names(ATUS.SUM))] + ATUS.SUM$t070101 + ATUS.SUM$t070103
Childcare <- ATUS.SUM[, grep("^t03", names(ATUS.SUM))]
```

```
# Create a data frame from relevant variables within ATUS Summary
# Childnum there for future use
Gender.Roles.Data <- select(ATUS.SUM, TUCASEID, TESEX, TEAGE, TUFNWGTP, TUYEAR, TRCHILDNUM, month, TUDI
# Join this dataset with the CPS states info by unique id number of particiapnt
# Add in relevant categories
Gender.Roles.Data$Working <- rowSums(Working)
Gender.Roles.Data$House.Maintenance <- rowSums(House.Maintenance)
Gender.Roles.Data$Vehicle.Maintenance <- rowSums(Vehicle.Maintenance)
Gender.Roles.Data$Housework <- rowSums(Housework)
Gender.Roles.Data$Food.Prep <- rowSums(Food.Prep)
Gender.Roles.Data$Childcare <- rowSums(select(Childcare, t030101:t030399))
# Join this dataset with the CPS states info by unique id number of particiapnt
Gender.Roles.Data <- left_join(Gender.Roles.Data, ATUS.CPS.States, by = 'TUCASEID')
Gender.Roles.Data <- filter(Gender.Roles.Data)
Gender.Roles.Data$TESEX[Gender.Roles.Data$TESEX == 1] <- "M"
Gender.Roles.Data$TESEX[Gender.Roles.Data$TESEX == 2] <- "F"
```

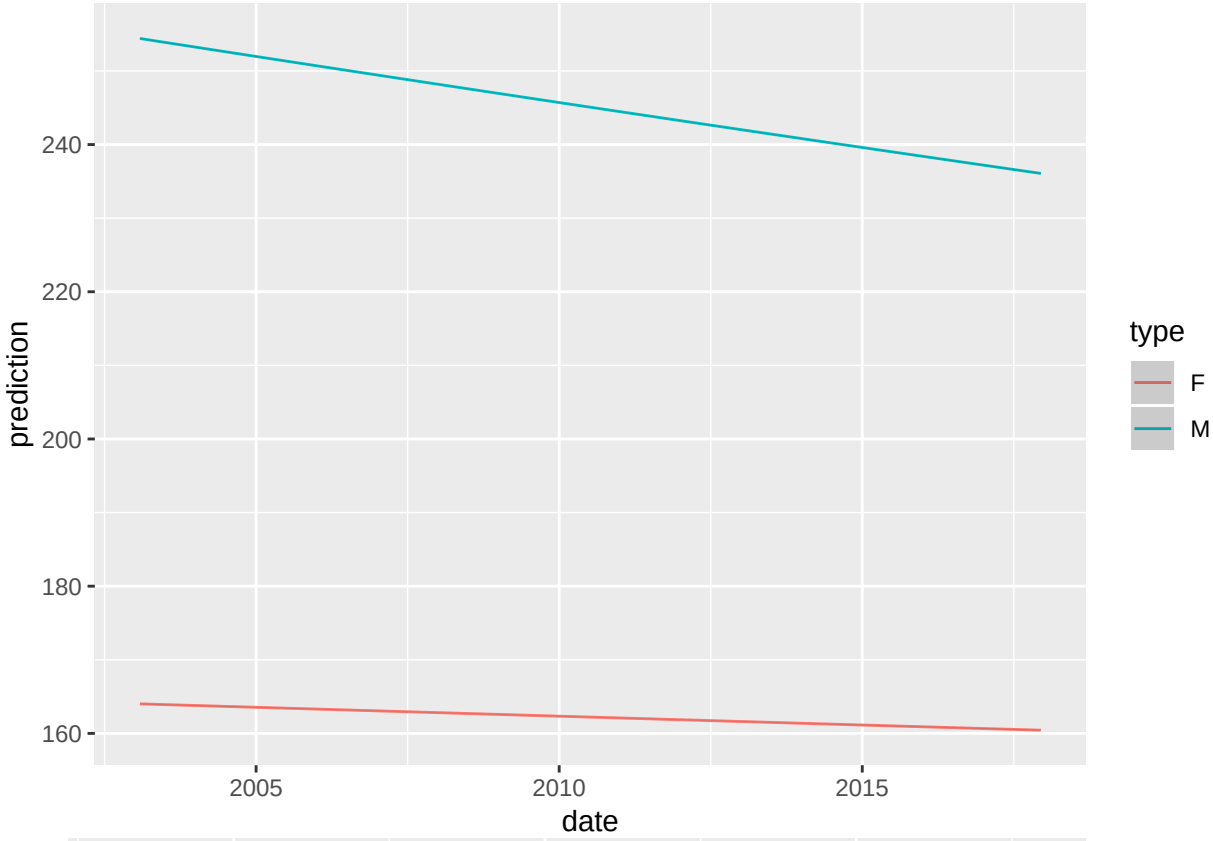
```
for (variable in c("Working", "House.Maintenance", "Vehicle.Maintenance", "Housework", "Food.Prep", "Ch
    Gender.Roles.Data[,paste0('weighted.', variable)] <- 0
    for (sex in c("M", "F")) {
        for (year in unique(Gender.Roles.Data$TUYEAR)) {
            for (month in unique(Gender.Roles.Data$month)) {
                Filtered.Data <- filter(Gender.Roles.Data, TESEX == sex, TUYEAR == year, month == month
                bottom.sum <- sum(Filtered.Data$TUFNWGTP)
                top.sum <- sum(Filtered.Data$TUFNWGTP * Filtered.Data[,variable])
                weighted.values <- top.sum / bottom.sum

                Gender.Roles.Data[Gender.Roles.Data$TESEX == sex & Gender.Roles.Data$TUYEAR == year & G
            }
        }
```

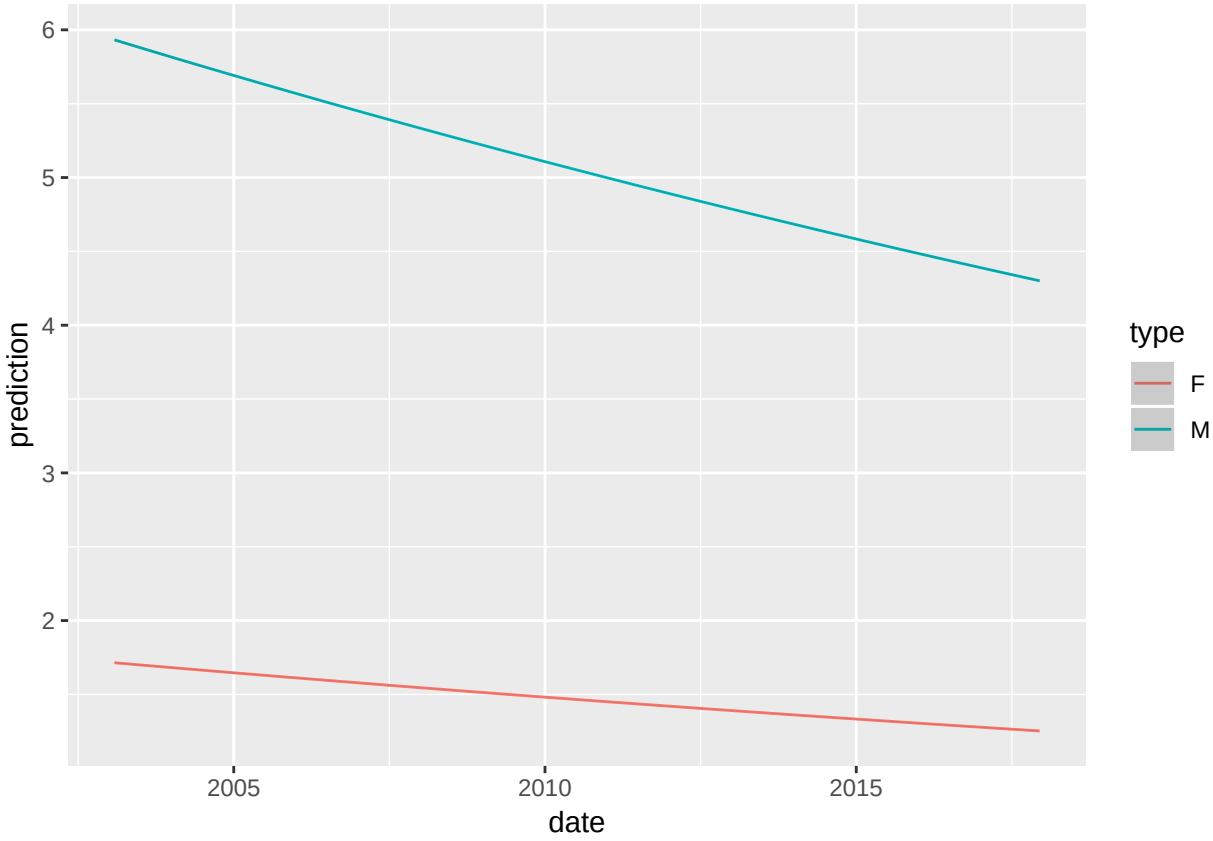
```
    }
}
Gender.Roles.Train <- filter(Gender.Roles.Data, month %% 2 == 0)
Gender.Roles.Validate <- filter(Gender.Roles.Data, month %% 2 != 0)
```

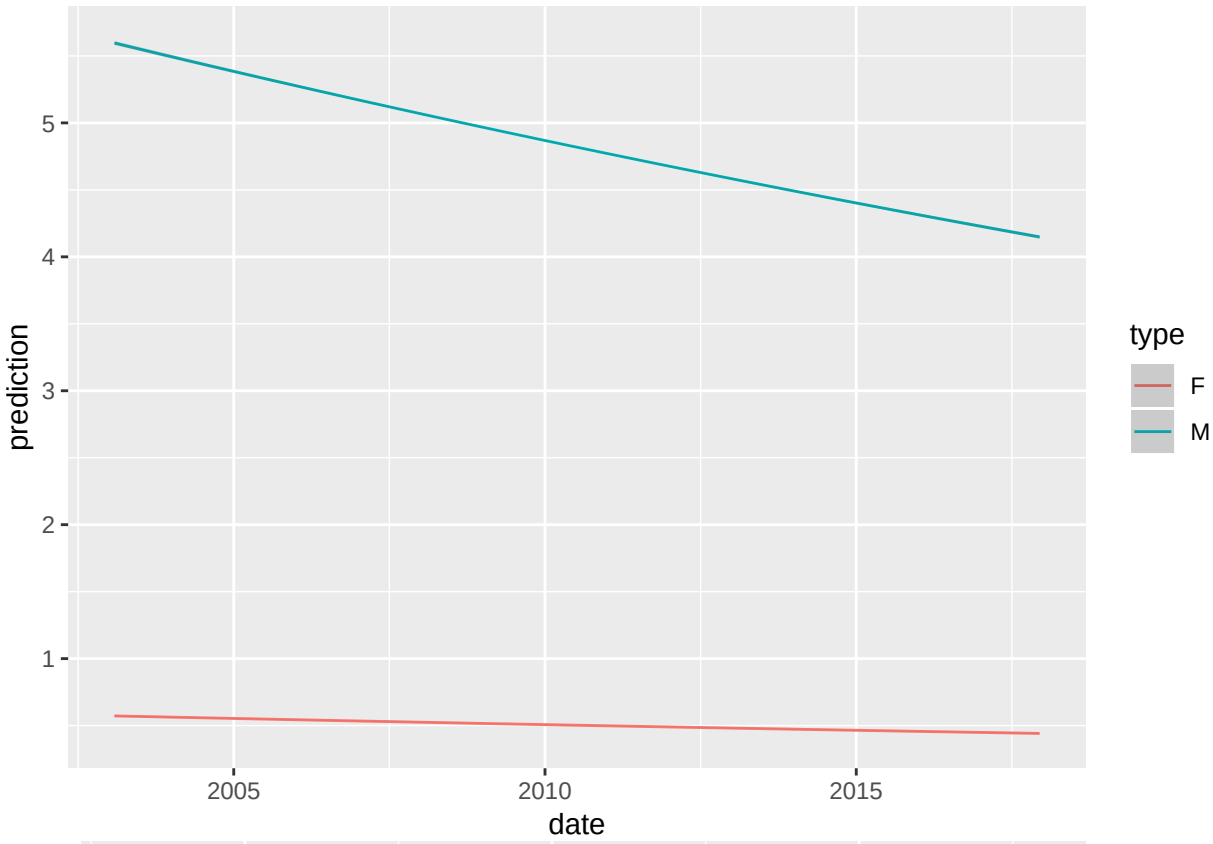
```
# Commented out lines show how to introduce knots to the models
for (variable in c("Working", "House.Maintenance", "Vehicle.Maintenance", "Housework", "Food.Prep", "Chi
    # Start building models for the data
    n <- nrow(Gender.Roles.Train)
    # model1 <- glm(as.formula(paste0('weighted.',variable,' ~ ns(TUDIARYDATE, knots = (c(as.Date("2006
    model1 <- glm(as.formula(paste0('weighted.',variable,' ~ ns(TUDIARYDATE)')), data = Gender.Roles.Tra
    model2 <- update(model1, . ~ . + TESEX)
    # model3 <- update(model1, . ~ -1 + TESEX + TESEX:ns(TUDIARYDATE, knots = (c(as.Date('2006-01-01'),
    model3 <- update(model1, . ~ -1 + TESEX + TESEX:ns(TUDIARYDATE))
    # Use same method as in lab 5 to plot them
    male.prediction <- predict.glm(model3, newdata = filter(Gender.Roles.Train, TESEX == 'M'), se = TRU

    female.prediction <- predict.glm(model3, newdata = filter(Gender.Roles.Train, TESEX == 'F'), se = T

    df <- data.frame(age = c(filter(Gender.Roles.Train, TESEX == 'M')$TEAGE, filter(Gender.Roles.Train,

    model3_plot <- ggplot(df, aes(x=date, y=prediction, colour=type)) +
    geom_line() +
    geom_ribbon(aes(ymin = prediction - prediction_error, ymax = prediction + prediction_error), alpha =
    print(model3_plot)
}
```

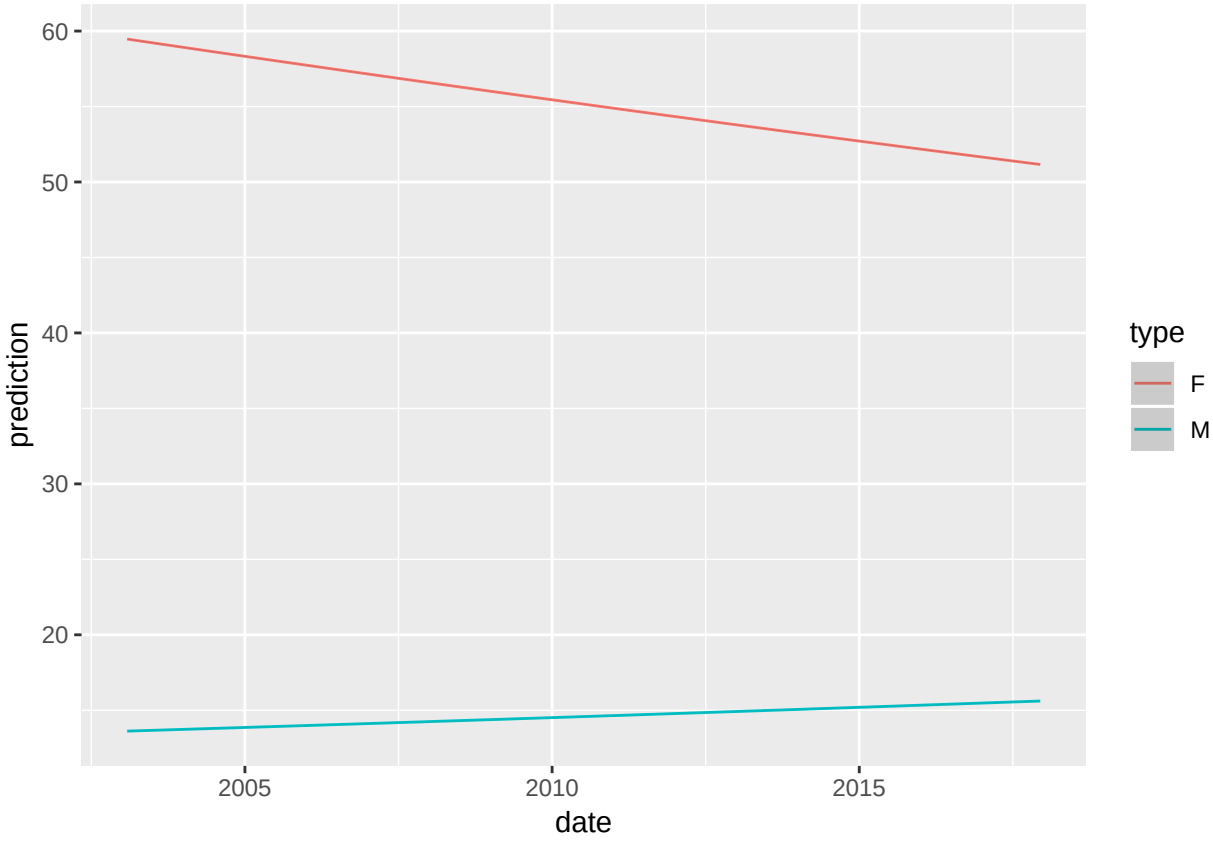
```
## Warning: glm.fit: algorithm did not converge
```

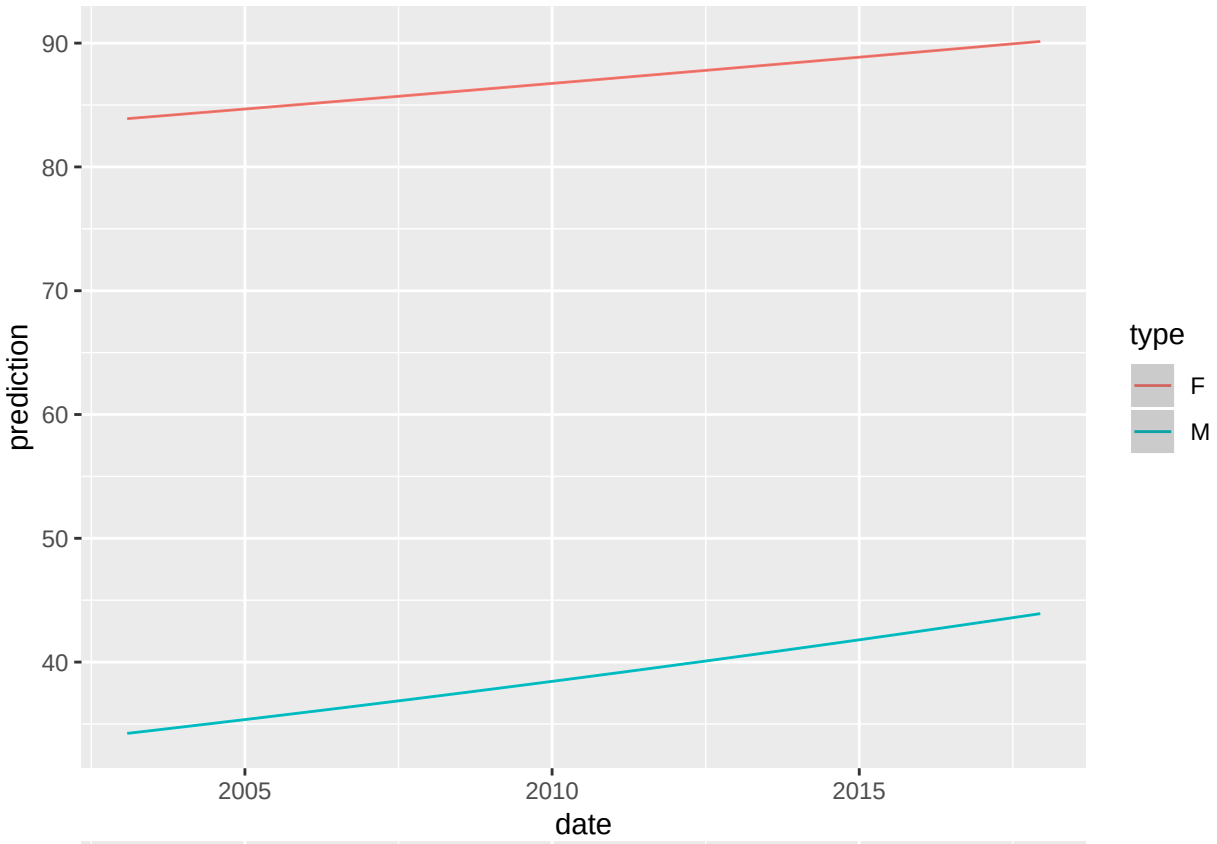
```
## Warning: glm.fit: algorithm did not converge
```

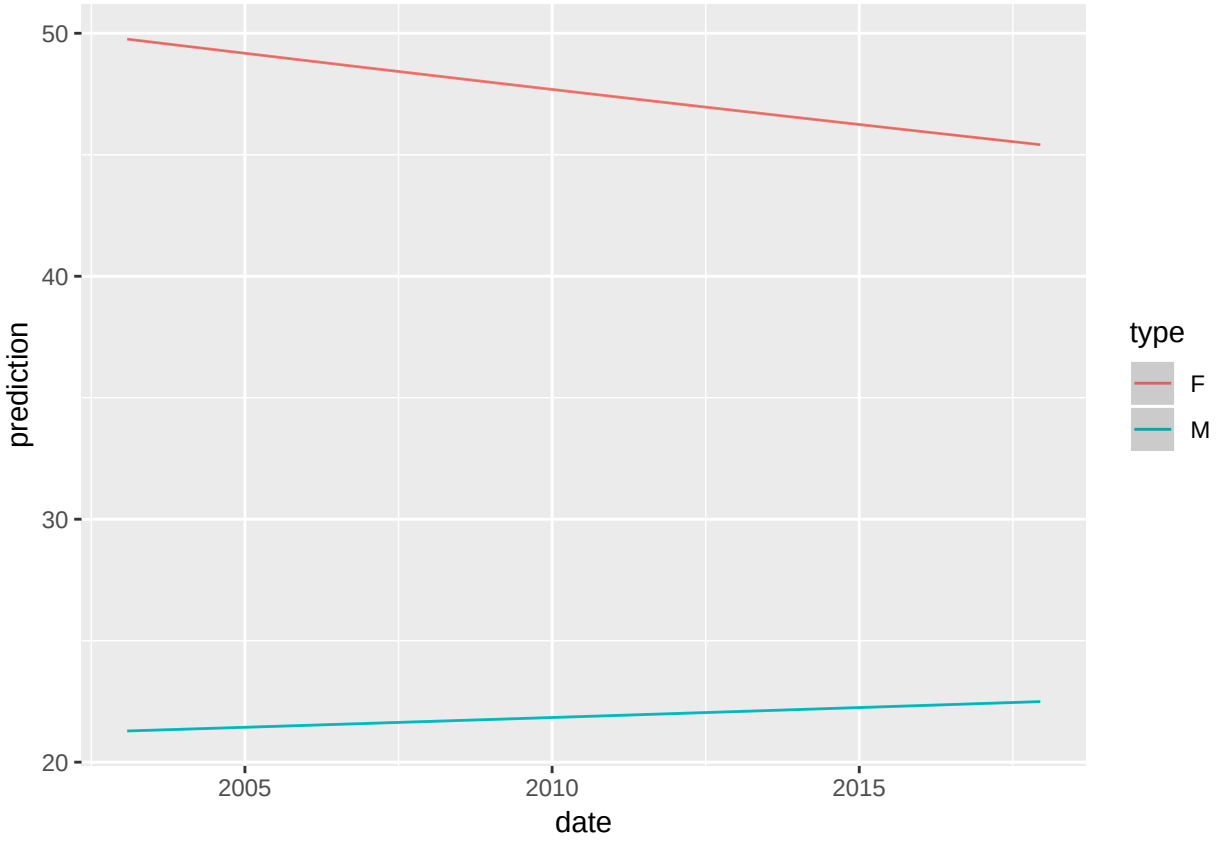

prediction
240
220
200
180
160
2005
2010
2015
date
type
F
M


prediction
6
5
4
3
2
2005
2010
2015
date
type
F
M


prediction
5
4
3
2
1
2005
2010
2015
date
type
F
M


prediction
60
50
40
30
20
2005
2010
2015
date
type
F
M


90
80
70
60
50
40
prediction
2005
2010
2015
date
type
F
M


50
40
30
20
prediction
2005
2010
2015
date
type
F
M