Reproduced analysis of FARS data

Results

```
library(tibble)
library(dplyr)
library(tidyr)
library(readr)
library(maps)
library(purrr)
library(knitr)
library(ggplot2)
library(scales)
library(ggthemes)
```

```
load("../data/clean_fars.RData")
source("../R/fars_functions.R")
```

Percentages of drivers testing positive by drug type, sex, and year group.

```
clean_fars %>%
  mutate(year_cat = cut(year, breaks = c(1999, 2002, 2006, 2010),
                        labels = c("1999-2002", "2003-2006",
                                   "2007-2010"),
                        include.lowest = TRUE, right = TRUE)) %>%
  filter(!is.na(sex)) %>%
  group_by(drug_type, sex, year_cat) %>%
  summarize(n_non_missing = sum(!is.na(positive_for_drug)),
            positive_test = sum(positive_for_drug, na.rm = TRUE),
            perc_positive = round(100 * positive_test / n_non_missing, 1)) %>%
  select(drug_type, sex, year_cat, perc_positive) %>%
  unite(sex_year_cat, sex, year_cat) %>%
  spread(sex_year_cat, perc_positive) %>%
  kable(col.names = c("Drug type", "F 1999-2002",
                      "F 2003-2006", "F 2007-2010",
                      "M 1999-2002", "M 2003-2006",
                      "M 2007-2010"))
```

Drug type	F 1999-2002	F 2003-2006	F 2007-2010	M 1999-2002	M 2003-2006	M 2007-2010
Alcohol	26.4	24.3	27.1	43.2	42.9	43.3
Cannabinoid	2.8	5.7	7.3	5.8	10.3	11.8
Depressant	3.4	3.8	4.8	2.0	2.5	3.2
Narcotic	4.2	4.9	7.0	2.2	3.4	4.0
Other	5.6	6.6	7.2	4.3	4.5	4.2
Stimulant	7.2	9.1	8.7	10.5	11.9	9.2

Figure 1: Prevalence of nonalcoholic drugs in fatally injured drivers by year and age group

```
clean_fars %>%
  filter(drug_type != "Alcohol",
         !is.na(agecat))%>%
  group_by(unique_id, agecat, year) %>%
```

```
  summarize(positive_test = sum(positive_for_drug, na.rm = TRUE),
            positive = any(positive_test > 0)) %>%
  ungroup() %>%
  group_by(year, agecat) %>%
  summarize(total_test = length(positive),
            positive = sum(positive),
            perc_positive = round(100 * positive / total_test , 1)) %>%


ggplot(aes(year, perc_positive, position = agecat))+
  geom_line()+
  theme_few()+
 geom_point(aes(shape = agecat))+
  scale_shape_manual("Age",values = c(17,16,15, 3))+
  labs (x="Year",
      y="Positive for Nonalcoholic Drugs %")+
  scale_y_continuous(limits = c(0,35))
```

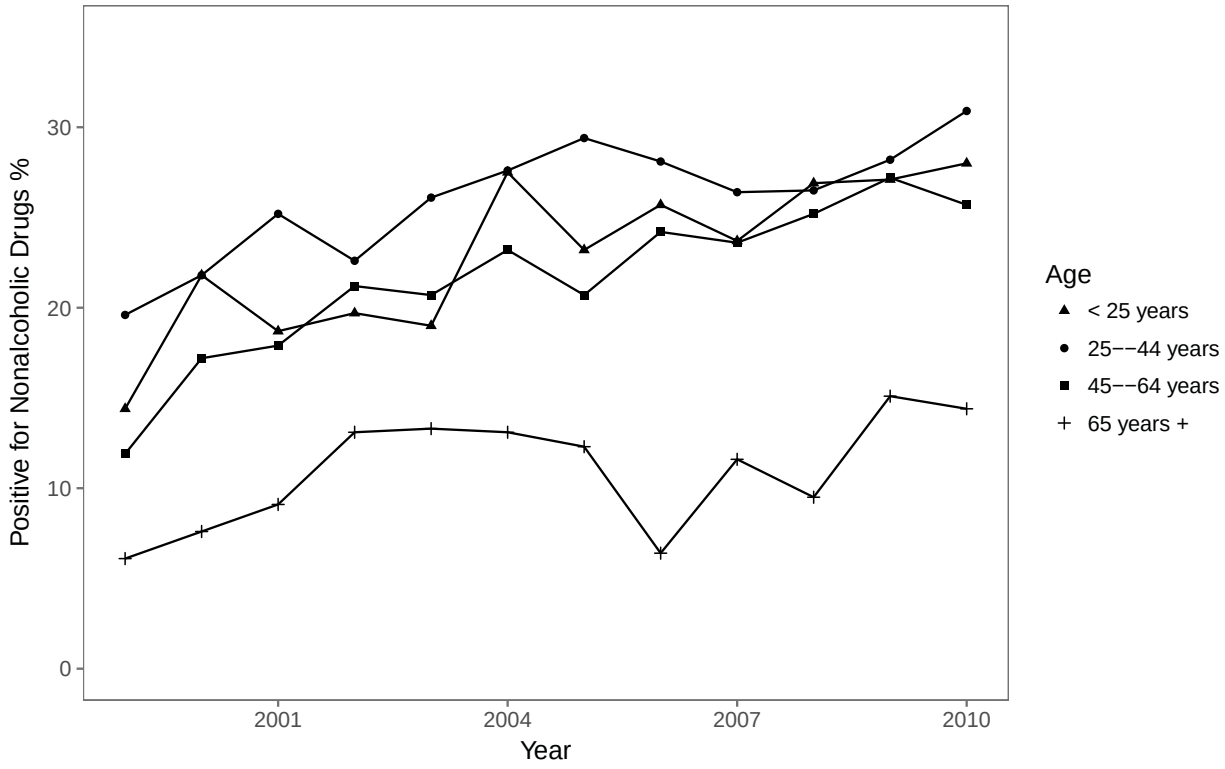


Figure 2: Prevalence of nonalcohol drugs in fatally injured drivers by year and drug type

```
clean_fars %>%
  group_by(year, drug_type) %>%
  summarize(n_non_missing = sum(!is.na(positive_for_drug)),
            positive_test = sum(positive_for_drug, na.rm = TRUE),
            perc_positive = round(100 * positive_test / n_non_missing, 1)) %>%
  filter(drug_type != "Alcohol") %>%

ggplot(aes(year, perc_positive, position = drug_type)) +
  geom_point(aes(shape = drug_type))+
```

```
  scale_shape_manual("Drug Type",values = c(17,16,15, 3, 7))+
  geom_line()+
  theme_few()+
  labs (x="Year",
      y="Positive for Drugs %")+
  scale_y_continuous(breaks= c(0, 4, 8,  12))
```

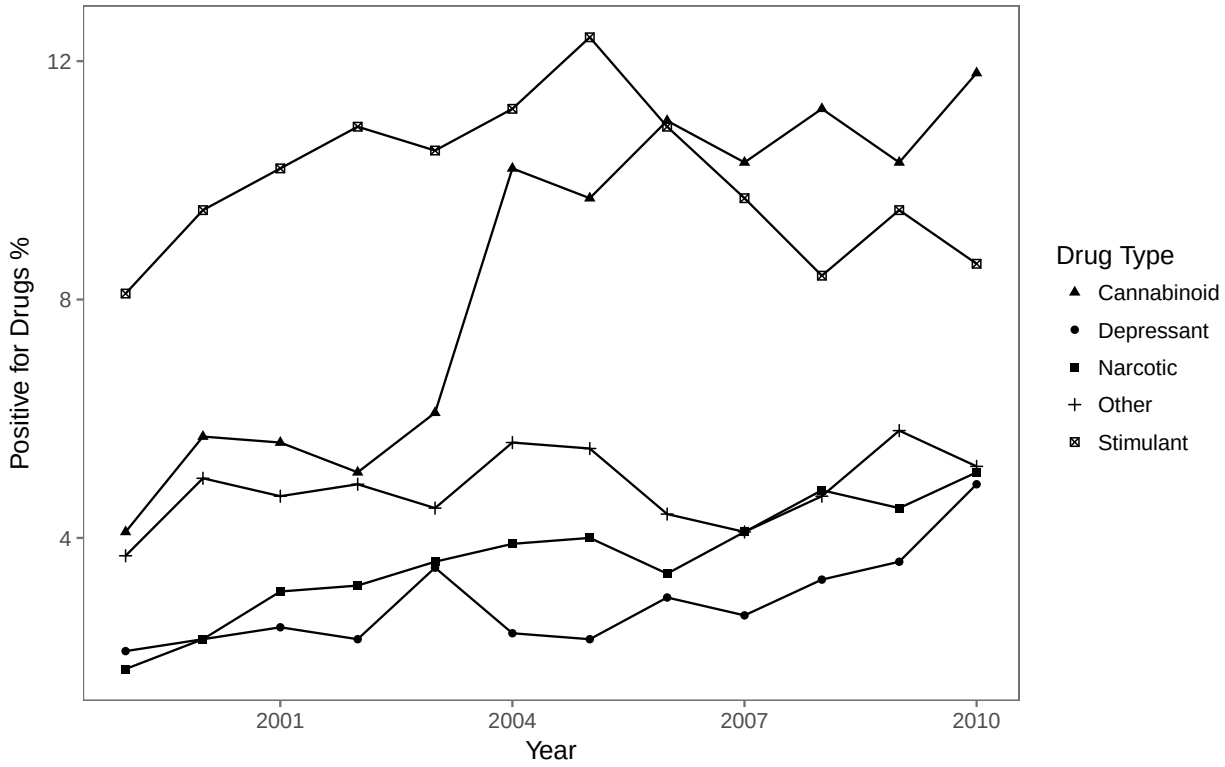
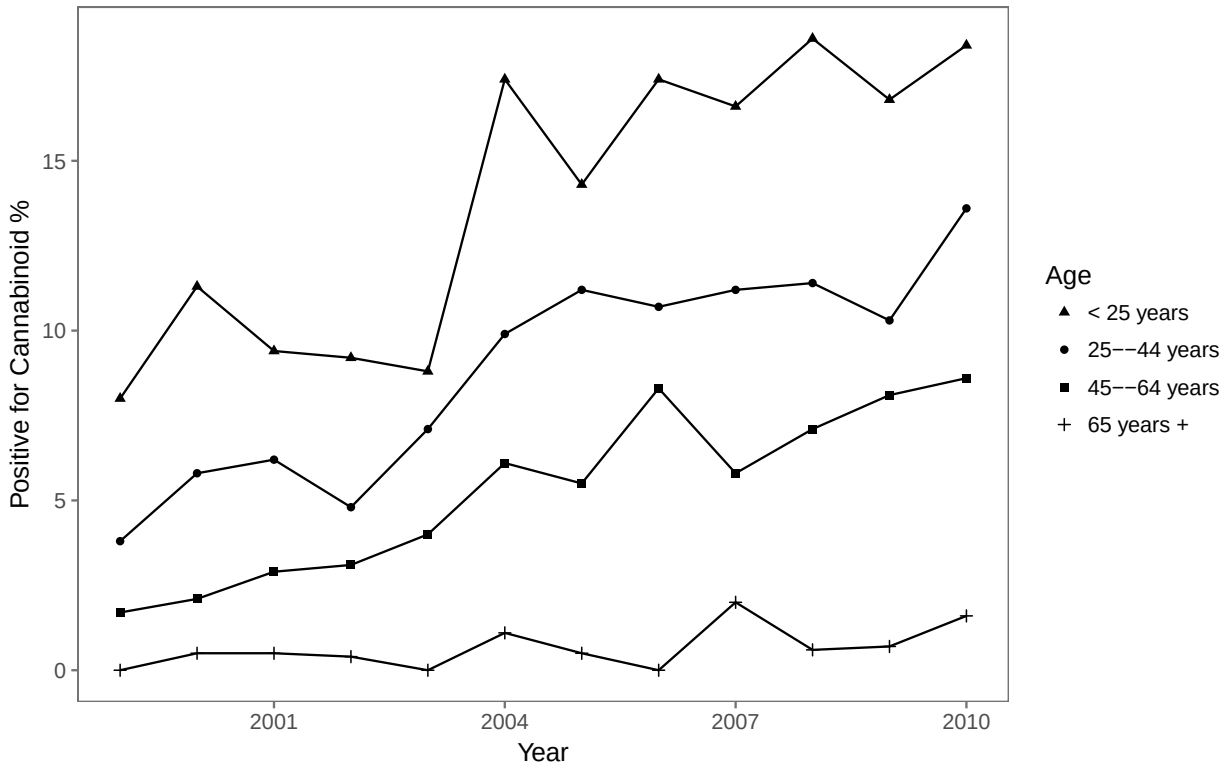


Figure 3: Prevelance of cannabinoid drugs in fatally injured drivers by year and age group

```
clean_fars %>%
  group_by(agecat, year, drug_type) %>%

  summarize(n_non_missing = sum(!is.na(positive_for_drug)),
            positive_test = sum(positive_for_drug, na.rm = TRUE),
            perc_positive = round(100 * positive_test / n_non_missing, 1)) %>%
 filter(drug_type == "Cannabinoid") %>%
  filter(!is.na(agecat)) %>%

ggplot(aes(year, perc_positive, position = agecat))+
  geom_line()+
  geom_point(aes(shape = agecat))+
  scale_shape_manual("Age",values = c(17,16,15, 3))+
  theme_few()+
  labs (x="Year",
      y="Positive for Cannabinoid %")
```



Prevalence of drugs in fatally injured drivers for 1999 and 2010 by drug type

```
first_prevalence <- clean_fars %>%
      filter(year %in% c("1999", "2010")) %>%
      group_by(drug_type, year) %>%
      summarize(positive = sum(positive_for_drug, na.rm = TRUE),
                trials = sum(!is.na(positive_for_drug)))

second_prevalence <- data.frame(prevalence = perc_cis(x = first_prevalence$positive,
                                            n = first_prevalence$trials))

first_prevalence<- tibble::rowid_to_column(as.data.frame(first_prevalence, var = "rowid"))
second_prevalence <- tibble::rowid_to_column(as.data.frame(second_prevalence, var = "rowid"))

prev_final <- first_prevalence %>%
  full_join(second_prevalence, by = "rowid") %>%
  select(drug_type, year, prevalence) %>%
  spread(key = year, value = prevalence) %>%
  rename(`Drug type` = drug_type)
kable(prev_final)
```

Drug type	1999	2010
Alcohol	38.7% (36.5%, 40.9%)	39.1% (36.7%, 41.5%)
Cannabinoid	4.1% (3.1%, 5%)	11.8% (10.2%, 13.4%)
Depressant	2.1% (1.5%, 2.8%)	4.9% (3.8%, 5.9%)
Narcotic	1.8% (1.2%, 2.5%)	5.1% (4%, 6.2%)
Other	3.7% (2.9%, 4.6%)	5.2% (4.1%, 6.3%)
Stimulant	8.1% (6.8%, 9.4%)	8.6% (7.2%, 9.9%)

Statistics for testing for trend in prevalence of drugs over study years by drug type using Cochran-Armitage trend test

```
drug_list <- c("Alcohol", "Nonalcohol", "Narcotic", "Depressant",
               "Stimulant", "Cannabinoid", "Other")
drug_trend_tests_ca <- lapply(drug_list, test_trend_ca)
drug_trend_tests_ca <- dplyr::bind_rows(drug_trend_tests_ca) %>%
  dplyr::mutate(drug = drug_list) %>%
  dplyr::select(drug, Z, p.value)
drug_trend_tests_ca %>%
  kable()
```

drug	Z	p.value
Alcohol	1.2	0.228
Nonalcohol	9.9	0.000
Narcotic	6.7	0.000
Depressant	4.7	0.000
Stimulant	0.5	0.604
Cannabinoid	13.6	0.000
Other	1.4	0.157

Statistics for testing for trend in prevalence of drugs over study years by drug type using Wald test of logistic regression coefficient for "year"

```
drug_list <- c("Alcohol", "Nonalcohol", "Narcotic", "Depressant",
"Stimulant", "Cannabinoid", "Other")
drug_trend_tests_log_reg <- lapply(drug_list, test_trend_log_reg)
drug_trend_tests_log_reg <- bind_rows(drug_trend_tests_log_reg) %>%
mutate(drug = drug_list) %>%
select(drug, Z, p.value)
drug_trend_tests_log_reg %>%
kable()
```

drug	Z	p.value
Alcohol	1.2	0.228
Nonalcohol	9.9	0.000
Narcotic	6.6	0.000
Depressant	4.7	0.000
Stimulant	-0.5	0.604
Cannabinoid	13.5	0.000
Other	1.4	0.158