```r
library(plyr)
library(dplyr)
```

```
##
## Attaching package:  ’dplyr’
## The following objects are masked from ’package:plyr’:
##
##    arrange, count, desc, failwith, id, mutate, rename, summarise,
##    summarize
## The following objects are masked from ’package:stats’:
##
##    filter, lag
## The following objects are masked from ’package:base’:
##
##    intersect, setdiff, setequal, union
```

```r
library(tidyr)
library(lubridate)
```

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

```r
library(ggplot2)
library(grid)

library(MMWRweek)
library(cdcfluview)

get_legend_grob <- function(x) {
  data <- ggplot2:::ggplot_build(x)

  plot <- data$plot
  panel <- data$panel
  data <- data$data
  theme <- ggplot2:::plot_theme(plot)
  position <- theme$legend.position
  if (length(position) == 2) {
    position <- "manual"
  }

  legend_box <- if (position != "none") {
    ggplot2:::build_guides(plot$scales, plot$layers, plot$mapping,
      position, theme, plot$guides, plot$labels)
  } else {
    ggplot2:::zeroGrob()
  }
  if (ggplot2:::is.zero(legend_box)) {
    position <- "none"
  }
  else {
    legend_width <- gtable:::gtable_width(legend_box) + theme$legend.margin
    legend_height <- gtable:::gtable_height(legend_box) + theme$legend.margin
    just <- valid.just(theme$legend.justification)
    xjust <- just[1]
    yjust <- just[2]
    if (position == "manual") {
      xpos <- theme$legend.position[1]
      ypos <- theme$legend.position[2]
      legend_box <- editGrob(legend_box, vp = viewport(x = xpos,
        y = ypos, just = c(xjust, yjust), height = legend_height,
        width = legend_width))
    }
    else {
      legend_box <- editGrob(legend_box, vp = viewport(x = xjust,
        y = yjust, just = c(xjust, yjust)))
    }
  }
  return(legend_box)
}
```

```
regionflu <- get_flu_data("hhs",
  sub_region = 1:10,
  data_source = "who",
  years=1997:2017)
usflu <- get_flu_data("national",
  sub_region = NA,
  data_source = "who",
  years=1997:2017)

regionflu_ilinet <- get_flu_data("hhs",
  sub_region = 1:10,
  data_source = "ilinet",
  years=1997:2017)
usflu_ilinet <- get_flu_data("national",
  sub_region = NA,
  data_source = "ilinet",
  years=1997:2017)

flu_ilinet <- rbind.fill(usflu_ilinet, regionflu_ilinet) %>%
  transmute(
    region_type = `REGION TYPE`,
    region = REGION,
    year = YEAR,
    week = WEEK,
    wILI = as.numeric(`% WEIGHTED ILI`),
    ILI = as.numeric(`%UNWEIGHTED ILI`),
    total_ILI = as.numeric(ILITOTAL),
    total_patients = as.numeric(`TOTAL PATIENTS`)
  ) %>%
  mutate(
    time = MMWRweek2Date(year, week)
  )
```

```
## Warning in evalq(as.numeric(c("1.10148", "1.20007", "1.37876", "1.1992",
:  NAs introduced by coercion
## Warning in evalq(as.numeric(c("1.21686", "1.28064", "1.23906", "1.14473",
:  NAs introduced by coercion
## Warning in evalq(as.numeric(c("570", "615", "681", "653", "700",
"655", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("46842", "48023", "54961", "57044",
"55506", :  NAs introduced by coercion
```

```
flu_ilinet$season <- ifelse(
  flu_ilinet$week <= 30,
  paste0(flu_ilinet$year - 1, "/", flu_ilinet$year),
  paste0(flu_ilinet$year, "/", flu_ilinet$year + 1)
)

## Season week column: week number within season
## weeks after week 30 get season_week = week - 30
## weeks before week 30 get season_week = week + (number of weeks in previous year) - 30
## This computation relies on the start_date function in package MMWRweek,
## which is not exported from that package's namespace!!!
flu_ilinet$season_week <- ifelse(
  flu_ilinet$week <= 30,
  flu_ilinet$week + MMWRweek(MMWRweek:::start_date(flu_ilinet$year) - 1)$MMWRweek - 30,
  flu_ilinet$week - 30
)


flu_merged <- rbind.fill(
```

```r
usflu[[1]] %>%
  transmute(
    region_type = `REGION TYPE`,
    region = REGION,
    year = YEAR,
    week = WEEK,
    total_specimens = as.numeric(`TOTAL SPECIMENS`),
    total_A = as.numeric(`A (2009 H1N1)`) +
      as.numeric(`A (H1)`) +
      as.numeric(`A (H3)`) +
      as.numeric(`A (Subtyping not Performed)`) +
      as.numeric(`A (Unable to Subtype)`) +
      as.numeric(H3N2v),
    total_A_typed = as.numeric(`A (2009 H1N1)`) +
      as.numeric(`A (H1)`) +
      as.numeric(`A (H3)`) +
      as.numeric(H3N2v),
    total_A_2009H1N1 = as.numeric(`A (2009 H1N1)`),
    total_A_H1 = as.numeric(`A (H1)`),
    total_A_H3 = as.numeric(`A (H3)`),
    total_A_H3N2v = as.numeric(H3N2v),
    total_B = as.numeric(B),
    percent_positive = as.numeric(`PERCENT POSITIVE`),
    percent_A = total_A / total_specimens * 100,
    percent_A_2009H1N1 = as.numeric(`A (2009 H1N1)`) / total_specimens * 100,
    percent_A_H1 = as.numeric(`A (H1)`) / total_specimens * 100,
    percent_A_H3 = as.numeric(`A (H3)`) / total_specimens * 100,
    percent_A_H3N2v = as.numeric(H3N2v) / total_specimens * 100,
    percent_B = total_B / total_specimens * 100,
    percent_A_2009H1N1_rel_typed_A = as.numeric(`A (2009 H1N1)`) / total_A_typed * 100,
    percent_A_H1_rel_typed_A = as.numeric(`A (H1)`) / total_A_typed * 100,
    percent_A_H3_rel_typed_A = as.numeric(`A (H3)`) / total_A_typed * 100,
    percent_A_H3N2v_rel_typed_A = as.numeric(H3N2v) / total_A_typed * 100
  ),
regionflu[[1]] %>%
  transmute(
    region_type = `REGION TYPE`,
    region = REGION,
    year = YEAR,
    week = WEEK,
    total_specimens = as.numeric(`TOTAL SPECIMENS`),
    total_A = as.numeric(`A (2009 H1N1)`) +
      as.numeric(`A (H1)`) +
      as.numeric(`A (H3)`) +
      as.numeric(`A (Subtyping not Performed)`) +
      as.numeric(`A (Unable to Subtype)`) +
      as.numeric(H3N2v),
    total_A_typed = as.numeric(`A (2009 H1N1)`) +
      as.numeric(`A (H1)`) +
      as.numeric(`A (H3)`) +
      as.numeric(H3N2v),
    total_A_2009H1N1 = as.numeric(`A (2009 H1N1)`),
    total_A_H1 = as.numeric(`A (H1)`),
    total_A_H3 = as.numeric(`A (H3)`),
    total_A_H3N2v = as.numeric(H3N2v),
    total_B = as.numeric(B),
    percent_positive = as.numeric(`PERCENT POSITIVE`),
    percent_A = total_A / total_specimens * 100,
    percent_A_2009H1N1 = as.numeric(`A (2009 H1N1)`) / total_specimens * 100,
    percent_A_H1 = as.numeric(`A (H1)`) / total_specimens * 100,
    percent_A_H3 = as.numeric(`A (H3)`) / total_specimens * 100,
    percent_A_H3N2v = as.numeric(H3N2v) / total_specimens * 100,
    percent_B = total_B / total_specimens * 100,
    percent_A_2009H1N1_rel_typed_A = as.numeric(`A (2009 H1N1)`) / total_A_typed * 100,
    percent_A_H1_rel_typed_A = as.numeric(`A (H1)`) / total_A_typed * 100,
    percent_A_H3_rel_typed_A = as.numeric(`A (H3)`) / total_A_typed * 100,
    percent_A_H3N2v_rel_typed_A = as.numeric(H3N2v) / total_A_typed * 100
  )
) %>%
mutate(
  time = MMWRweek2Date(year, week)
)
```

```
## Warning in evalq(as.numeric(c("1291", "1513", "1552", "1669", "1897",
"2106", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
```

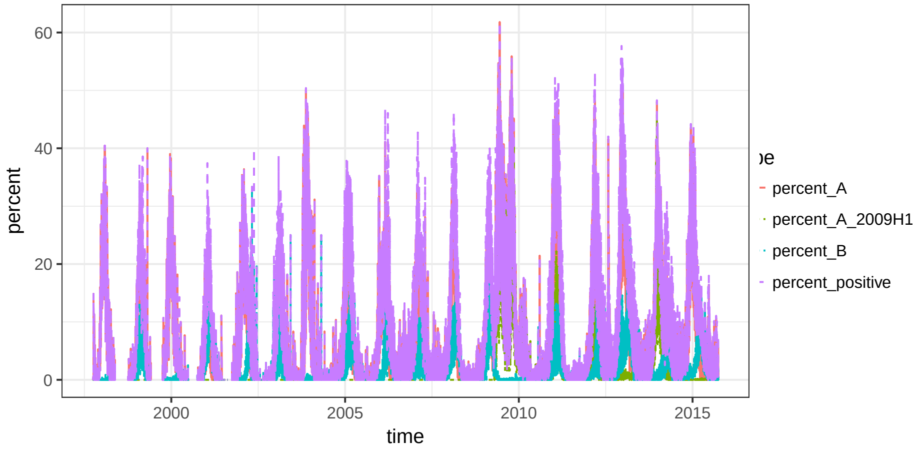
```
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "3", "0", "9", "0", "3",
"5", "14", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "1", "0", "0", "0", "1",
"1", "1", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0.727032", "1.09536", "0.419413",
"0.527148", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "3", "0", "9", "0", "3",
"5", "14", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "3", "0", "9", "0", "3",
"5", "14", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("51", "152", "143", "98", "147", "343",
"133", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
```

```
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0",
"0", "0", :  NAs introduced by coercion
```

```
flu_merged$season <- ifelse(
  flu_merged$week <= 30,
  paste0(flu_merged$year - 1, "/", flu_merged$year),
  paste0(flu_merged$year, "/", flu_merged$year + 1)
)
```

```
## Season week column: week number within season
## weeks after week 30 get season_week = week - 30
## weeks before week 30 get season_week = week + (number of weeks in previous year) - 30
## This computation relies on the start_date function in package MMWRweek,
## which is not exported from that package's namespace!!!
flu_merged$season_week <- ifelse(
  flu_merged$week <= 30,
  flu_merged$week + MMWRweek(MMWRweek:::start_date(flu_merged$year) - 1)$MMWRweek - 30,
  flu_merged$week - 30
)
```

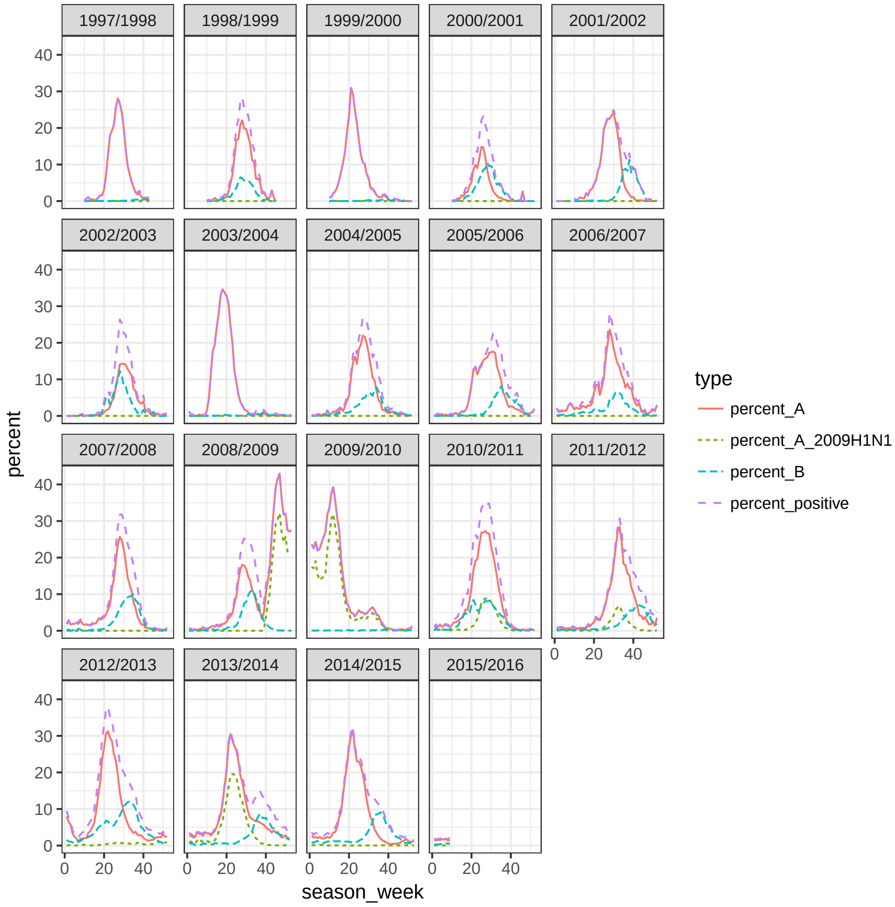
```
grid.newpage()
pushViewport(viewport(layout = grid.layout(nrow = 2, ncol = 2, widths = unit(c(1, 0.2), "nul

p_typed <- ggplot(flu_merged %>%
    gather_("type", "percent", c("percent_A", "percent_A_2009H1N1", "percent_B", "percent_po
  geom_line(aes(x = time, y = percent, colour = type, linetype = type)) +
  theme_bw()

type_legend <- get_legend_grob(p_typed)
p_typed <- p_typed +
  theme(legend.position = "none")

p_ilinet <- ggplot(flu_ilinet %>%
    filter(paste(year, week, sep = "_") %in% paste(usflu_merged$year, usflu_merged$week, sep
  ) +
  geom_line(aes(x = time, y = wILI)) +
  theme_bw()

## Error in filter_impl(.data, dots):  object ’usflu_merged’ not found

pushViewport(viewport(layout.pos.row = 1, layout.pos.col = 2))
grid.draw(type_legend)
upViewport()

print(p_typed, vp = viewport(layout.pos.row = 1, layout.pos.col = 1))
```



```
print(p_ilinet, vp = viewport(layout.pos.row = 2, layout.pos.col = 1))

## Error in print(p_ilinet, vp = viewport(layout.pos.row = 2, layout.pos.col
= 1)):  object 'p_ilinet' not found
```

```
region_val <- "X"
season_val <- "2000/2001"

p_typed <- ggplot(flu_merged %>%
    filter(region == region_val) %>%
    gather_("type", "percent", c("percent_A", "percent_A_2009H1N1", "percent_B", "percent_po
  geom_line(aes(x = season_week, y = percent, colour = type, linetype = type)) +
  facet_wrap(~ season) +
  theme_bw()
```

```
print(p_typed)
```


1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015
2015/2016
percent
season_week
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive