```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
```

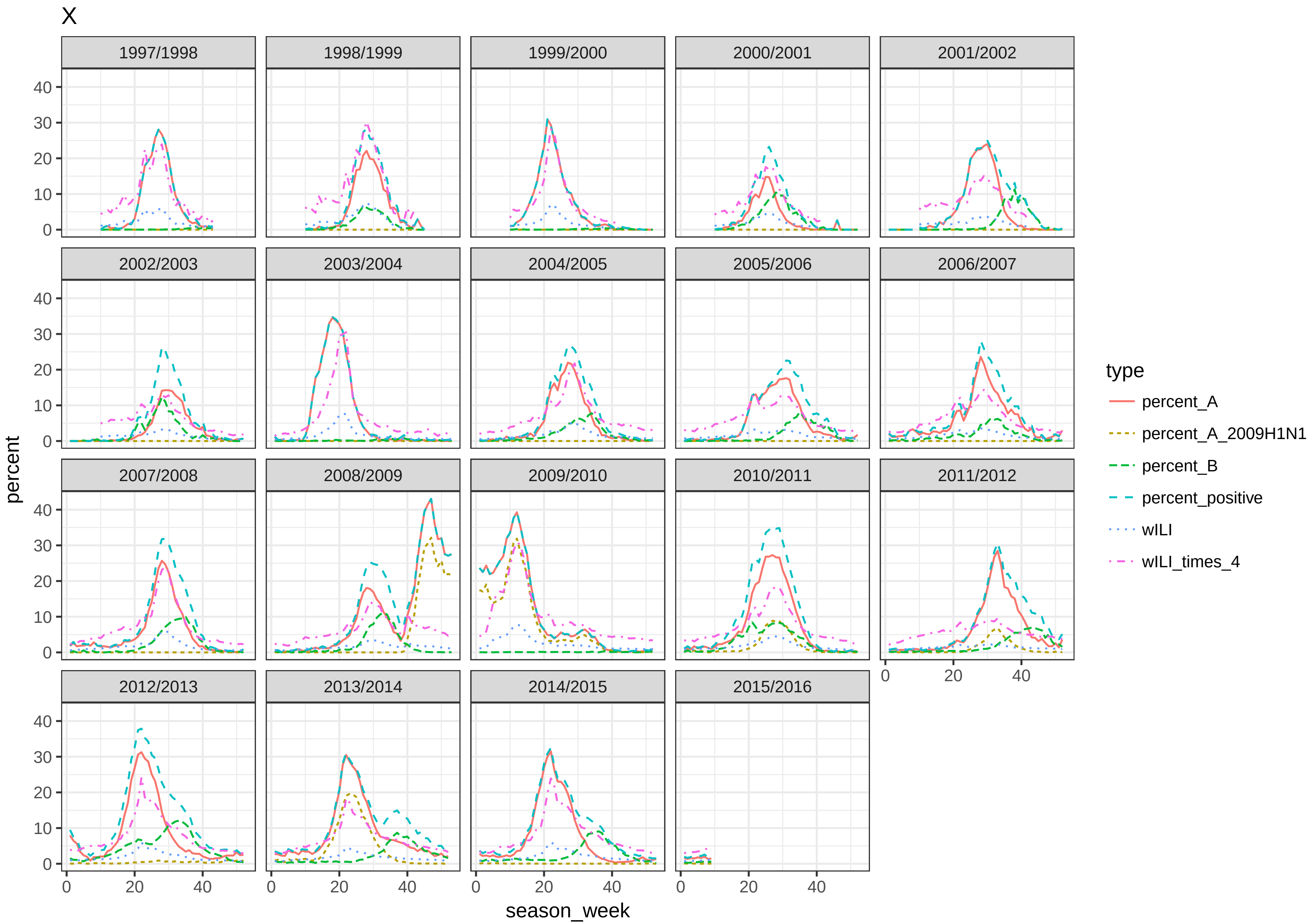
```r
library(ggplot2)
library(grid)

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)

flu_merged <- rbind.fill(
  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)
  )
```

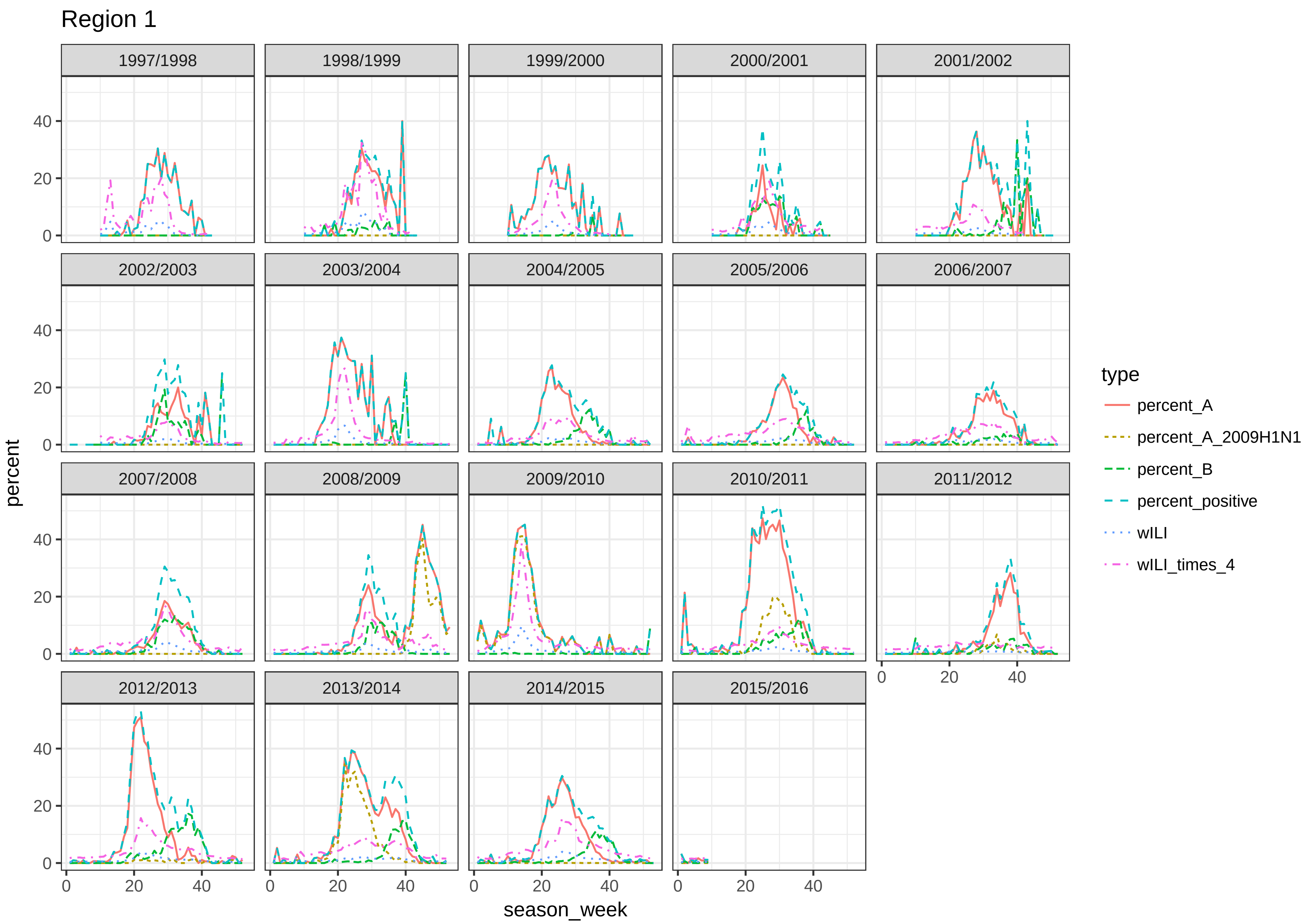
```
## Warning in evalq(as.numeric(c("1291", "1513", "1552", "1669", "1897", "2106", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0", "0", "0", :  NAs introduced by coercion
## Warning in evalq(as.numeric(c("0", "0", "0", "0", "0", "0", "0", "0", "0",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

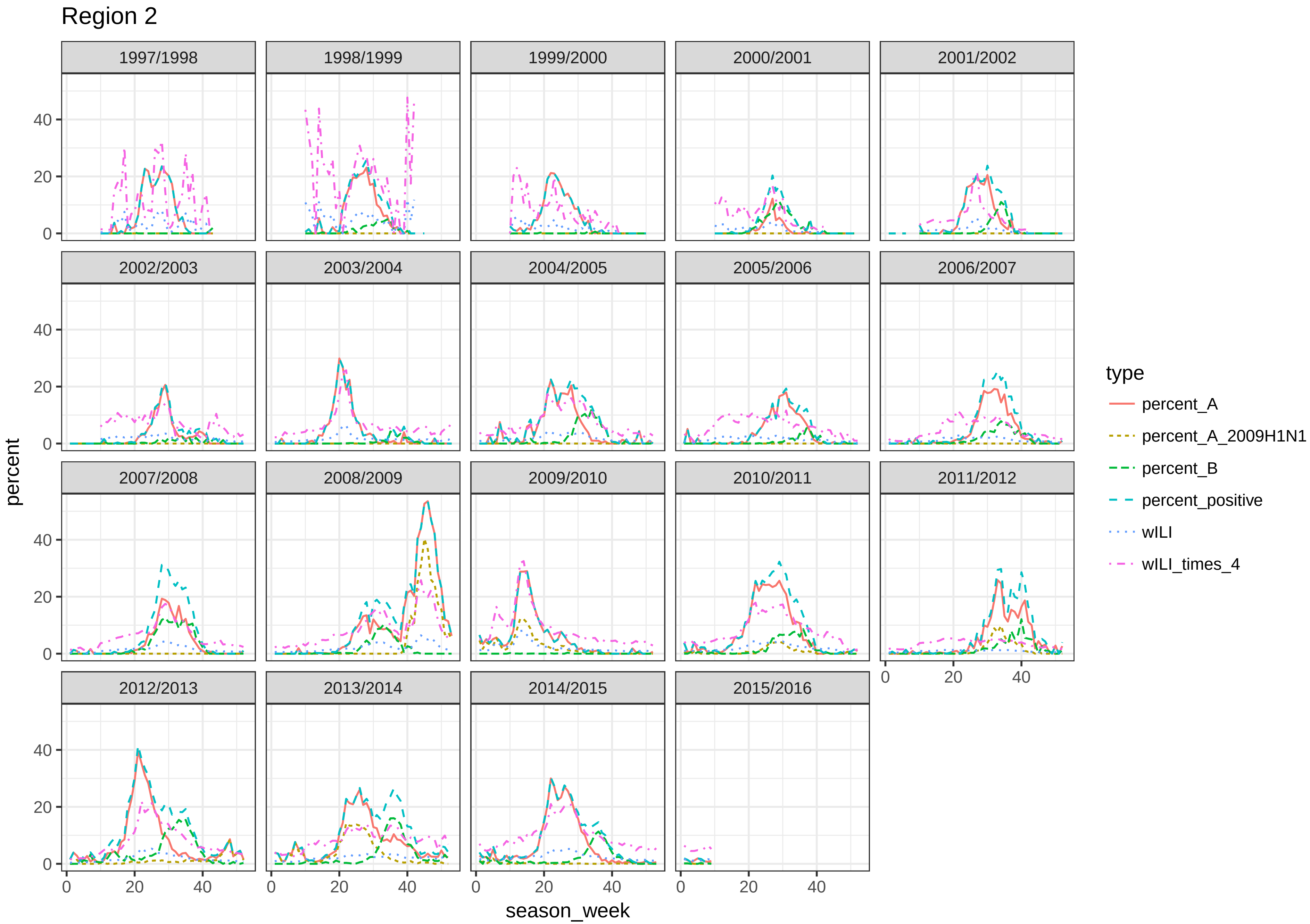
```
flu_merged$season <- ifelse(
  flu_merged$week <= 30,
  paste0(flu_merged$year - 1, "/", flu_merged$year),
  paste0(flu_merged$year, "/", flu_merged$year + 1)
)

## 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
)

flu_typed <- flu_merged

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

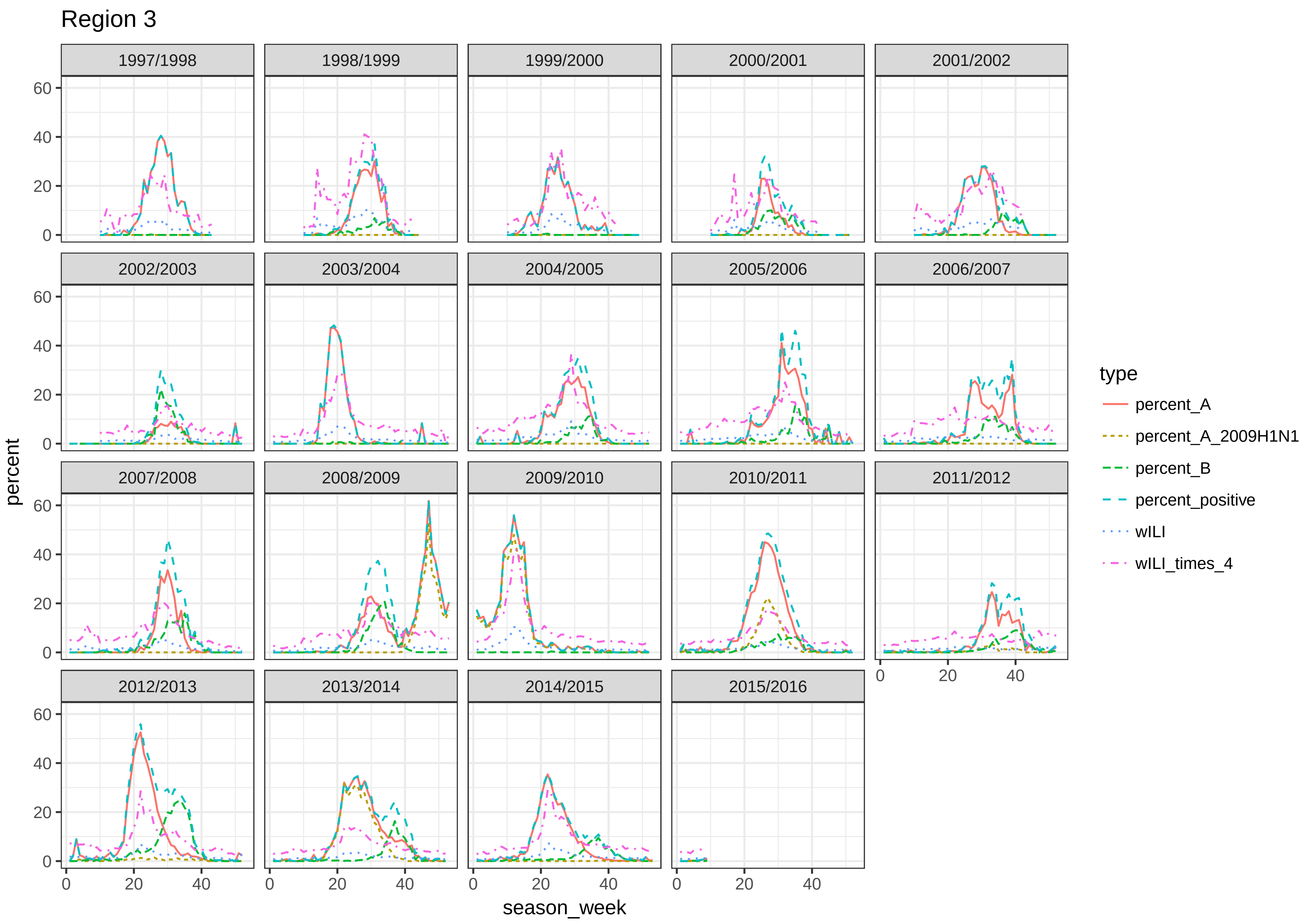
```r
flu_wili <- rbind.fill(usflu, regionflu) %>%
  transmute(
    region_type = `REGION TYPE`,
    region = REGION,
    year = YEAR,
    week = WEEK,
    wILI = as.numeric(`% WEIGHTED ILI`),
    ILI = as.numeric(`%UNWEIGHTED ILI`),
    total_ILI = as.numeric(ILITOTAL),
    total_patients = as.numeric(`TOTAL PATIENTS`)
  )

## 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 <- left_join(flu_typed, flu_wili,
  by = c("region_type", "region", "year", "week"))
```

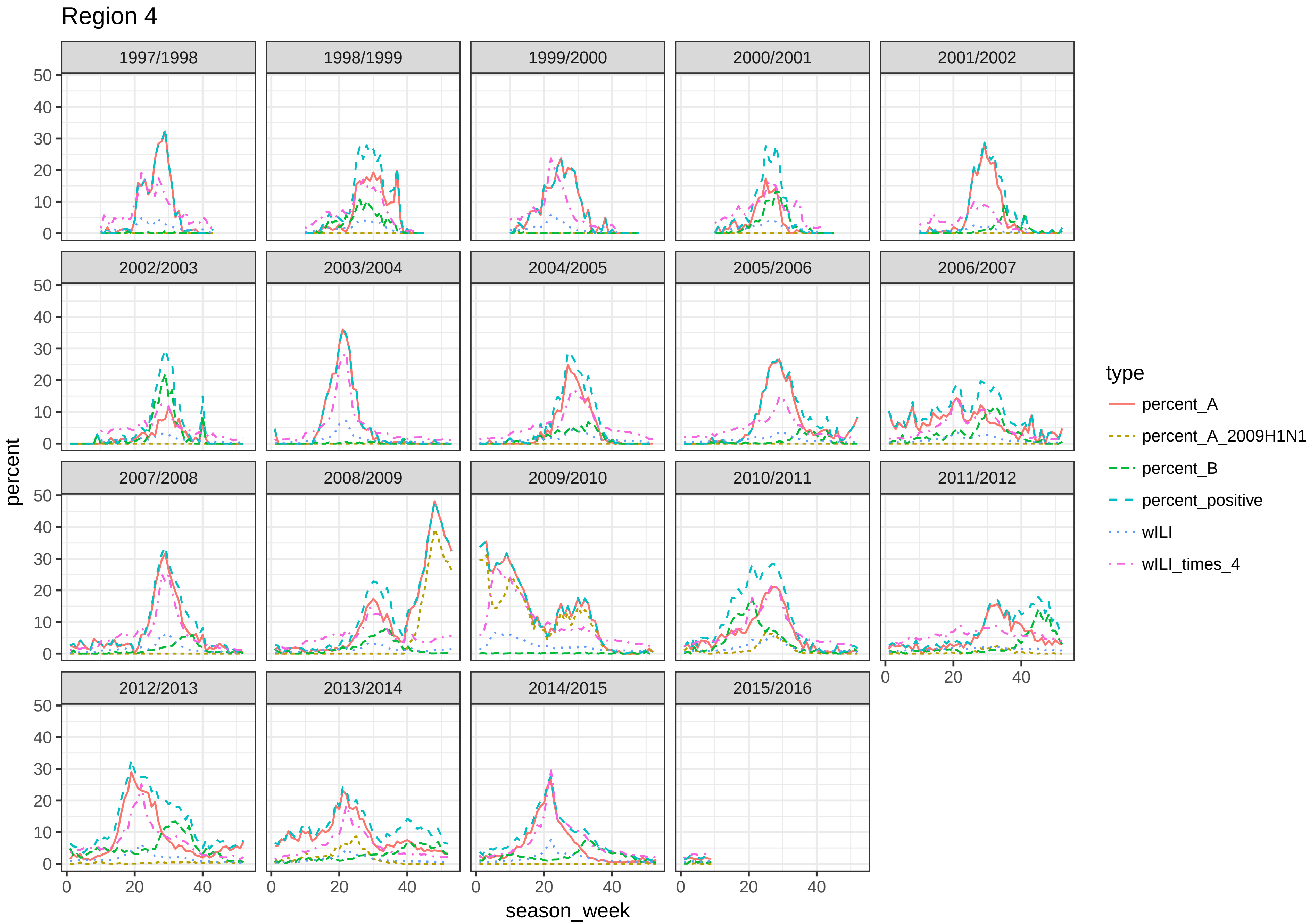
```r
flu$wILI_times_4 <- flu$wILI * 4

for(region_val in unique(flu$region)) {
  region_flu <- flu %>% filter(region == region_val)

#  for(season_val in unique(region_flu£season)) {
    p_typed <- ggplot(region_flu %>%
#        filter(season == season_val) %>%
        gather_("type", "percent", c("percent_A", "percent_A_2009H1N1", "percent_B", "percent_positive", "wILI", "wILI_times_4"))) +
      geom_line(aes(x = season_week, y = percent, colour = type, linetype = type)) +
      facet_wrap(~ season) +
      ggtitle(region_val) +
      theme_bw()

    print(p_typed)
#  }
}
```


X
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
0
10
20
30
40
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4

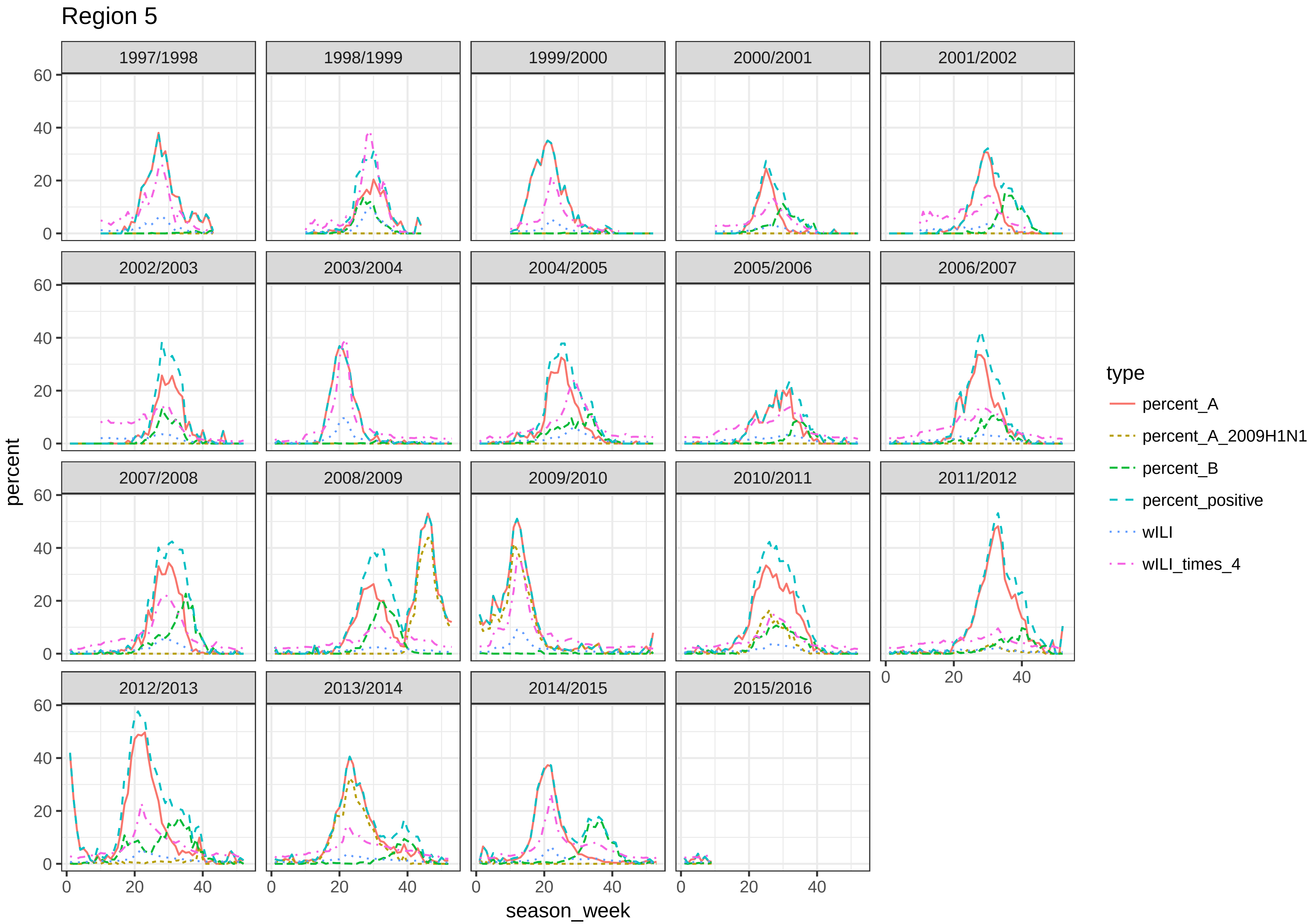

Region 1
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015
2015/2016
0
20
40
percent
season_week
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4

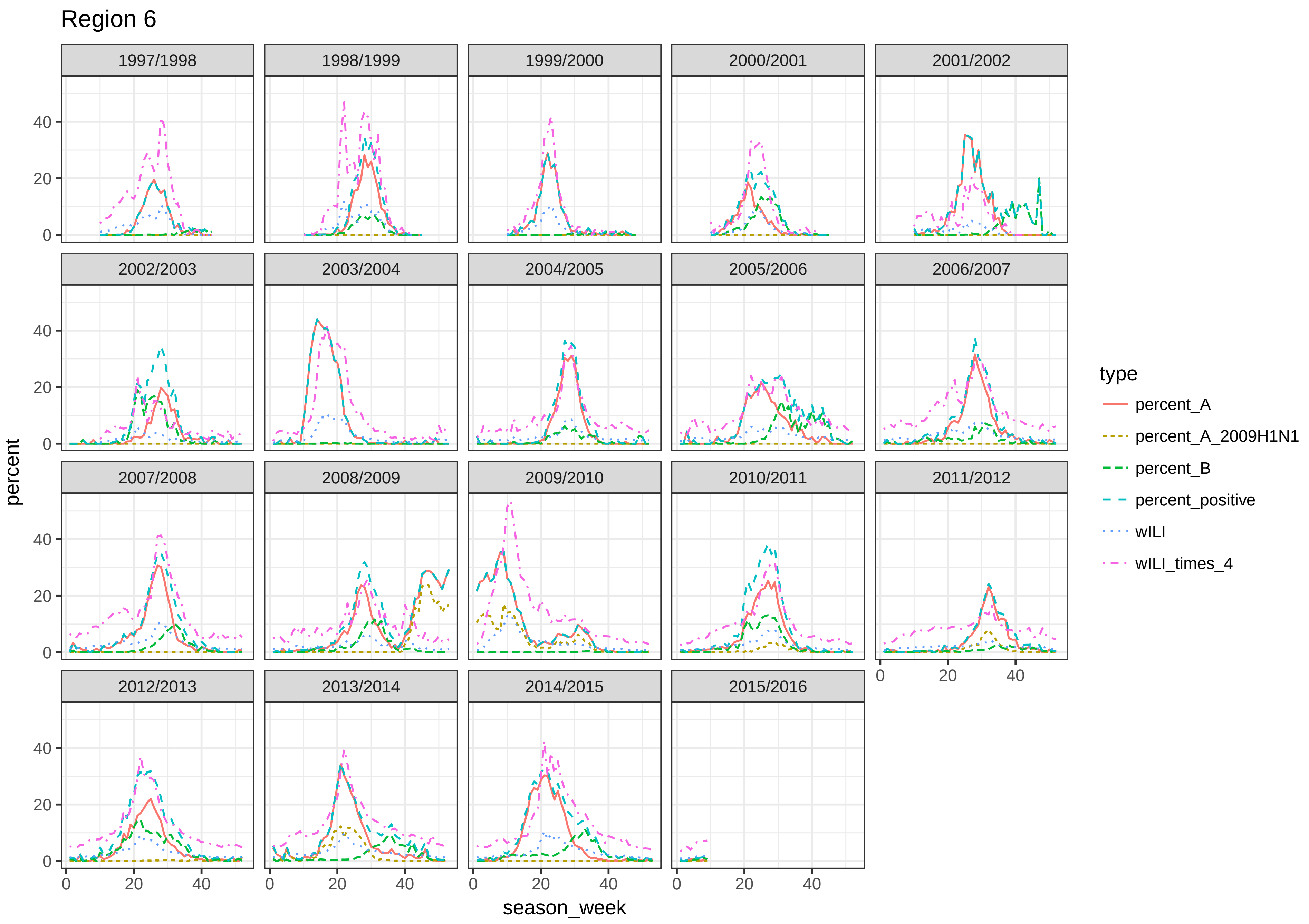

Region 2
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015
2015/2016
percent
0
20
40
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4

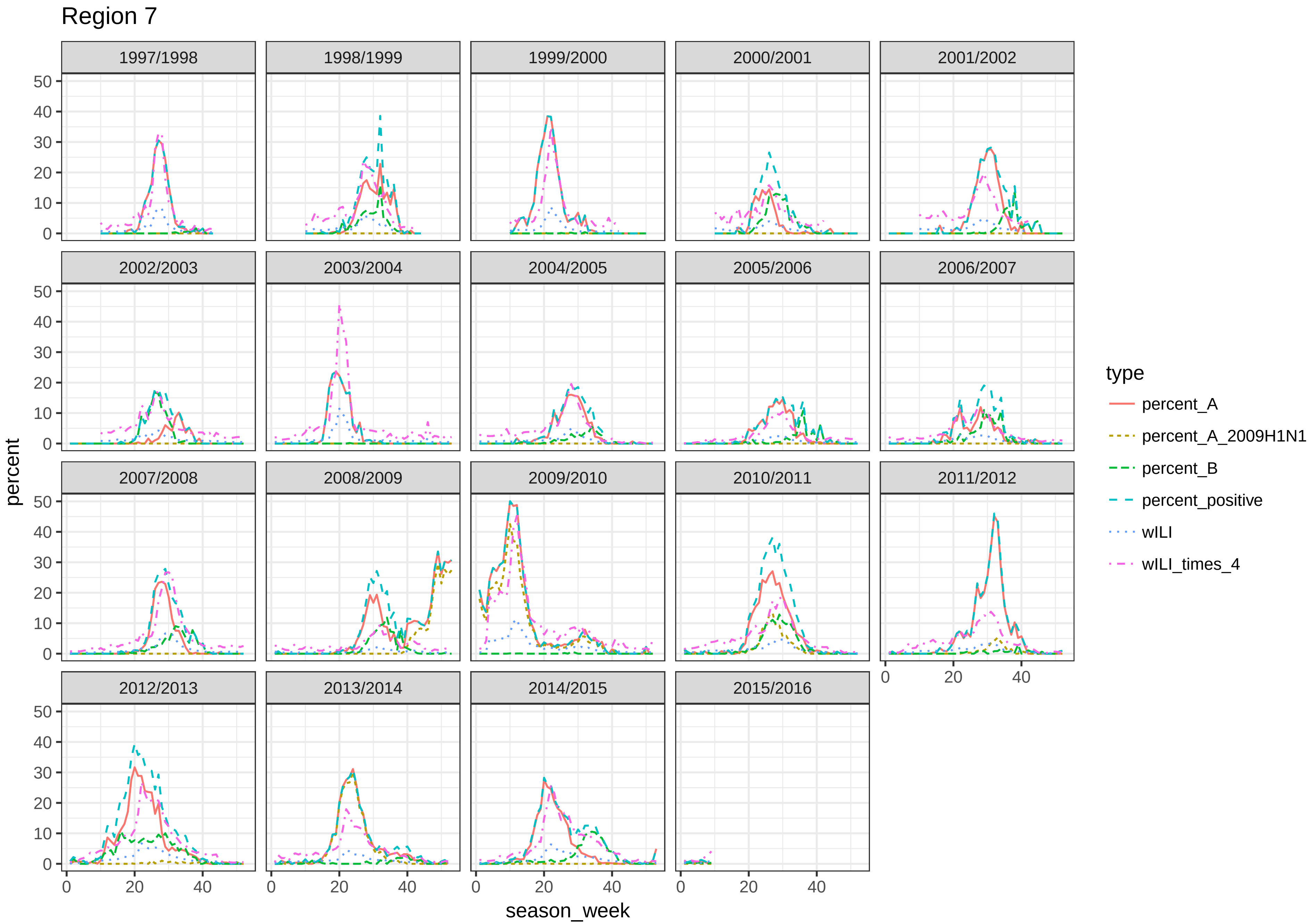

Region 3
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015
2015/2016
percent
60
40
20
0
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4

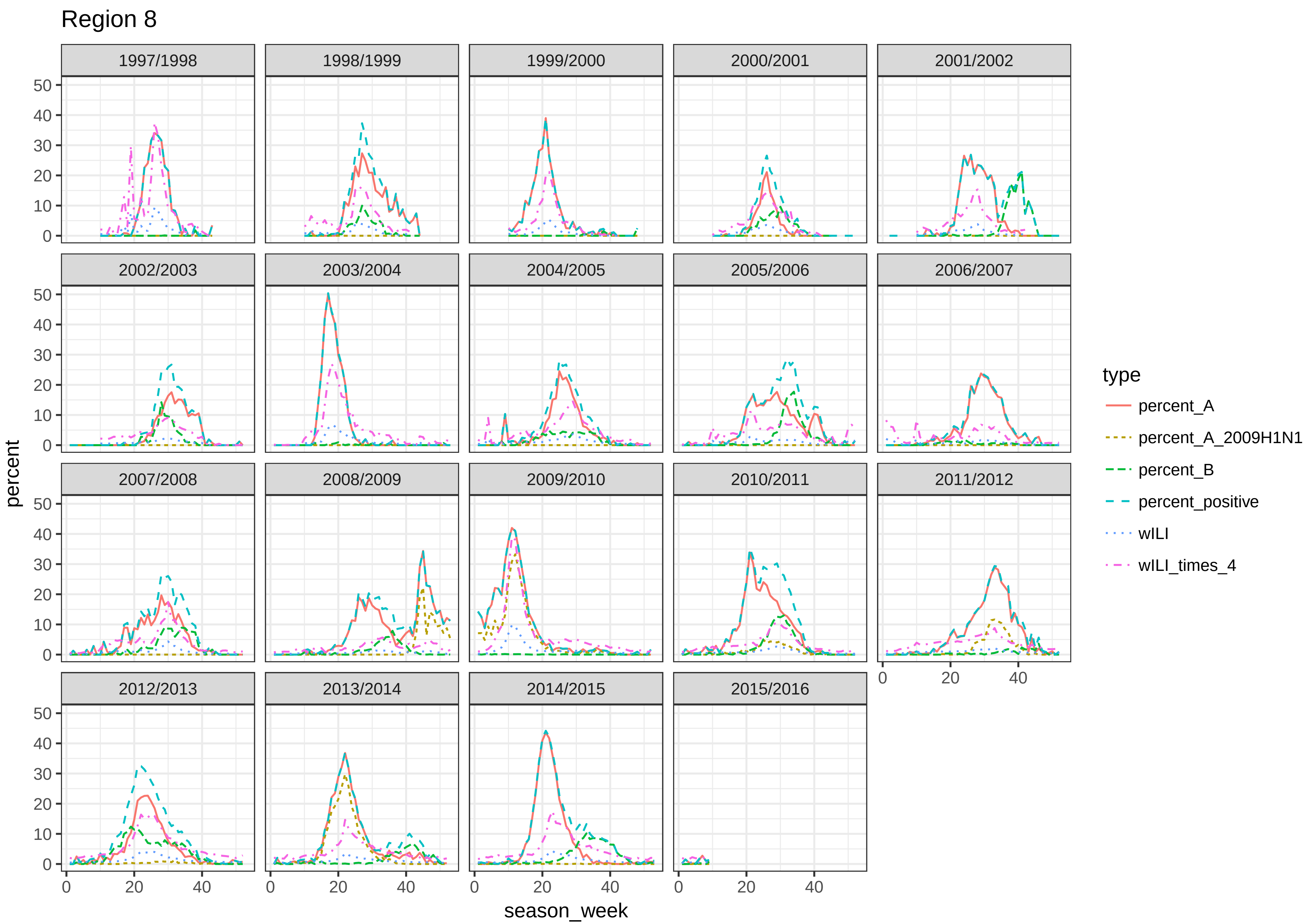


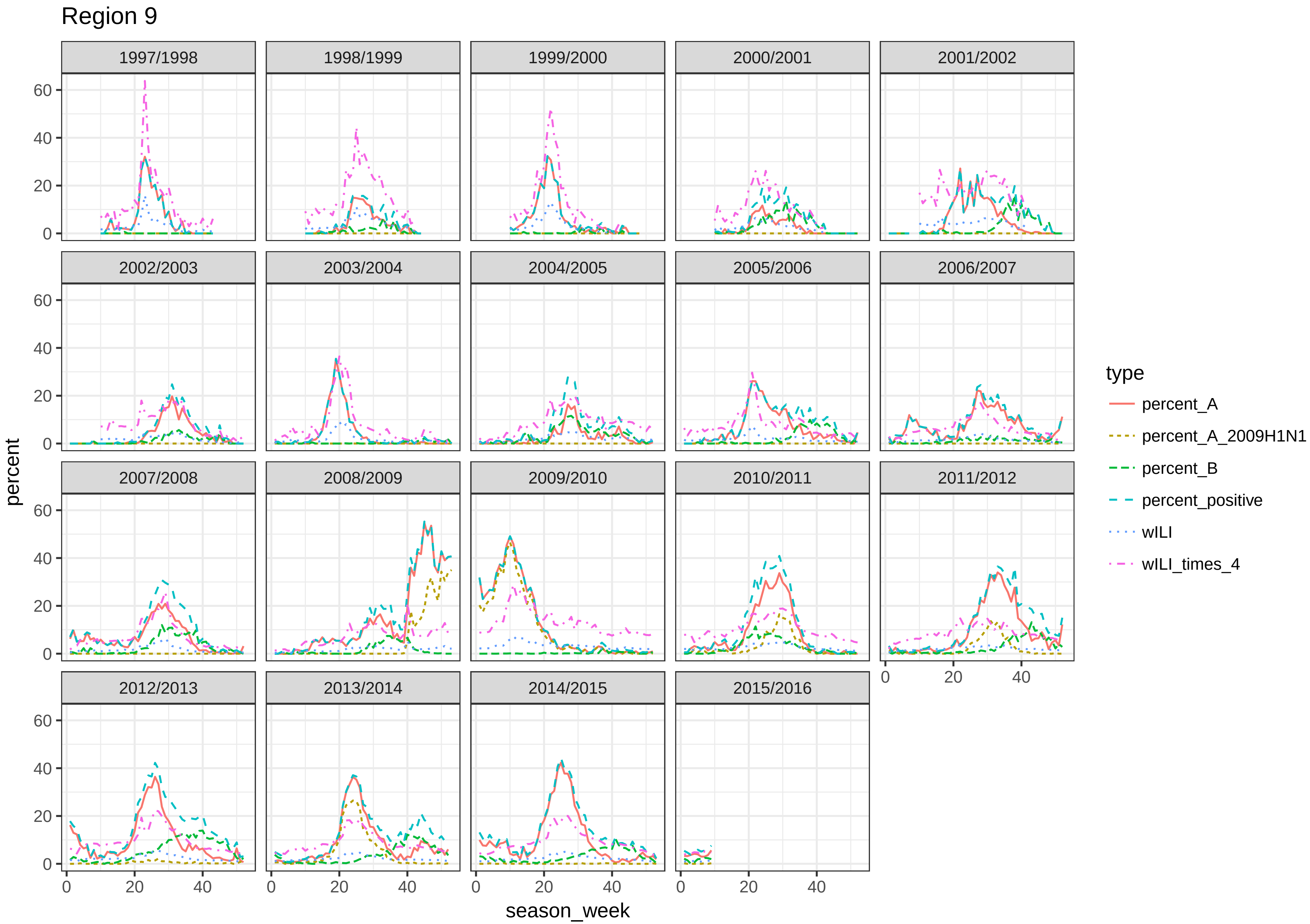
Region 4
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015
2015/2016
percent
0
10
20
30
40
50
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4

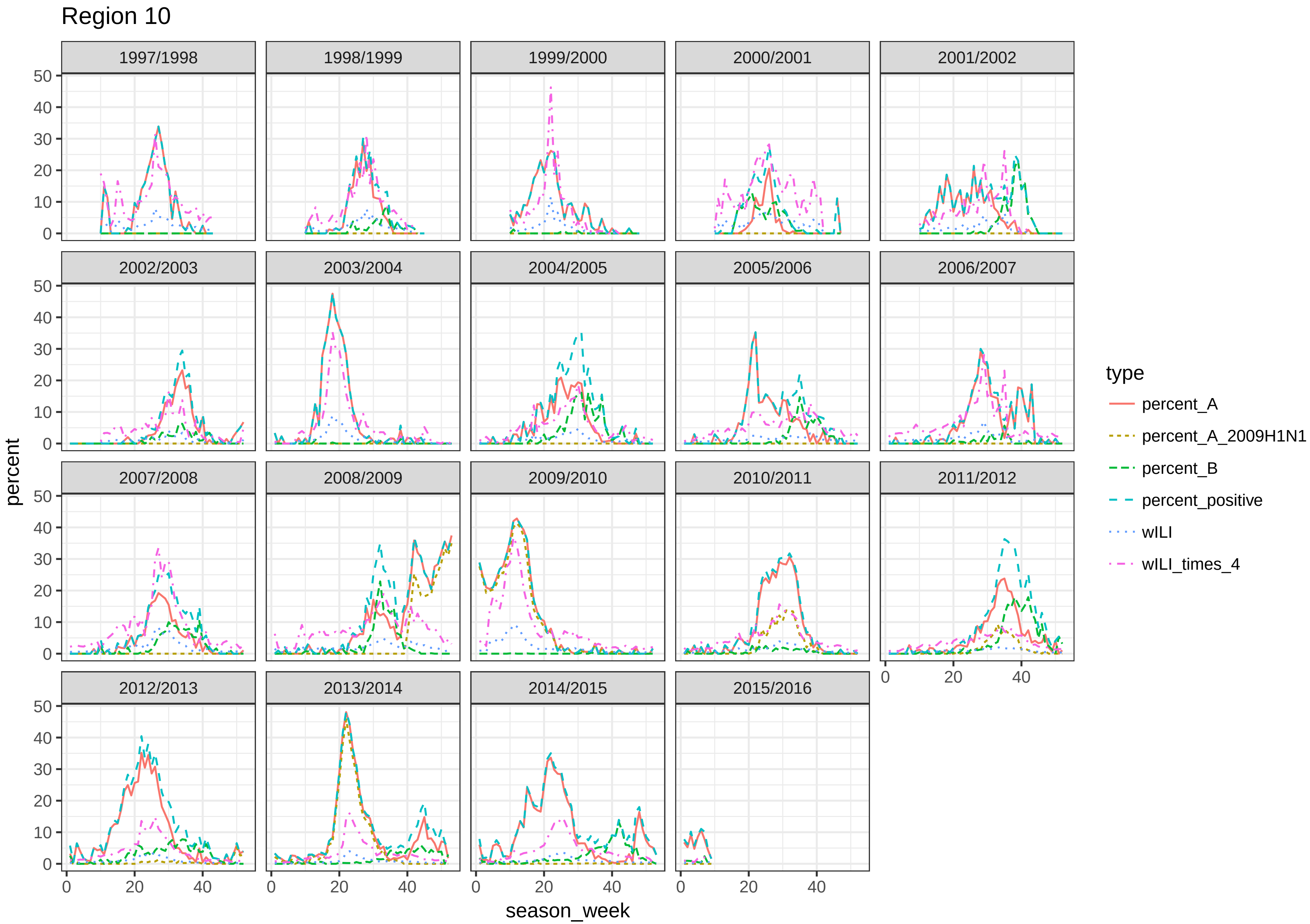

Region 5
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011
2011/2012
2012/2013
2013/2014
2014/2015
2015/2016
percent
0
20
40
60
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4


Region 6
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
0
20
40
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4


Region 7
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
0
10
20
30
40
50
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4


Region 8
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
0
10
20
30
40
50
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4


Region 9
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
0
20
40
60
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4


Region 10
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002
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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
0
10
20
30
40
50
season_week
0
20
40
type
percent_A
percent_A_2009H1N1
percent_B
percent_positive
wILI
wILI_times_4