

Charlotte Wickham's purrr tutorial

The code demonstrated here are from Charlotte Wickham's purrr-tutorial. She gave a two day tutorial at the 2017 UseR, YouTube Solving iteration problems with purrr day1 and YouTube Solving iteration problems with purrr II day2.

Here is the link to the <http://bit.ly/purrr-slides>.

I also find that Sharon Machlis purrr videos are quite useful. `map_df`

Day 1 of Charlotte's purrr tutorial

```
library(pacman)
p_load(tidyverse, repurrrsive, nycflights13, fs, glue, babynames, Lahman, tidymodels)
```

```
data(sw_films)
# View(sw_films)
```

```
data(sw_people)
# View(sw_people)
```

```
data(sw_planets)
# View(sw_planets)
```

```
data(sw_species)
# View(sw_species)
```

```
data(sw_starships)
# View(sw_starships)
```

```
data(sw_vehicles)
# View(sw_vehicles)
```

```
sw_people %>% map_chr(~ length(.x[["starships"]]))
```

```
## [1] "2" "0" "0" "1" "0" "0" "0" "0" "1" "5" "3" "0" "2" "2" "0" "0" "1" "1" "0"
## [20] "0" "1" "0" "0" "1" "0" "0" "0" "1" "0" "1" "0" "0" "0" "0" "0" "0" "1" "0"
## [39] "0" "0" "0" "1" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "1" "0" "1"
## [58] "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0" "0"
## [77] "1" "0" "0" "0" "0" "0" "0" "1" "0" "0" "3"
```

```
sw_people %>% map_chr(~ .x[["hair_color"]])
```

```
## [1] "blond"      "n/a"      "n/a"      "none"
## [5] "brown"     "brown, grey" "brown"    "n/a"
## [9] "black"     "auburn, white" "blond"    "auburn, grey"
## [13] "brown"     "brown"     "n/a"      "n/a"
## [17] "brown"     "brown"     "white"    "grey"
## [21] "black"     "none"      "none"     "black"
```

```
## [25] "none"      "none"      "auburn"    "brown"
## [29] "brown"     "none"      "brown"     "none"
## [33] "blond"     "none"      "none"      "none"
## [37] "brown"     "black"     "none"      "black"
## [41] "black"     "none"      "none"      "none"
## [45] "none"      "none"      "none"      "none"
## [49] "white"     "none"      "black"     "none"
## [53] "none"      "none"      "none"      "none"
## [57] "black"     "brown"     "brown"     "none"
## [61] "black"     "black"     "brown"     "white"
## [65] "black"     "black"     "blonde"    "none"
## [69] "none"      "none"      "white"     "none"
## [73] "none"      "none"      "none"      "none"
## [77] "none"      "brown"     "brown"     "none"
## [81] "none"      "black"     "brown"     "brown"
## [85] "none"      "unknown"   "brown"
```

```
sw_people %>% map_lgl(~ .x[["gender"]] == "male")
```

```
## [1] TRUE FALSE FALSE TRUE FALSE TRUE FALSE FALSE TRUE TRUE TRUE TRUE
## [13] TRUE TRUE TRUE FALSE TRUE TRUE TRUE TRUE TRUE TRUE FALSE TRUE TRUE
## [25] TRUE TRUE FALSE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [37] TRUE TRUE TRUE TRUE FALSE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [49] TRUE TRUE TRUE FALSE TRUE TRUE TRUE TRUE TRUE TRUE FALSE TRUE TRUE
## [61] FALSE FALSE FALSE TRUE TRUE TRUE FALSE TRUE TRUE FALSE FALSE TRUE
## [73] FALSE TRUE TRUE FALSE TRUE TRUE TRUE FALSE TRUE TRUE TRUE FALSE TRUE
## [85] FALSE FALSE FALSE
```

```
sw_people %>% map_dbl(~ as.numeric(.x[["mass"]]))
```

```
## [1] 77.0 75.0 32.0 136.0 49.0 120.0 75.0 32.0 84.0 77.0 84.0 NA
## [13] 112.0 80.0 74.0 NA 77.0 110.0 17.0 75.0 78.2 140.0 113.0 79.0
## [25] 79.0 83.0 NA NA 20.0 68.0 89.0 90.0 NA 66.0 82.0 NA
## [37] NA NA 40.0 NA NA 80.0 NA 55.0 45.0 NA 65.0 84.0
## [49] 82.0 87.0 NA 50.0 NA NA 80.0 NA 85.0 NA NA 80.0
## [61] 56.2 50.0 NA 80.0 NA 79.0 55.0 102.0 88.0 NA NA 15.0
## [73] NA 48.0 NA 57.0 159.0 136.0 79.0 48.0 80.0 NA NA NA
## [85] NA NA 45.0
```

```
sw_people %>% map_dbl(~ parse_number(.x[["mass"]]))
```

```
## [1] 77.0 75.0 32.0 136.0 49.0 120.0 75.0 32.0 84.0 77.0
## [11] 84.0 NA 112.0 80.0 74.0 1358.0 77.0 110.0 17.0 75.0
## [21] 78.2 140.0 113.0 79.0 79.0 83.0 NA NA 20.0 68.0
## [31] 89.0 90.0 NA 66.0 82.0 NA NA NA 40.0 NA
## [41] NA 80.0 NA 55.0 45.0 NA 65.0 84.0 82.0 87.0
## [51] NA 50.0 NA NA 80.0 NA 85.0 NA NA 80.0
## [61] 56.2 50.0 NA 80.0 NA 79.0 55.0 102.0 88.0 NA
## [71] NA 15.0 NA 48.0 NA 57.0 159.0 136.0 79.0 48.0
## [81] 80.0 NA NA NA NA NA 45.0
```

```
sw_people %>% map("starships") %>%
  map_int(length)
```

```
## [1] 2 0 0 1 0 0 0 0 1 5 3 0 2 2 0 0 1 1 0 0 1 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 1 0
## [39] 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [77] 1 0 0 0 0 0 0 1 0 0 3
```

```
planet_lookup <- sw_planets %>% map_chr("name") %>%
  set_names(map_chr(sw_planets, "url"))
planet_lookup
```

```
## http://swapi.co/api/planets/2/ http://swapi.co/api/planets/3/
## "Alderaan" "Yavin IV"
## http://swapi.co/api/planets/4/ http://swapi.co/api/planets/5/
## "Hoth" "Dagobah"
## http://swapi.co/api/planets/6/ http://swapi.co/api/planets/7/
## "Bespin" "Endor"
## http://swapi.co/api/planets/8/ http://swapi.co/api/planets/9/
## "Naboo" "Coruscant"
## http://swapi.co/api/planets/10/ http://swapi.co/api/planets/11/
## "Kamino" "Geonosis"
## http://swapi.co/api/planets/12/ http://swapi.co/api/planets/13/
## "Utapau" "Mustafar"
## http://swapi.co/api/planets/14/ http://swapi.co/api/planets/15/
## "Kashyyyk" "Polis Massa"
## http://swapi.co/api/planets/16/ http://swapi.co/api/planets/17/
## "Mygeeto" "Felucia"
## http://swapi.co/api/planets/18/ http://swapi.co/api/planets/19/
## "Cato Neimoidia" "Saleucami"
## http://swapi.co/api/planets/20/ http://swapi.co/api/planets/21/
## "Stewjon" "Eriadu"
## http://swapi.co/api/planets/22/ http://swapi.co/api/planets/23/
## "Corellia" "Rodia"
## http://swapi.co/api/planets/24/ http://swapi.co/api/planets/25/
## "Nal Hutta" "Dantooine"
## http://swapi.co/api/planets/26/ http://swapi.co/api/planets/27/
## "Bestine IV" "Ord Mantell"
## http://swapi.co/api/planets/28/ http://swapi.co/api/planets/29/
## "unknown" "Trandosha"
## http://swapi.co/api/planets/30/ http://swapi.co/api/planets/31/
## "Socorro" "Mon Cala"
## http://swapi.co/api/planets/32/ http://swapi.co/api/planets/33/
## "Chandrila" "Sullust"
## http://swapi.co/api/planets/34/ http://swapi.co/api/planets/35/
## "Toydaria" "Malastare"
## http://swapi.co/api/planets/36/ http://swapi.co/api/planets/37/
## "Dathomir" "Ryloth"
## http://swapi.co/api/planets/38/ http://swapi.co/api/planets/39/
## "Aleen Minor" "Vulpter"
## http://swapi.co/api/planets/40/ http://swapi.co/api/planets/41/
## "Troiken" "Tund"
## http://swapi.co/api/planets/42/ http://swapi.co/api/planets/43/
## "Haruun Kal" "Cerea"
## http://swapi.co/api/planets/44/ http://swapi.co/api/planets/45/
## "Glee Anselm" "Iridonia"
## http://swapi.co/api/planets/46/ http://swapi.co/api/planets/47/
## "Tholoth" "Iktotch"
## http://swapi.co/api/planets/48/ http://swapi.co/api/planets/49/
## "Quermia" "Dorin"
## http://swapi.co/api/planets/50/ http://swapi.co/api/planets/51/
## "Champala" "Mirial"
```

```
## http://swapi.co/api/planets/52/ http://swapi.co/api/planets/53/
##          "Serenno"          "Concord Dawn"
## http://swapi.co/api/planets/54/ http://swapi.co/api/planets/55/
##          "Zolan"          "Ojom"
## http://swapi.co/api/planets/56/ http://swapi.co/api/planets/57/
##          "Skako"          "Muunilinst"
## http://swapi.co/api/planets/58/ http://swapi.co/api/planets/59/
##          "Shili"          "Kalee"
## http://swapi.co/api/planets/60/ http://swapi.co/api/planets/1/
##          "Umbara"          "Tatooine"
## http://swapi.co/api/planets/61/
##          "Jakku"
```

Challenges:

1. Which film (see `sw_films`) has the most characters?

Answers:

2. Which `sw_species` has the most possible eye colors?

Answers:

3. Which `sw_planets` do we know the least about (i.e. have the most “unknown” entries)?

Answers:

Solutions:

1. Which film (see `sw_films`) has the most characters?

Answers: Attack of the Clones

```
# do one.
length(sw_films[[1]]$characters)
```

```
## [1] 18
```

```
sw_films %>% map("characters") %>%
  map_int(~ length(.x)) %>%
  set_names(map_chr(sw_films, "title"))
```

```
##          A New Hope      Attack of the Clones      The Phantom Menace
##              18              40              34
##  Revenge of the Sith      Return of the Jedi The Empire Strikes Back
##              34              20              16
##      The Force Awakens
##              11
```

```
sw_films %>% map("characters") %>%
  map_int(length) %>%
  set_names(map_chr(sw_films, "title")) %>%
  sort(decreasing = TRUE)
```

```
##      Attack of the Clones      The Phantom Menace      Revenge of the Sith
##              40              34              34
##      Return of the Jedi      A New Hope The Empire Strikes Back
```

```
##                20                18                16
##      The Force Awakens
##                11
```

2. Which `sw_species` has the most possible eye colors?

Answers: Mirialan, Togruta, Wookiee, Human

```
# do one
length(unlist(str_split(sw_species[[1]]$"eye_colors", ", ")))
```

```
## [1] 2
```

```
sw_species %>% map_chr("eye_colors") %>%
  stringr::str_split(", ") %>%
  map_int(length) %>%
  set_names(map_chr(sw_species, "name")) %>%
  sort(decreasing = TRUE)
```

```
##      Mirialan      Togruta      Wookiee      Human      Twi'lek
##          6          6          6          6          4
## Yoda's species      Hutt      Trandoshan      Ewok      Neimodian
##          3          2          2          2          2
##          Dug      Zabrak      Tholothian      Kel Dor      Geonosian
##          2          2          2          2          2
## Mon Calamari      Sullustan      Gungan      Toydarian      Aleena
##          1          1          1          1          1
##      Vulptereen      Xexto      Toong      Cerean      Nautolan
##          1          1          1          1          1
##      Iktotchi      Quermian      Chagrian      Clawdite      Besalisk
##          1          1          1          1          1
##      Kaminoan      Skakoan      Muun      Kaleesh      Pau'an
##          1          1          1          1          1
##      Droid      Rodian
##          1          1
```

3. Which `sw_planets` do we know the least about (i.e. have the most “unknown” entries)?

Answers: Aleen Minor, Tholoth, Quermia, Zolan, Umbara

```
sw_planets %>% map_int( ~ map_lgl(.x, ~ "unknown" %in% .x) %>%
  sum() ) %>%
  set_names(map_chr(sw_planets, "name")) %>%
  sort(decreasing = TRUE)
```

```
##      Aleen Minor      Tholoth      Quermia      Zolan      Umbara
##          8          8          8          8          8
##      Troiken      Mirial      Serenno      Concord Dawn      Jakku
##          7          7          7          7          7
##      unknown      Iridonia      Shili      Stewjon      Ojom
##          6          5          5          4          4
##      Tund      Iktotch      Dorin      Saleucami      Champala
##          3          3          3          2          2
##      Skako      Hoth      Dagobah      Coruscant      Mygeeto
##          2          1          1          1          1
##      Felucia Cato Neimoidia      Eriadu      Nal Hutta      Dantooine
##          1          1          1          1          1
##      Bestine IV      Trandosha      Socorro      Toydaria      Malastare
```

```
##           1           1           1           1           1
##      Dathomir      Vulpter      Haruun Kal      Cerea      Kalee
##           1           1           1           1           1
##      Alderaan      Yavin IV      Bespin      Endor      Naboo
##           0           0           0           0           0
##           Kamino      Geonosis      Utapau      Mustafar      Kashyyyk
##           0           0           0           0           0
##      Polis Massa      Corellia      Rodia      Ord Mantell      Mon Cala
##           0           0           0           0           0
##      Chandrila      Sullust      Ryloth      Glee Anselm      Muunilinst
##           0           0           0           0           0
##      Tatooine
##           0
```

Try Sharon's first Example

Read .csv files using map.

First, write some .csv files.

```
flights %>% filter(origin == "LGA") %>%
  write_csv("flights_LGA.csv")
flights %>% filter(origin == "EWR") %>%
  write_csv("flights_EWR.csv")
flights %>% filter(origin == "JFK") %>%
  write_csv("flights_JFK.csv")
```

```
myfiles <- list.files(pattern = ".csv")
myfiles
```

```
## [1] "flights_EWR.csv" "flights_JFK.csv" "flights_LGA.csv"
```

```
mydata <- myfiles %>% map_df(read_csv)
```

```
## Parsed with column specification:
## cols(
##   year = col_double(),
##   month = col_double(),
##   day = col_double(),
##   dep_time = col_double(),
##   sched_dep_time = col_double(),
##   dep_delay = col_double(),
##   arr_time = col_double(),
##   sched_arr_time = col_double(),
##   arr_delay = col_double(),
##   carrier = col_character(),
##   flight = col_double(),
##   tailnum = col_character(),
##   origin = col_character(),
##   dest = col_character(),
##   air_time = col_double(),
##   distance = col_double(),
##   hour = col_double(),
##   minute = col_double(),
##   time_hour = col_datetime(format = "")
```

```

## )
## Parsed with column specification:
## cols(
##   year = col_double(),
##   month = col_double(),
##   day = col_double(),
##   dep_time = col_double(),
##   sched_dep_time = col_double(),
##   dep_delay = col_double(),
##   arr_time = col_double(),
##   sched_arr_time = col_double(),
##   arr_delay = col_double(),
##   carrier = col_character(),
##   flight = col_double(),
##   tailnum = col_character(),
##   origin = col_character(),
##   dest = col_character(),
##   air_time = col_double(),
##   distance = col_double(),
##   hour = col_double(),
##   minute = col_double(),
##   time_hour = col_datetime(format = "")
## )
## Parsed with column specification:
## cols(
##   year = col_double(),
##   month = col_double(),
##   day = col_double(),
##   dep_time = col_double(),
##   sched_dep_time = col_double(),
##   dep_delay = col_double(),
##   arr_time = col_double(),
##   sched_arr_time = col_double(),
##   arr_delay = col_double(),
##   carrier = col_character(),
##   flight = col_double(),
##   tailnum = col_character(),
##   origin = col_character(),
##   dest = col_character(),
##   air_time = col_double(),
##   distance = col_double(),
##   hour = col_double(),
##   minute = col_double(),
##   time_hour = col_datetime(format = "")
## )

```

```
dim(flights)
```

```
## [1] 336776      19
```

```
dim(mydata)
```

```
## [1] 336776      19
```

```
file_delete(glue("{myfiles}"))
```

Day 2 of Charlotte's purrr tutorial

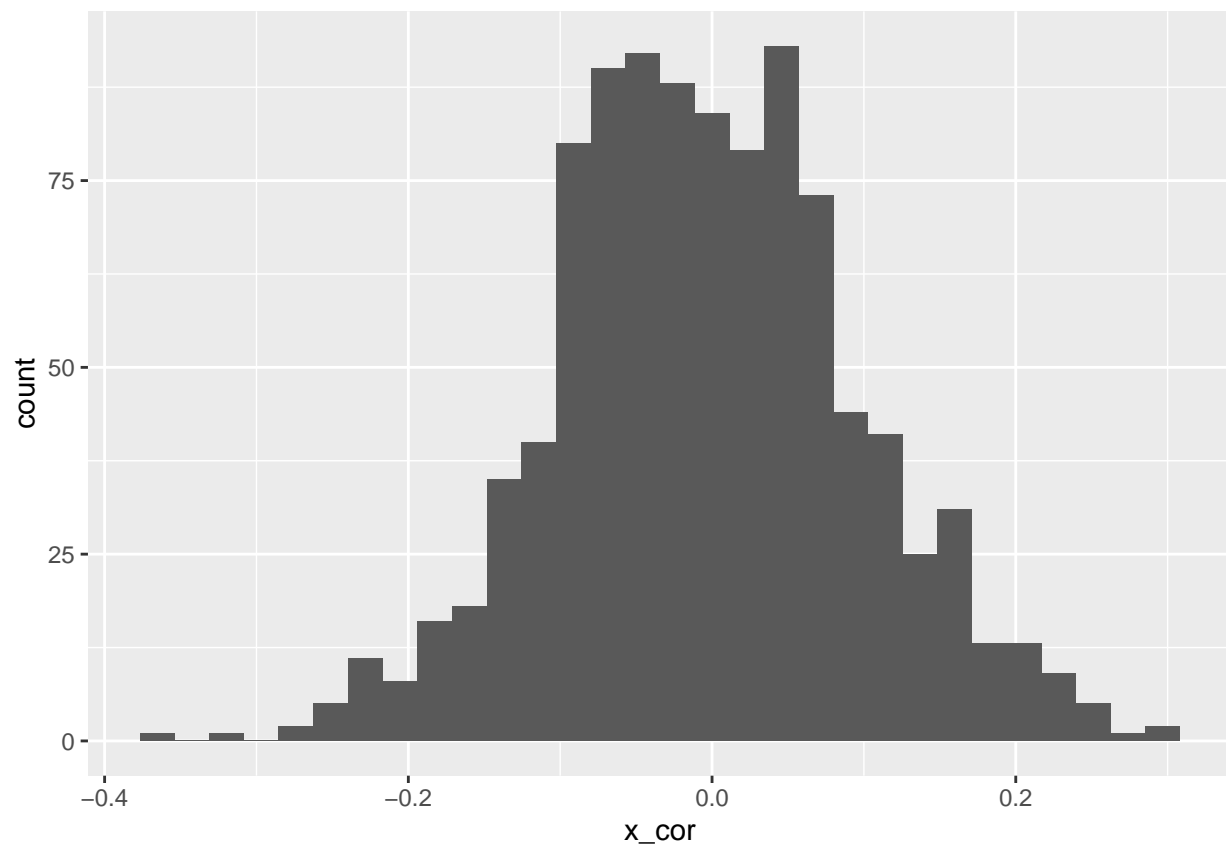
Try rerun().

```
x <- 3 %>% rerun(rnorm(100)) %>%  
  map(mean)  
x
```

```
## [[1]]  
## [1] -0.06692614  
##  
## [[2]]  
## [1] -0.112098  
##  
## [[3]]  
## [1] -0.217729
```

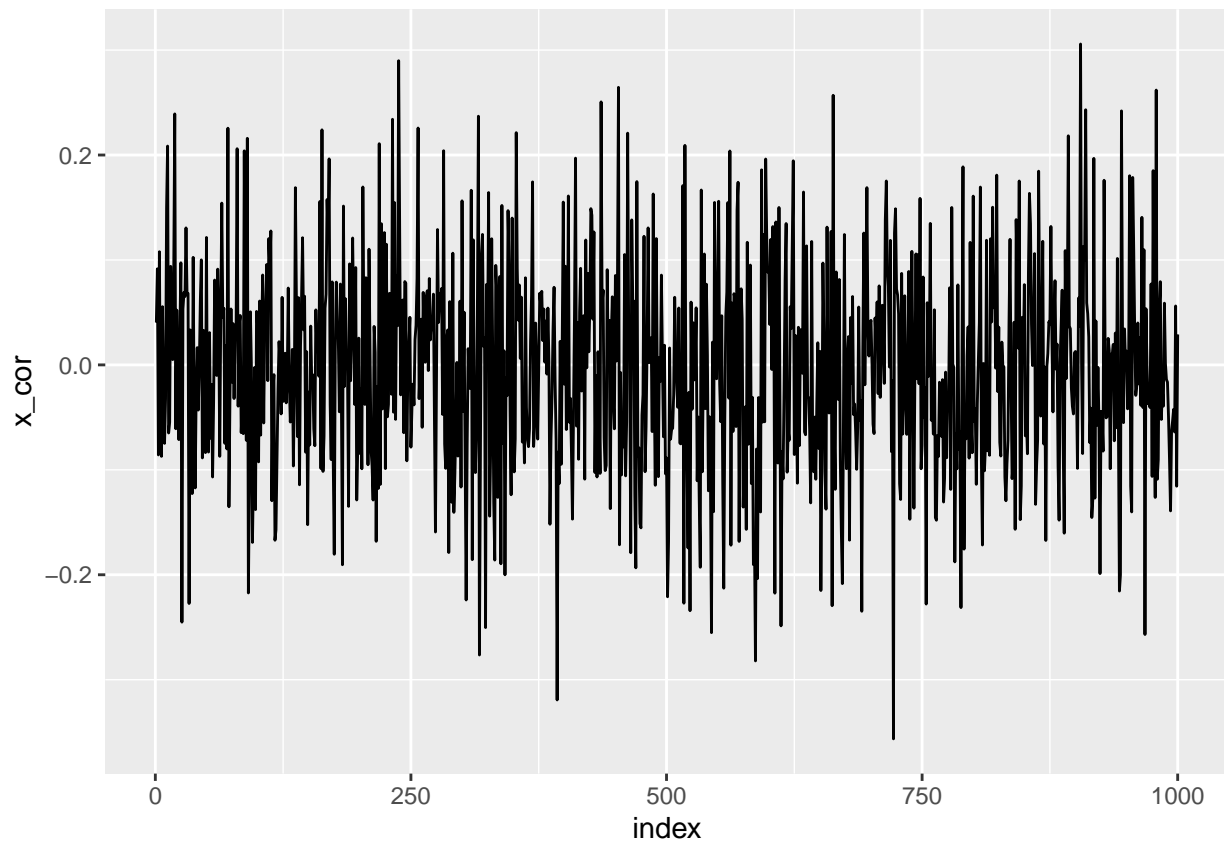
```
x <- 1000 %>% rerun( tibble( x = rnorm(100),  
                             y = rexp(100) )  
                   )  
  
x_cor <- x %>% map_df(~ tibble(x_cor = as.vector(cor(.x))[2]) )  
  
x_cor %>% ggplot(aes(x = x_cor)) +  
  geom_histogram()
```

`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.




```
x_cor <- x_cor %>% mutate( index = 1:length(x_cor))

x_cor %>% ggplot(aes(x = index, y = x_cor)) +
  geom_line()
```



Back to the tutorial.

Try to use the `gap_split` dataset to make plots for each country.

Make a list of ggplots.

Try `walk()`.

```
data(gap_split)
View(gap_split)
```

```
countries <- names(gap_split)
countries
```

```
##      [1] "Afghanistan"      "Albania"
##      [3] "Algeria"          "Angola"
##      [5] "Argentina"        "Australia"
##      [7] "Austria"          "Bahrain"
##      [9] "Bangladesh"       "Belgium"
##     [11] "Benin"            "Bolivia"
##     [13] "Bosnia and Herzegovina" "Botswana"
##     [15] "Brazil"           "Bulgaria"
##     [17] "Burkina Faso"     "Burundi"
##     [19] "Cambodia"         "Cameroon"
```

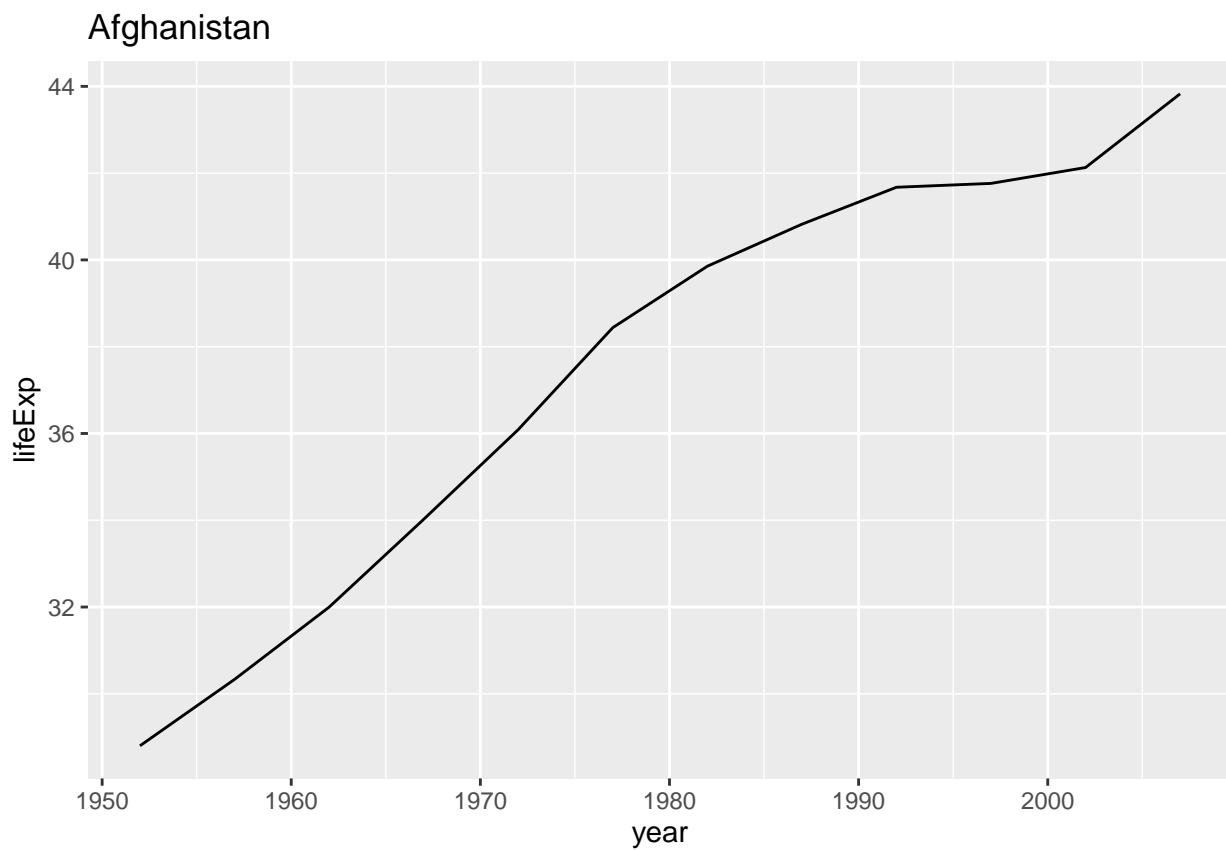
## [21]	"Canada"	"Central African Republic"
## [23]	"Chad"	"Chile"
## [25]	"China"	"Colombia"
## [27]	"Comoros"	"Congo, Dem. Rep."
## [29]	"Congo, Rep."	"Costa Rica"
## [31]	"Cote d'Ivoire"	"Croatia"
## [33]	"Cuba"	"Czech Republic"
## [35]	"Denmark"	"Djibouti"
## [37]	"Dominican Republic"	"Ecuador"
## [39]	"Egypt"	"El Salvador"
## [41]	"Equatorial Guinea"	"Eritrea"
## [43]	"Ethiopia"	"Finland"
## [45]	"France"	"Gabon"
## [47]	"Gambia"	"Germany"
## [49]	"Ghana"	"Greece"
## [51]	"Guatemala"	"Guinea"
## [53]	"Guinea-Bissau"	"Haiti"
## [55]	"Honduras"	"Hong Kong, China"
## [57]	"Hungary"	"Iceland"
## [59]	"India"	"Indonesia"
## [61]	"Iran"	"Iraq"
## [63]	"Ireland"	"Israel"
## [65]	"Italy"	"Jamaica"
## [67]	"Japan"	"Jordan"
## [69]	"Kenya"	"Korea, Dem. Rep."
## [71]	"Korea, Rep."	"Kuwait"
## [73]	"Lebanon"	"Lesotho"
## [75]	"Liberia"	"Libya"
## [77]	"Madagascar"	"Malawi"
## [79]	"Malaysia"	"Mali"
## [81]	"Mauritania"	"Mauritius"
## [83]	"Mexico"	"Mongolia"
## [85]	"Montenegro"	"Morocco"
## [87]	"Mozambique"	"Myanmar"
## [89]	"Namibia"	"Nepal"
## [91]	"Netherlands"	"New Zealand"
## [93]	"Nicaragua"	"Niger"
## [95]	"Nigeria"	"Norway"
## [97]	"Oman"	"Pakistan"
## [99]	"Panama"	"Paraguay"
## [101]	"Peru"	"Philippines"
## [103]	"Poland"	"Portugal"
## [105]	"Puerto Rico"	"Reunion"
## [107]	"Romania"	"Rwanda"
## [109]	"Sao Tome and Principe"	"Saudi Arabia"
## [111]	"Senegal"	"Serbia"
## [113]	"Sierra Leone"	"Singapore"
## [115]	"Slovak Republic"	"Slovenia"
## [117]	"Somalia"	"South Africa"
## [119]	"Spain"	"Sri Lanka"
## [121]	"Sudan"	"Swaziland"
## [123]	"Sweden"	"Switzerland"
## [125]	"Syria"	"Taiwan"
## [127]	"Tanzania"	"Thailand"

```
## [129] "Togo" "Trinidad and Tobago"
## [131] "Tunisia" "Turkey"
## [133] "Uganda" "United Kingdom"
## [135] "United States" "Uruguay"
## [137] "Venezuela" "Vietnam"
## [139] "West Bank and Gaza" "Yemen, Rep."
## [141] "Zambia" "Zimbabwe"
```

```
plots <- map2( gap_split, countries,
  ~ ggplot(.x, aes(x = year, y = lifeExp))
    + geom_line()
    + labs(title = .y))
```

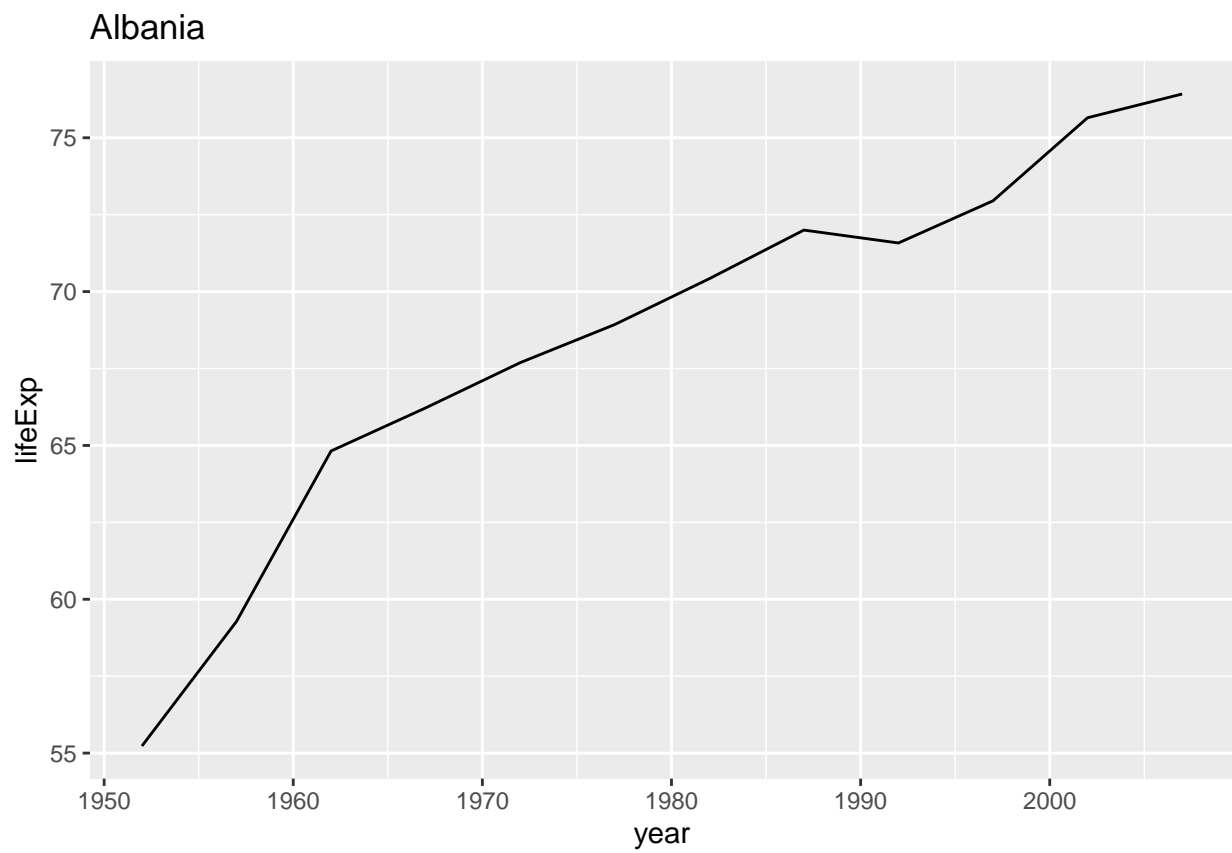
plots

```
## $Afghanistan
```

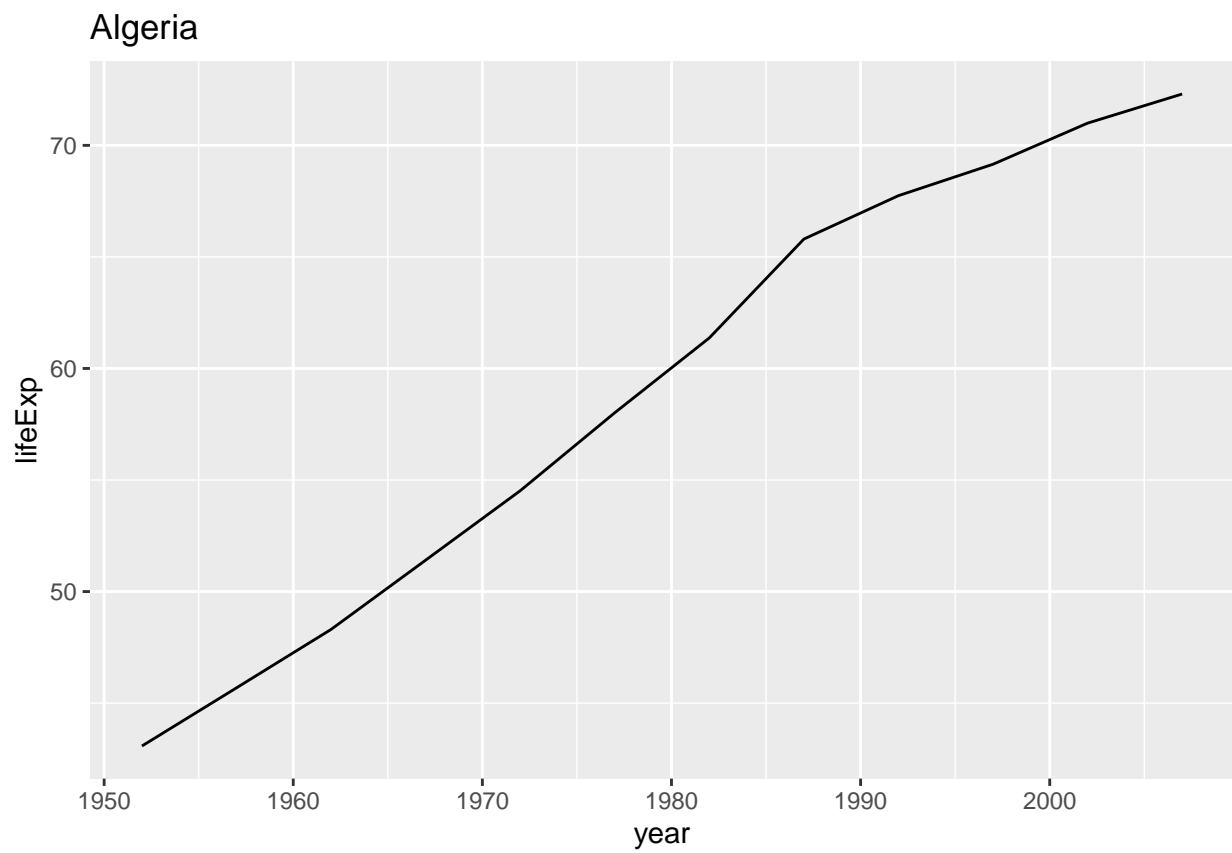


```
##
```

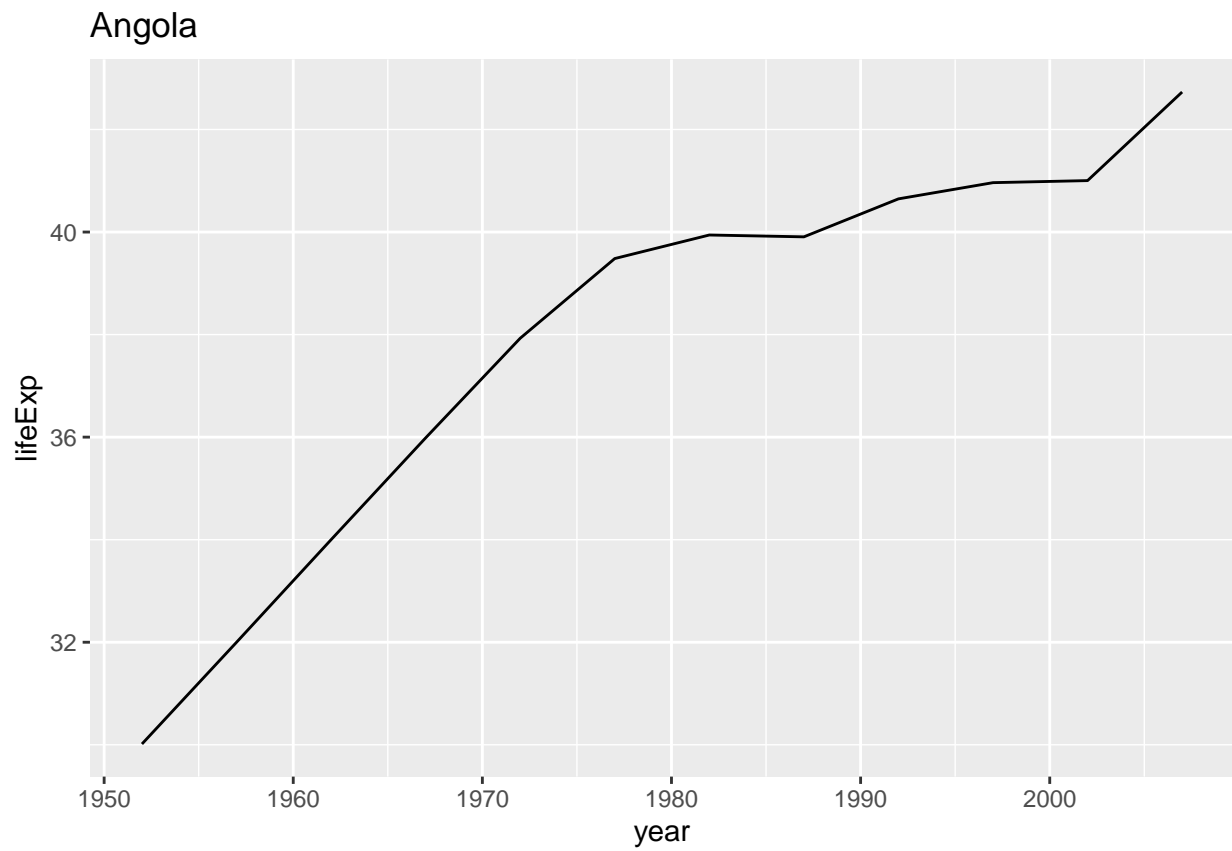
```
## $Albania
```



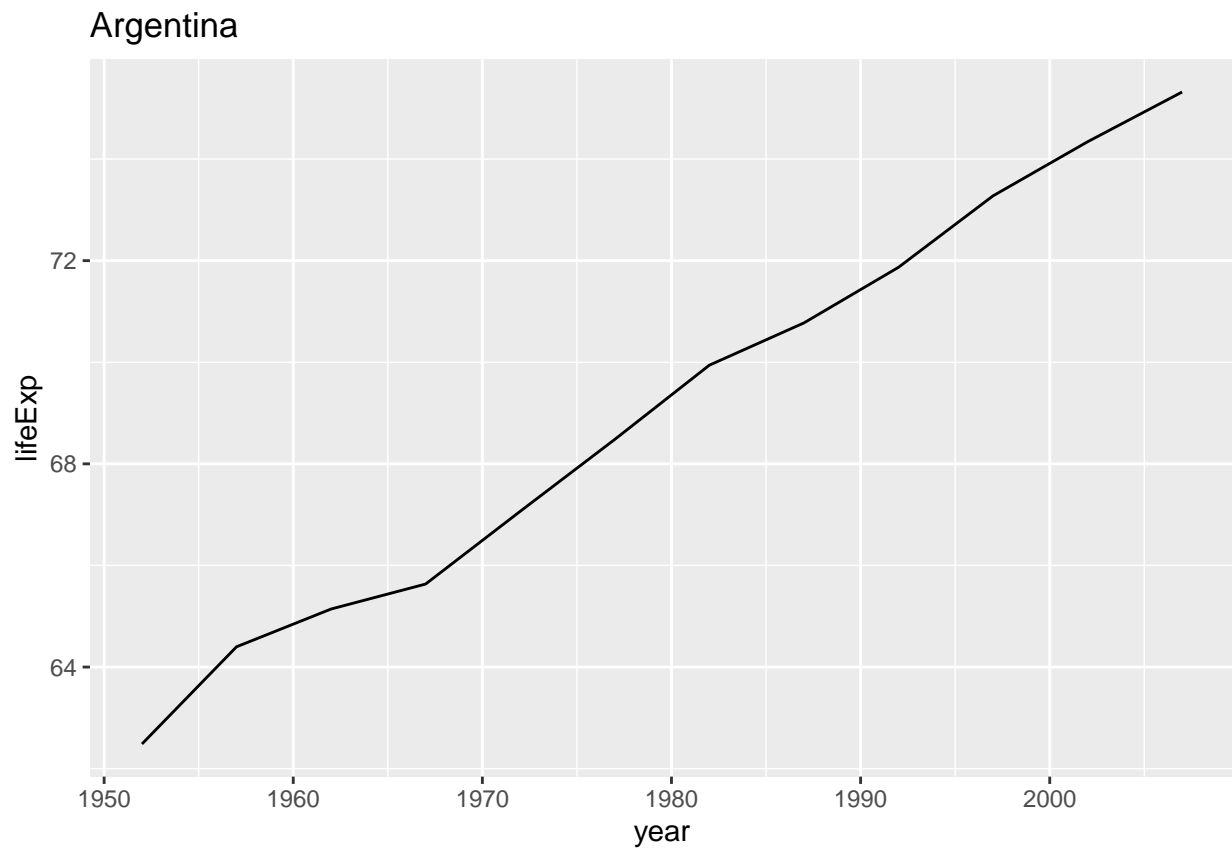
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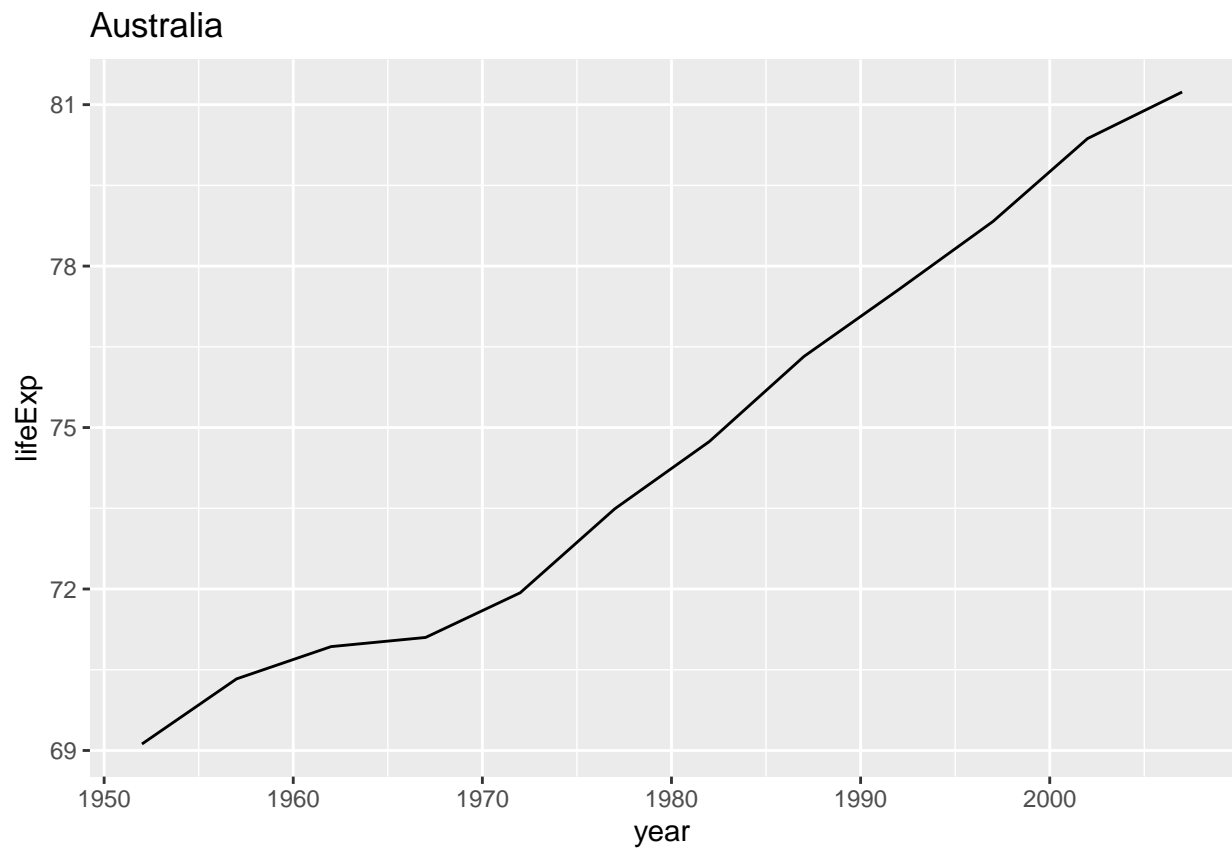
\$Angola



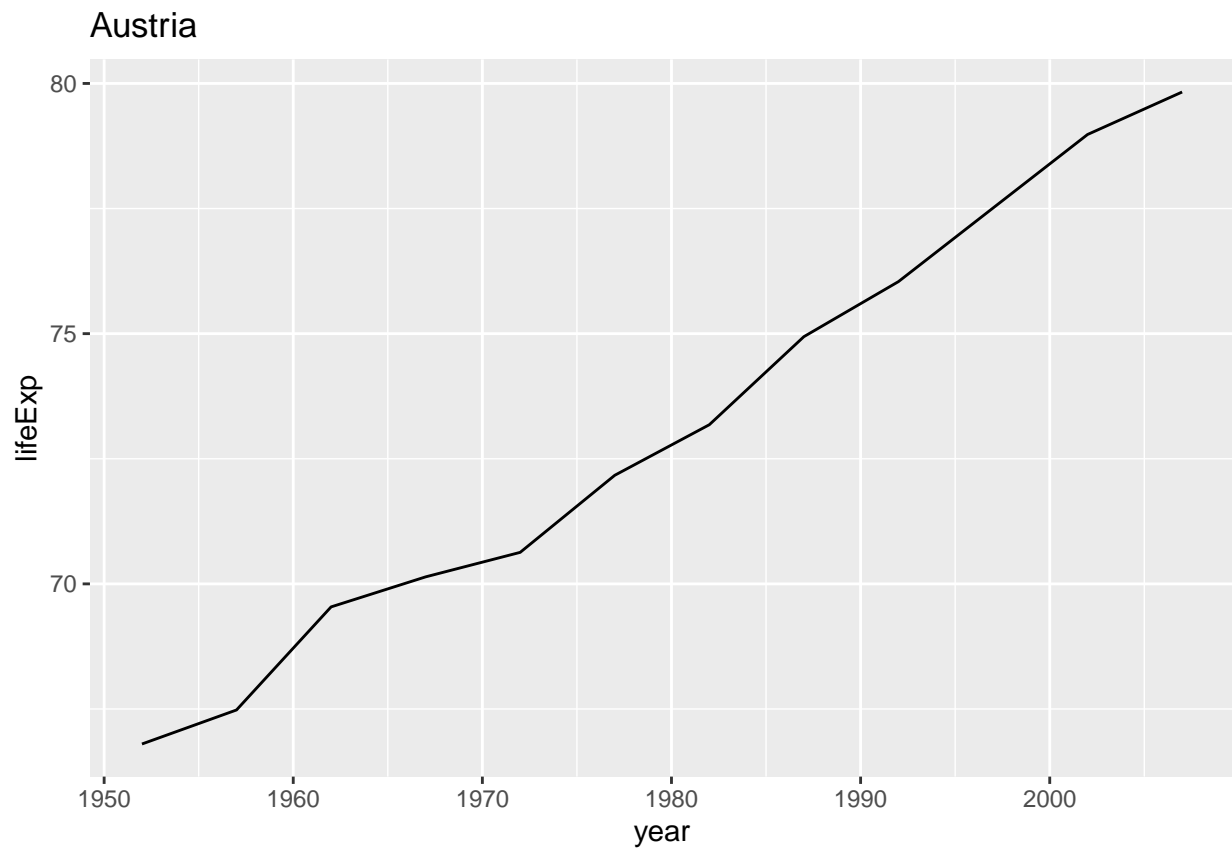
\$Argentina



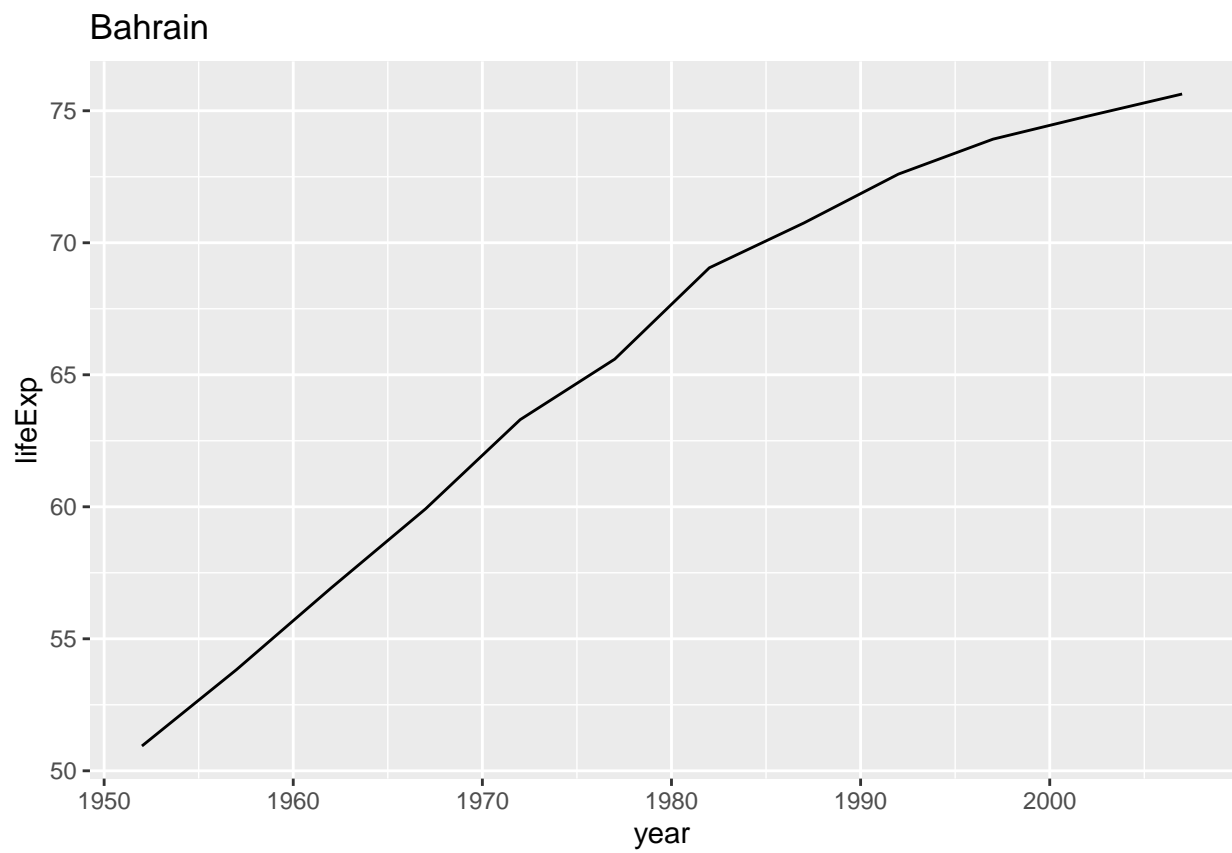
\$Australia



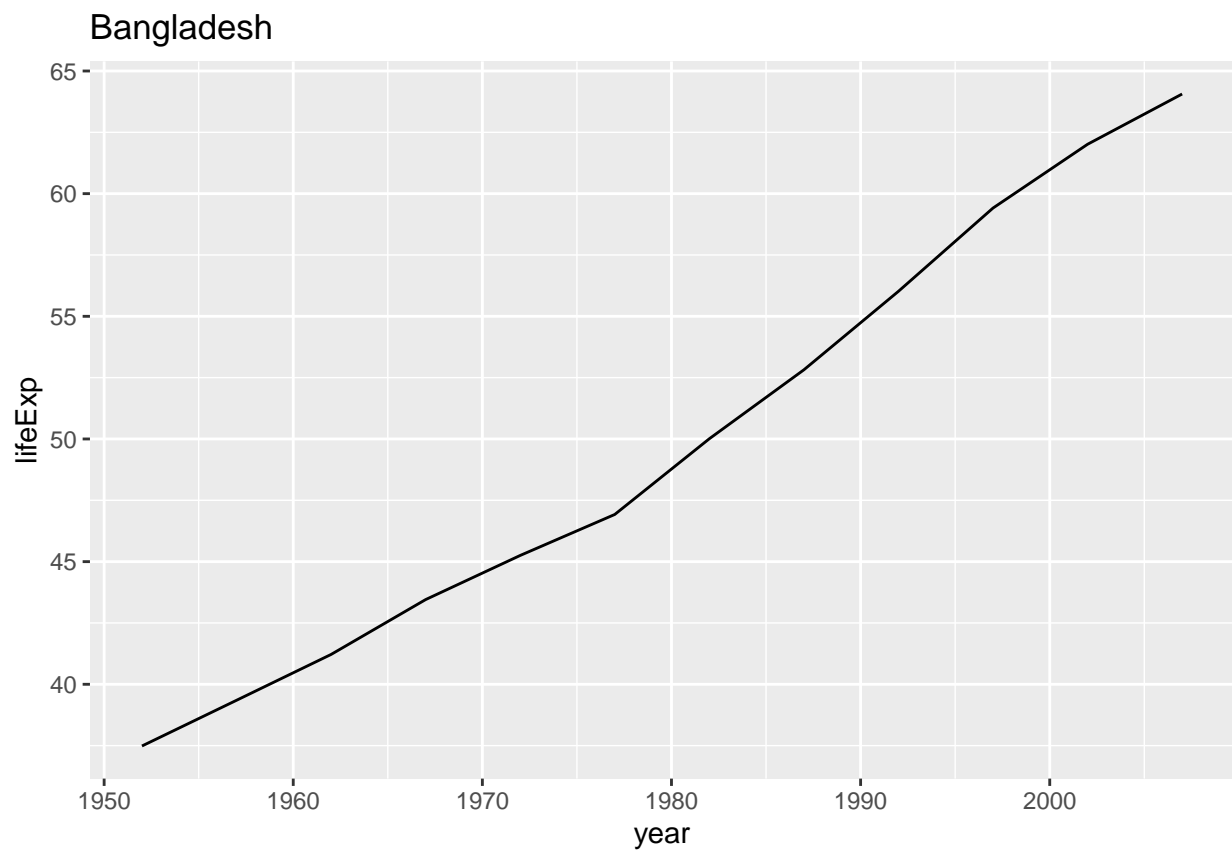
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##  
## $Australia
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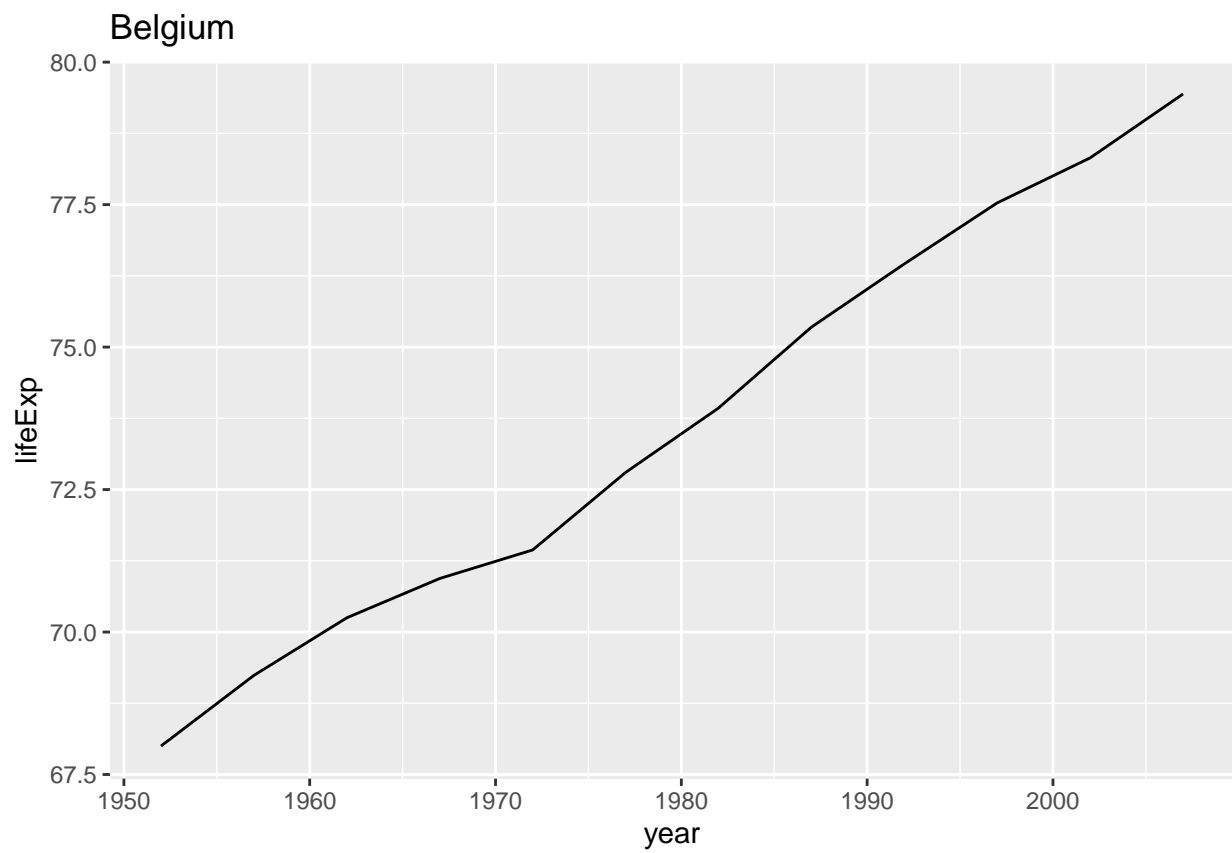
\$Bahrain



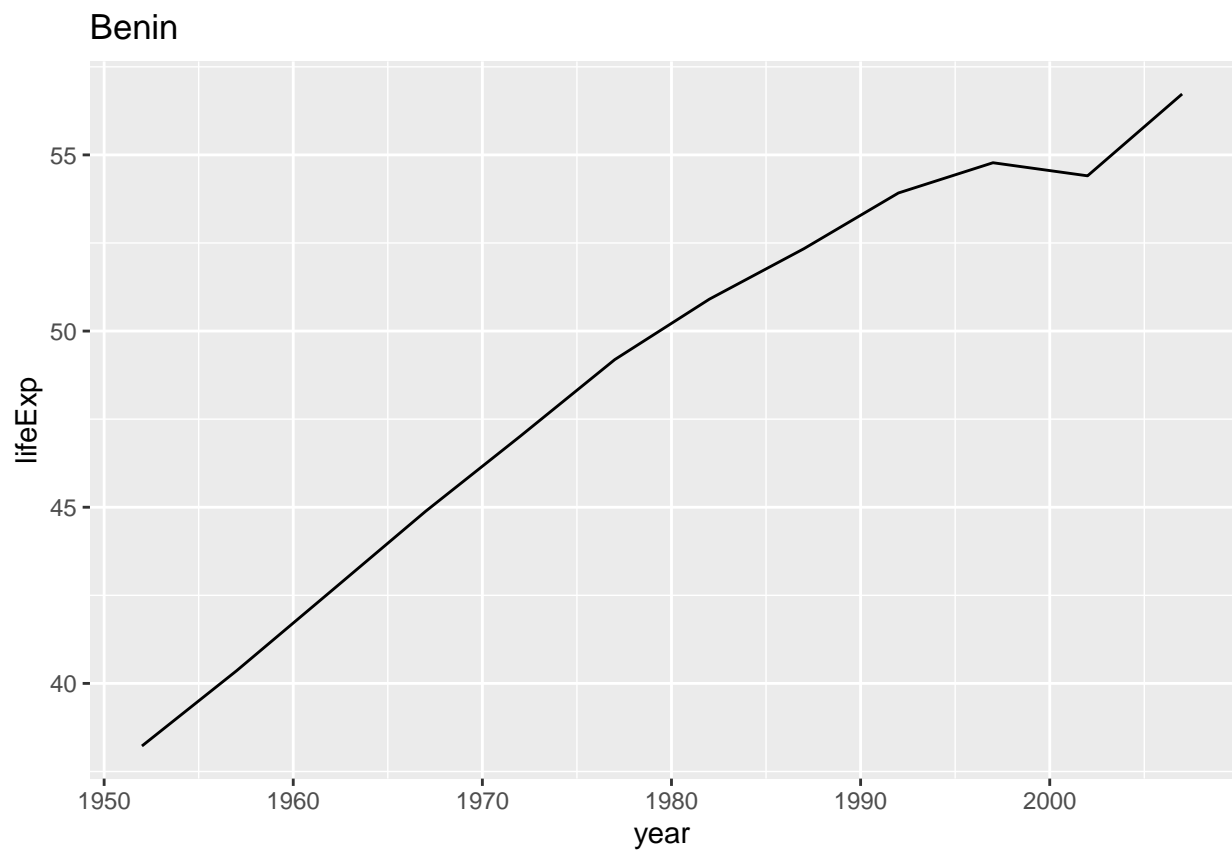
\$Bangladesh



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##  
## $Belgium
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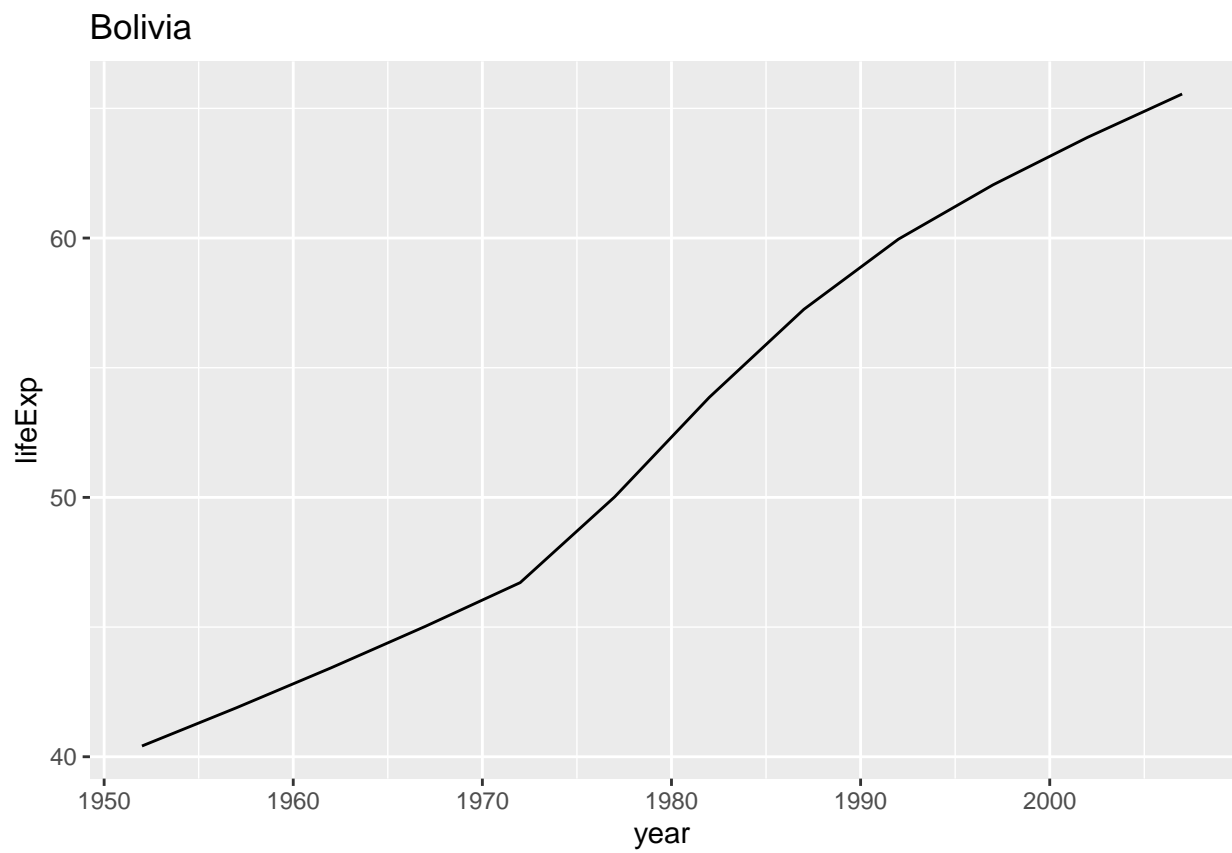


\$Benin



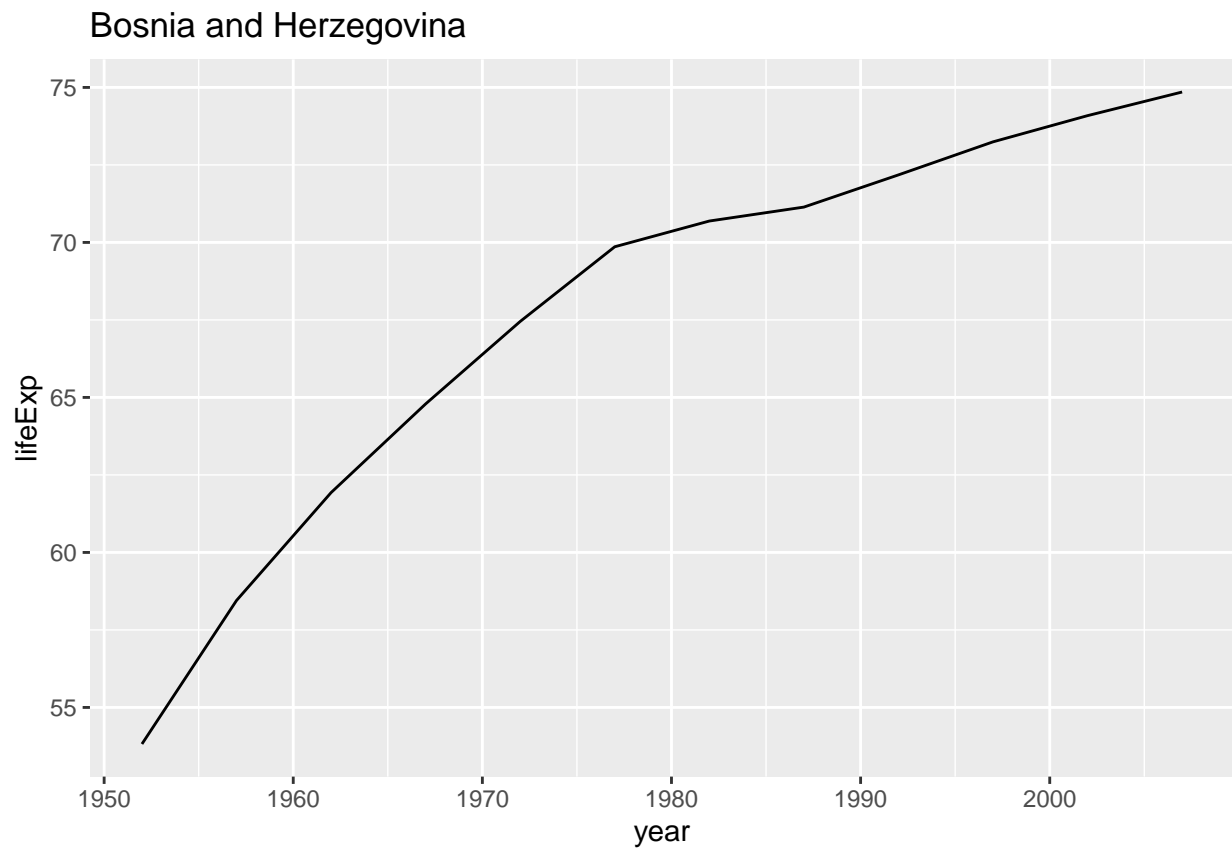
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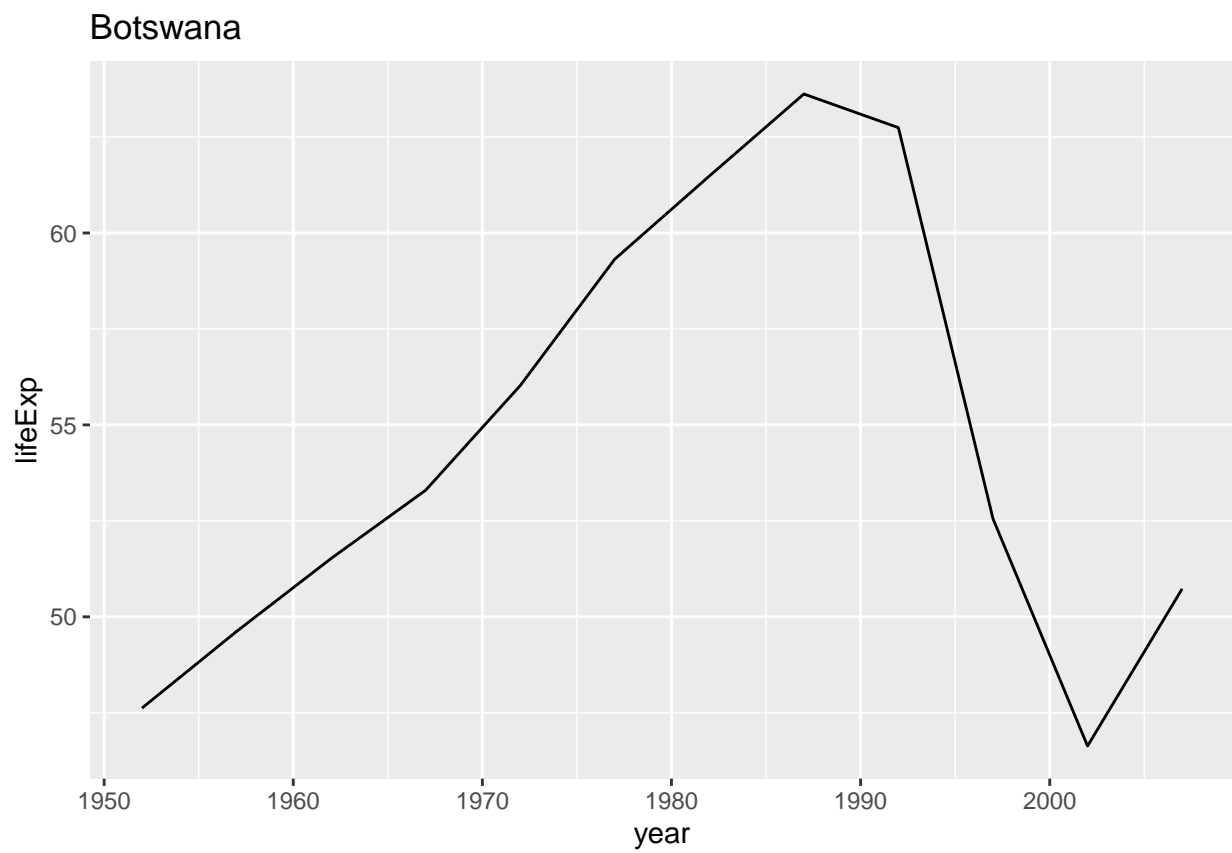
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\$`Bosnia and Herzegovina`

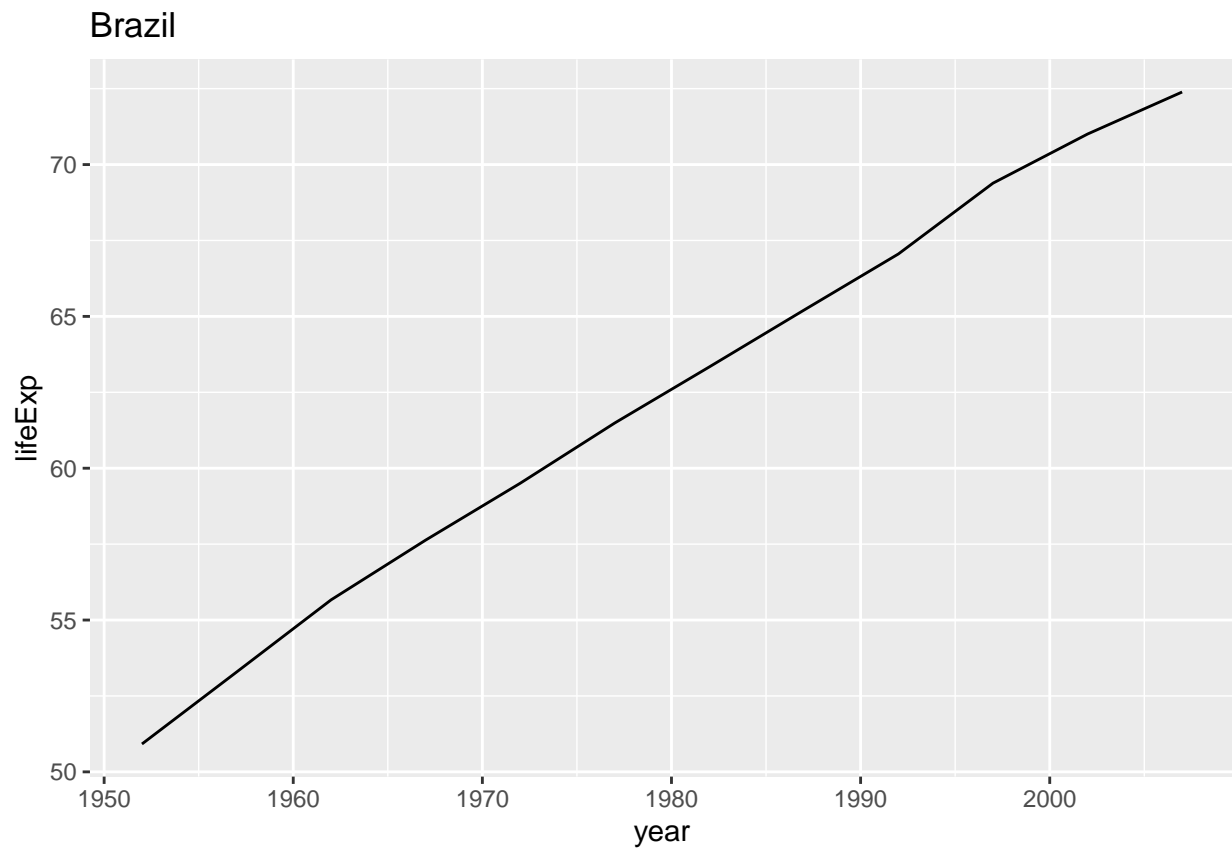


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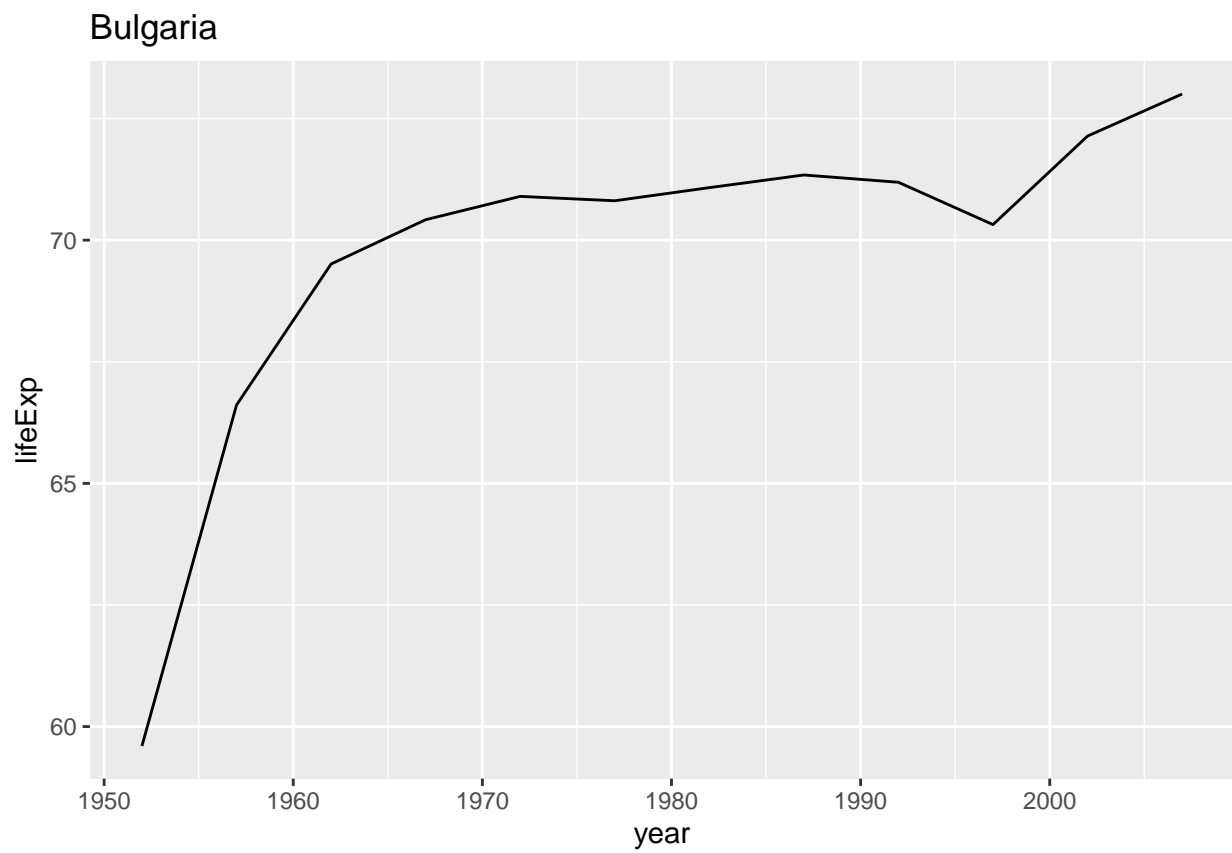


\$Brazil

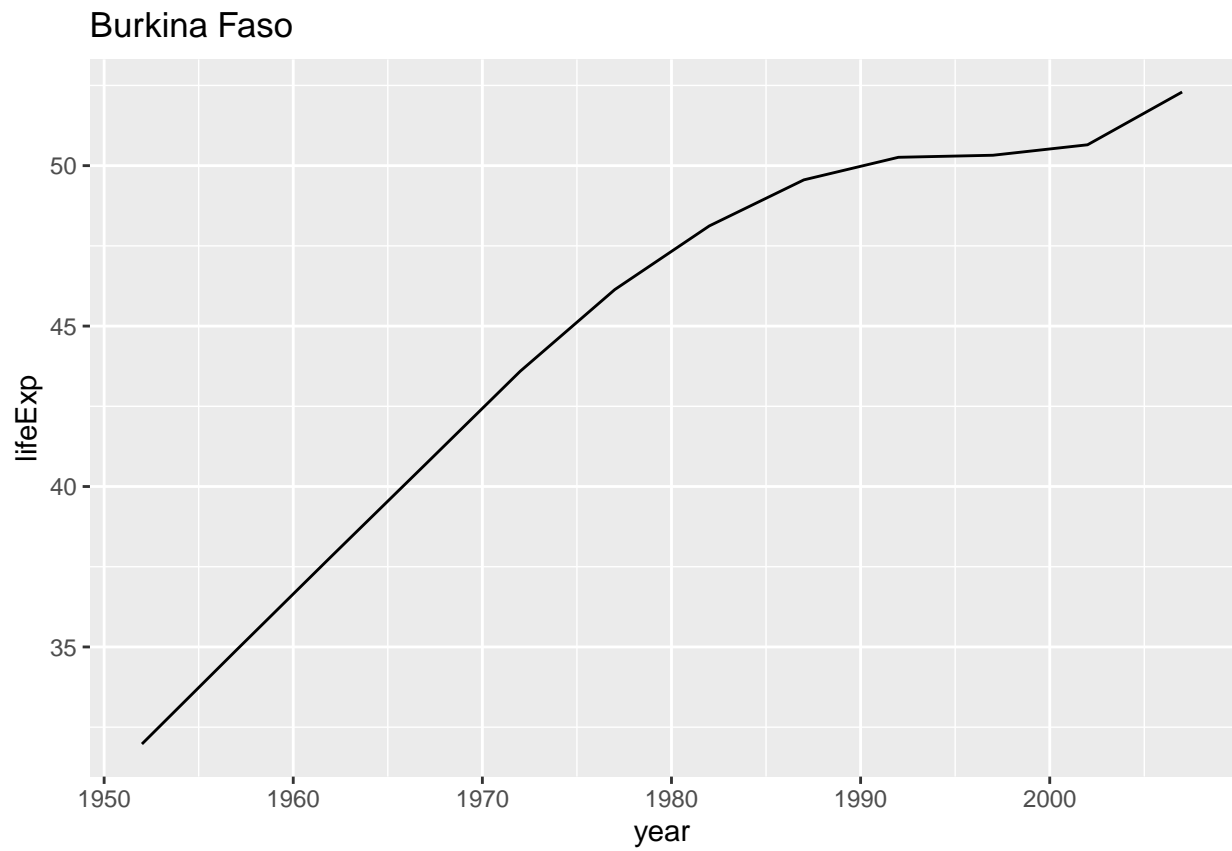


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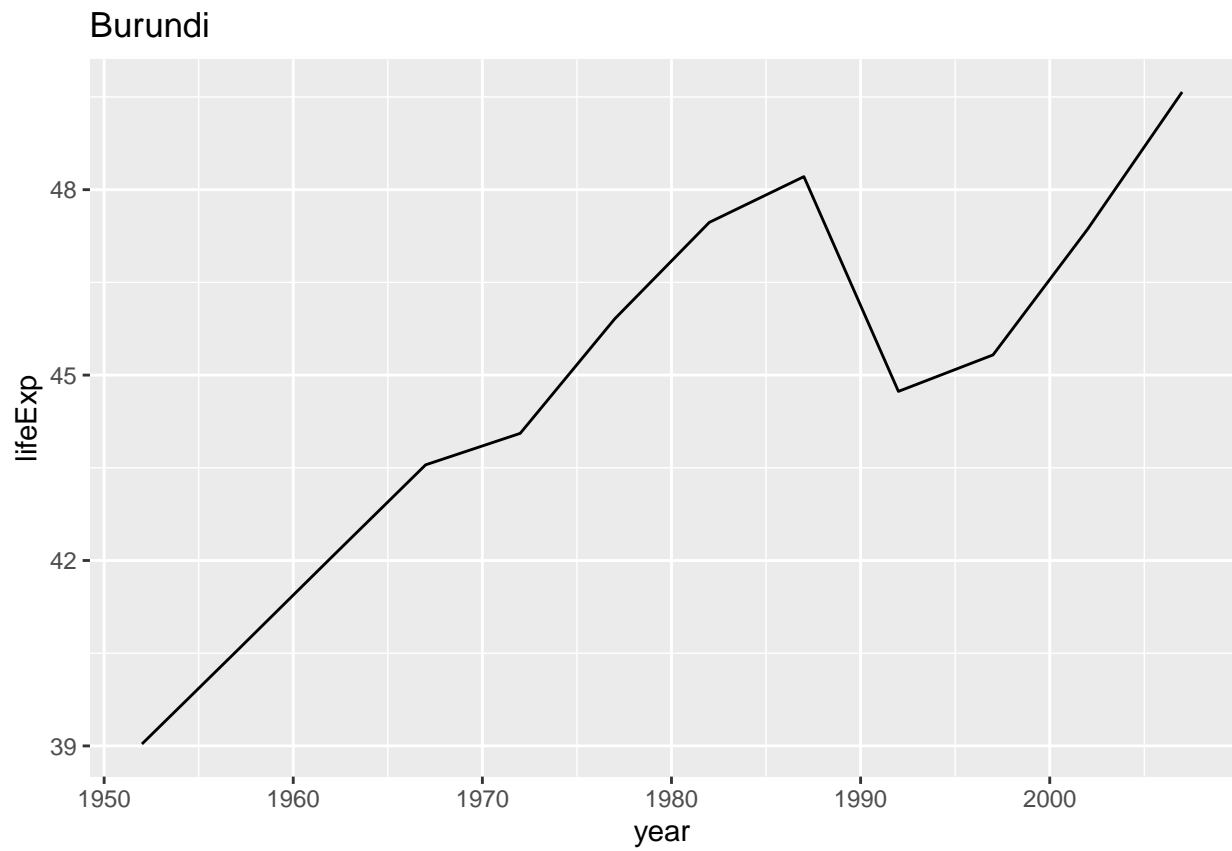


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##  
## $`Burkina Faso`
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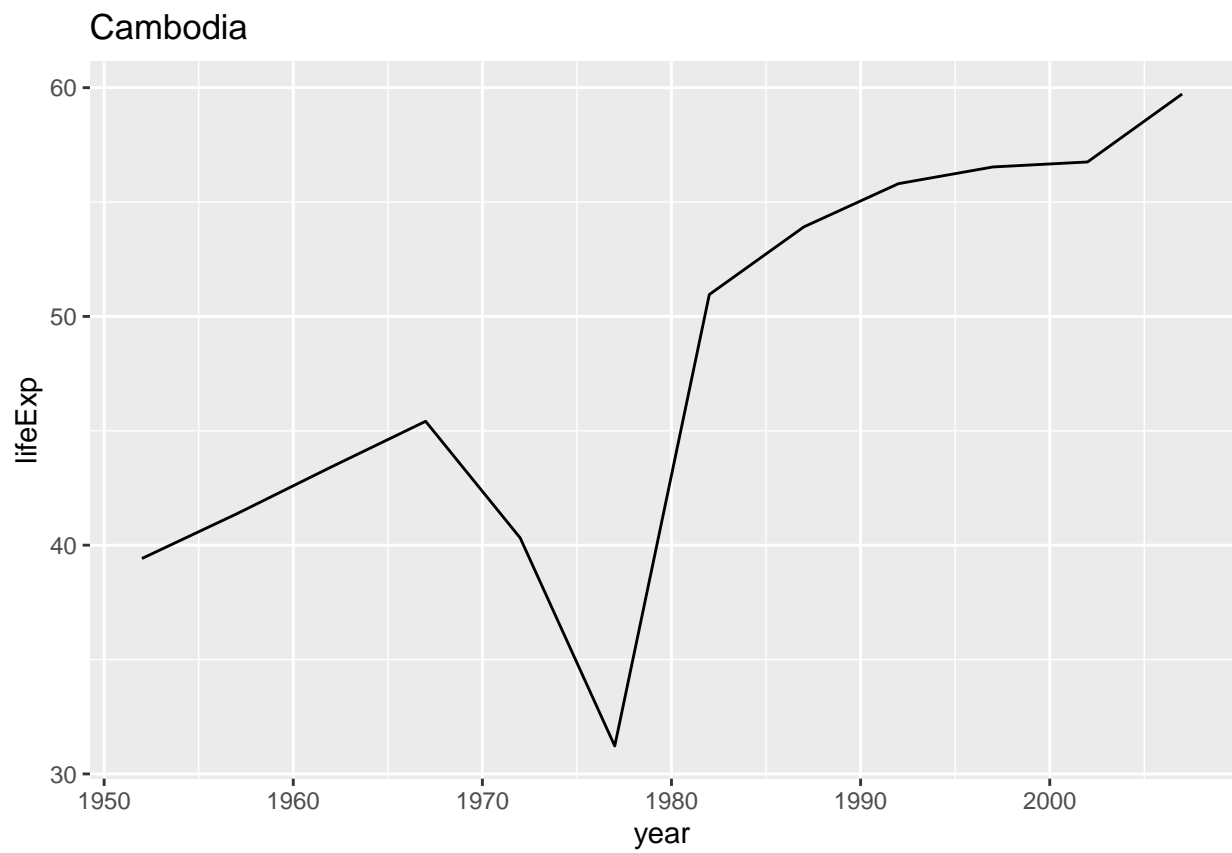
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\$Burundi

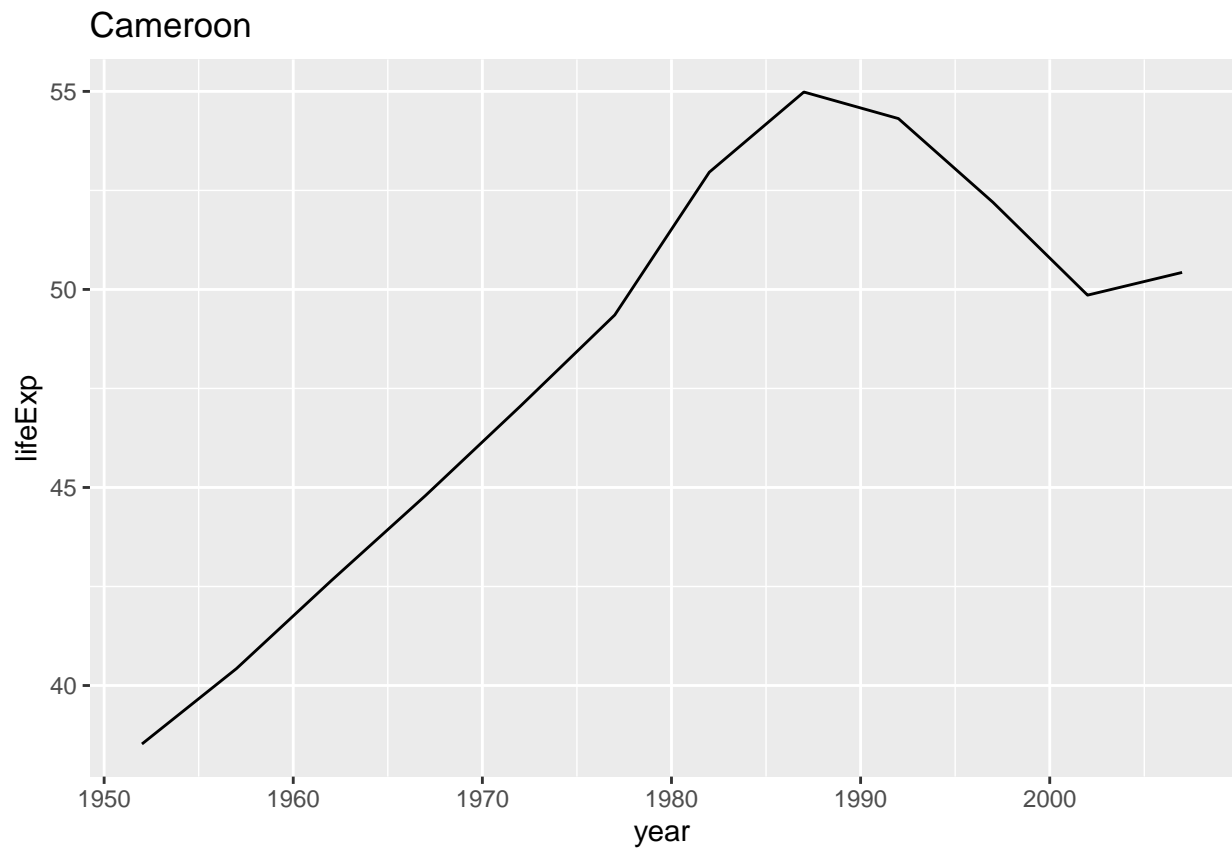


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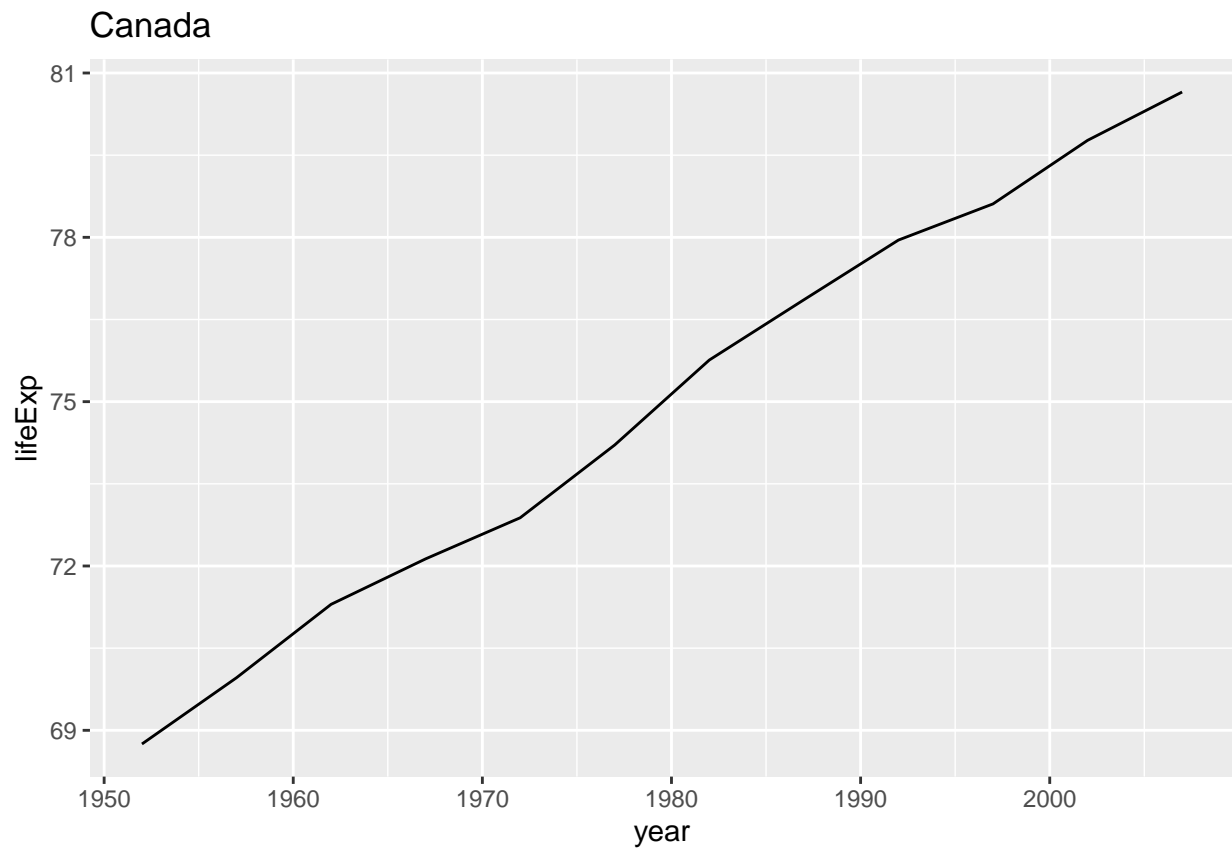


\$Cameroon

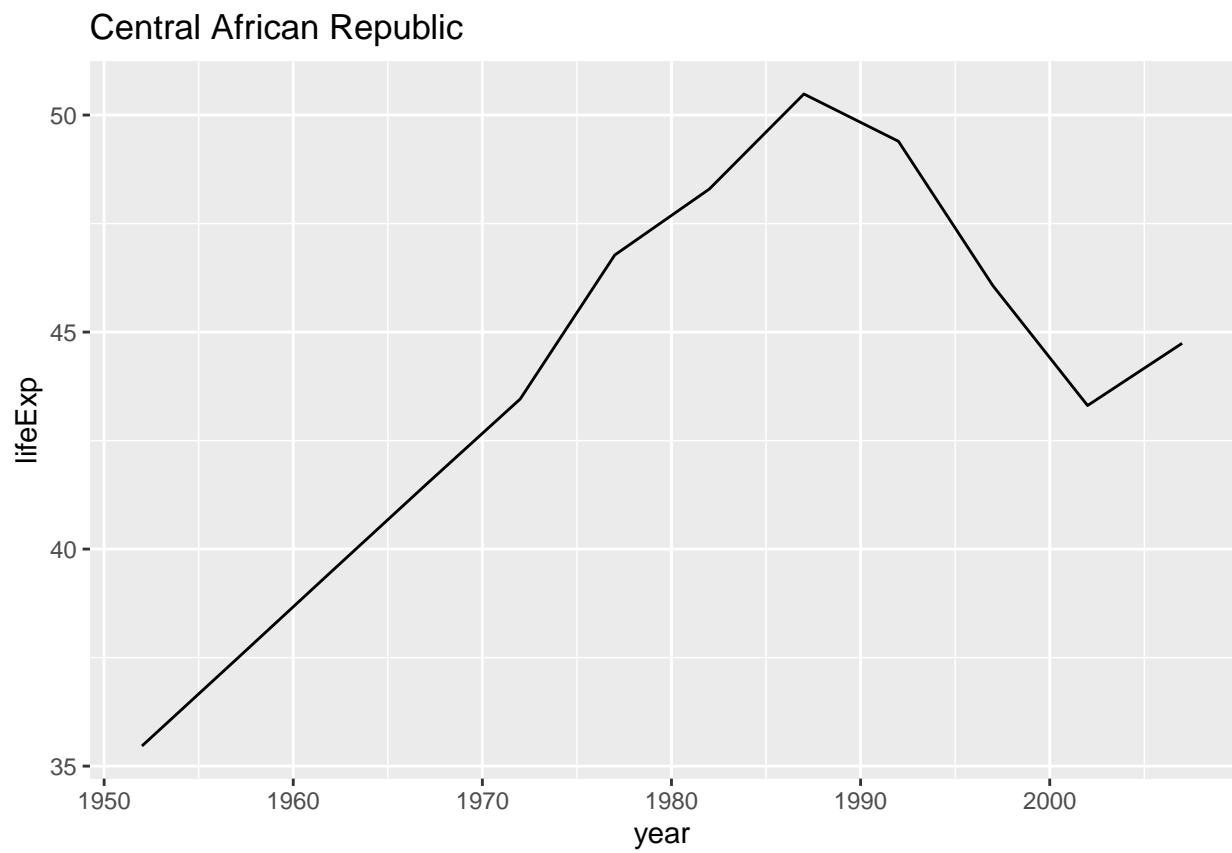


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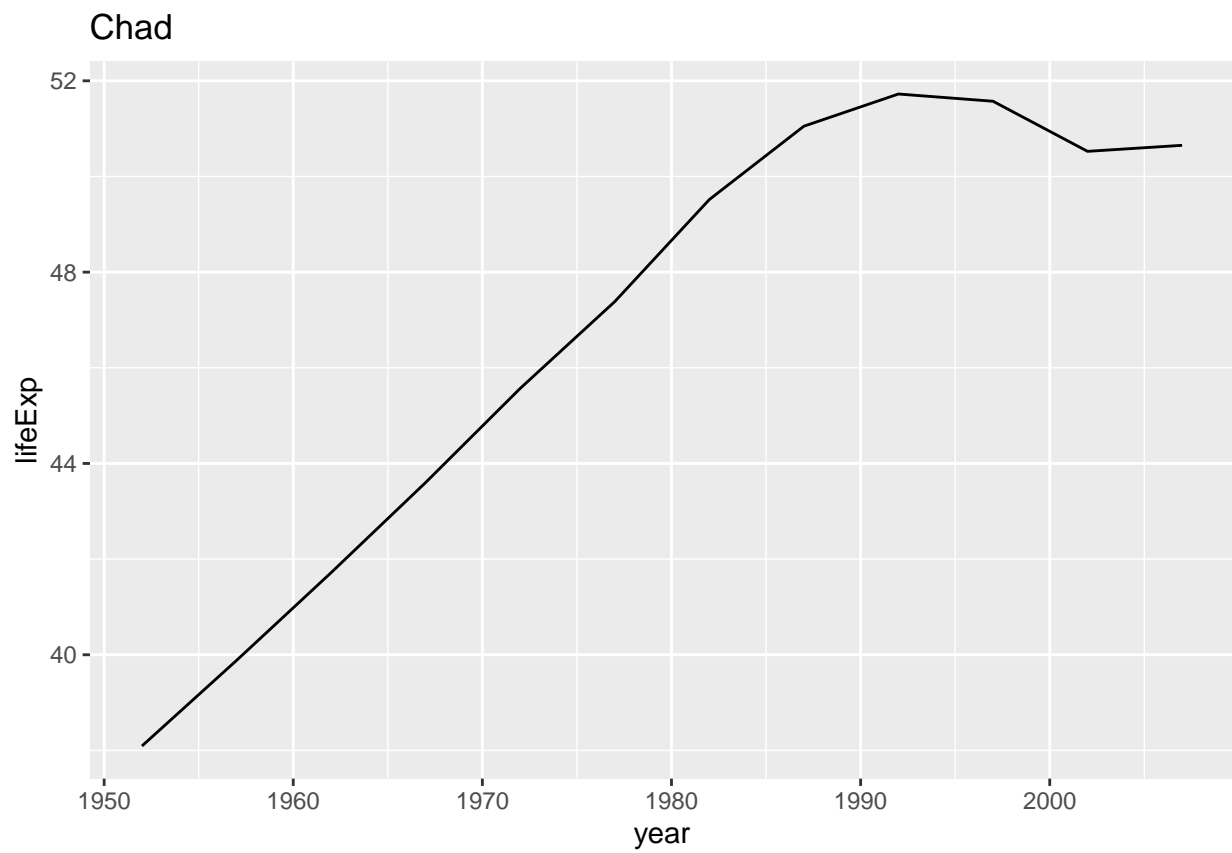
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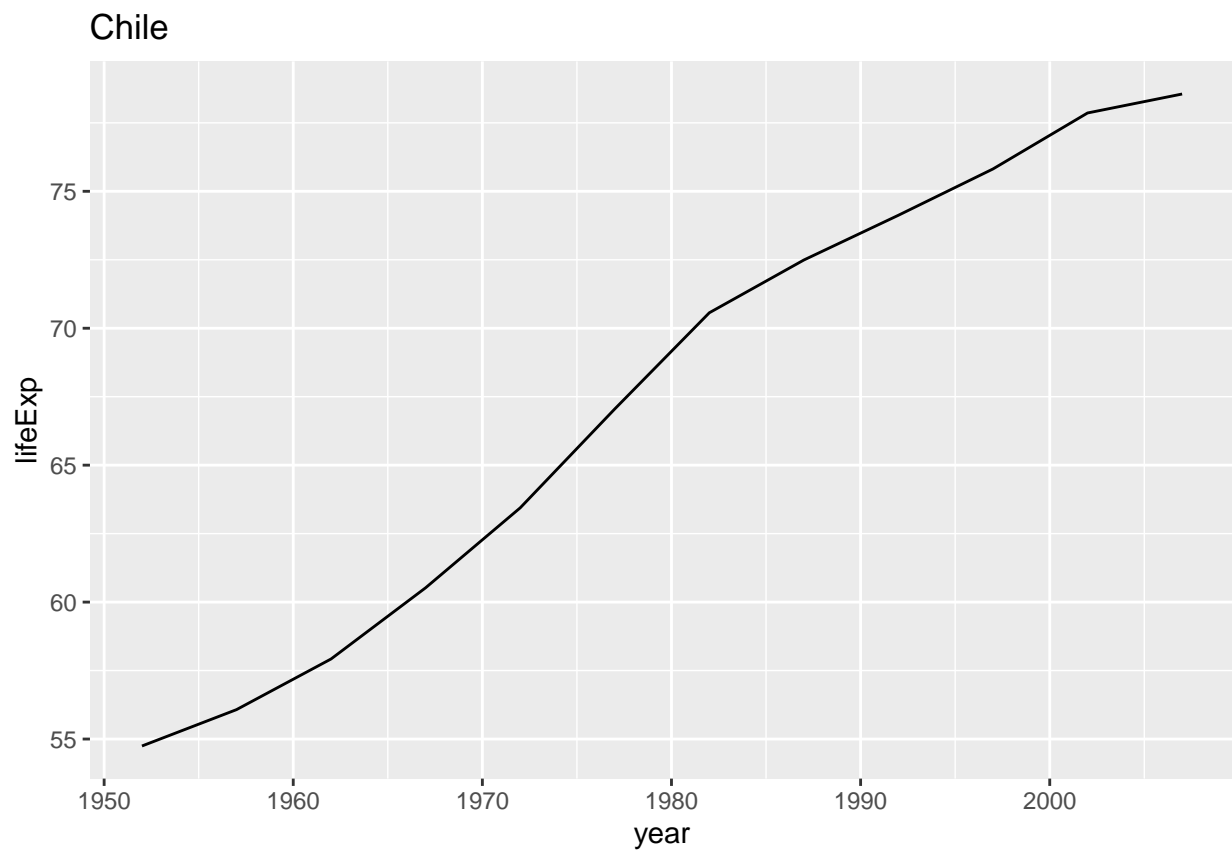
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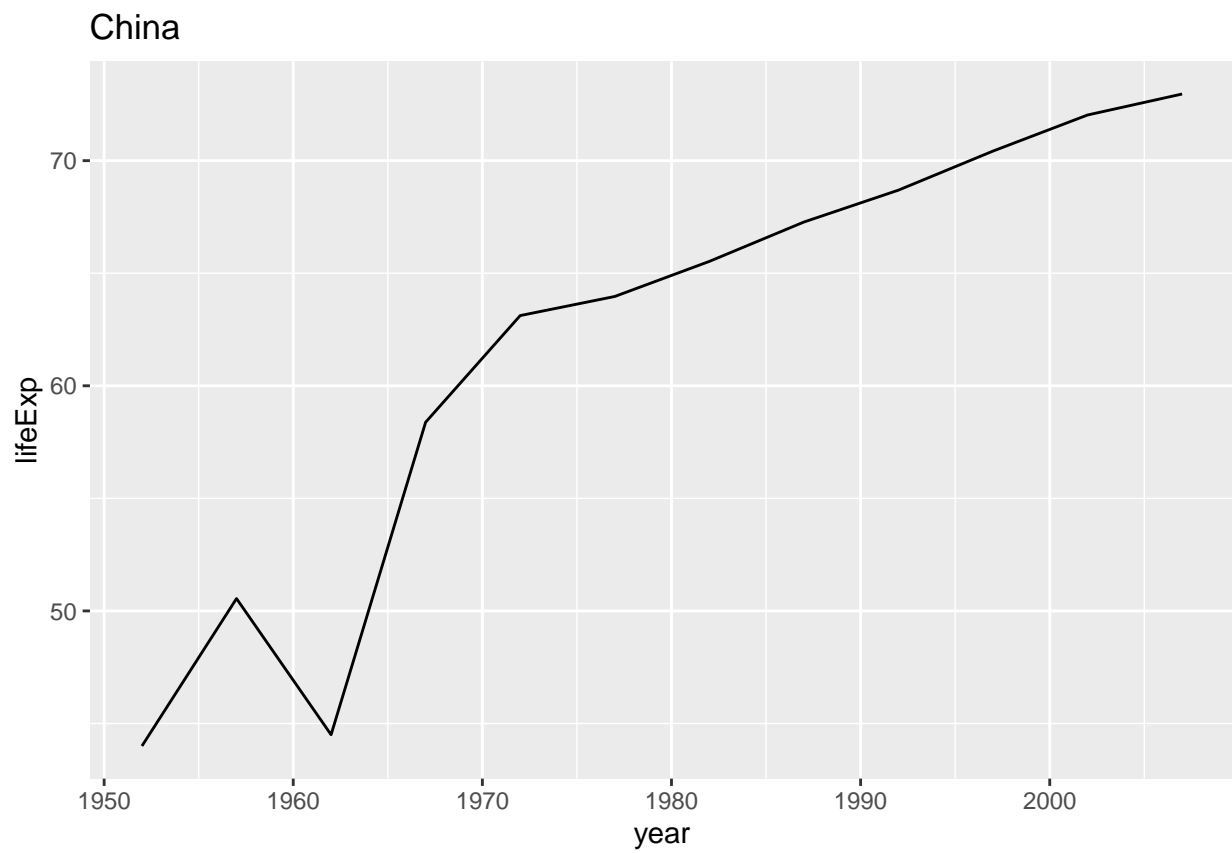
\$Chad



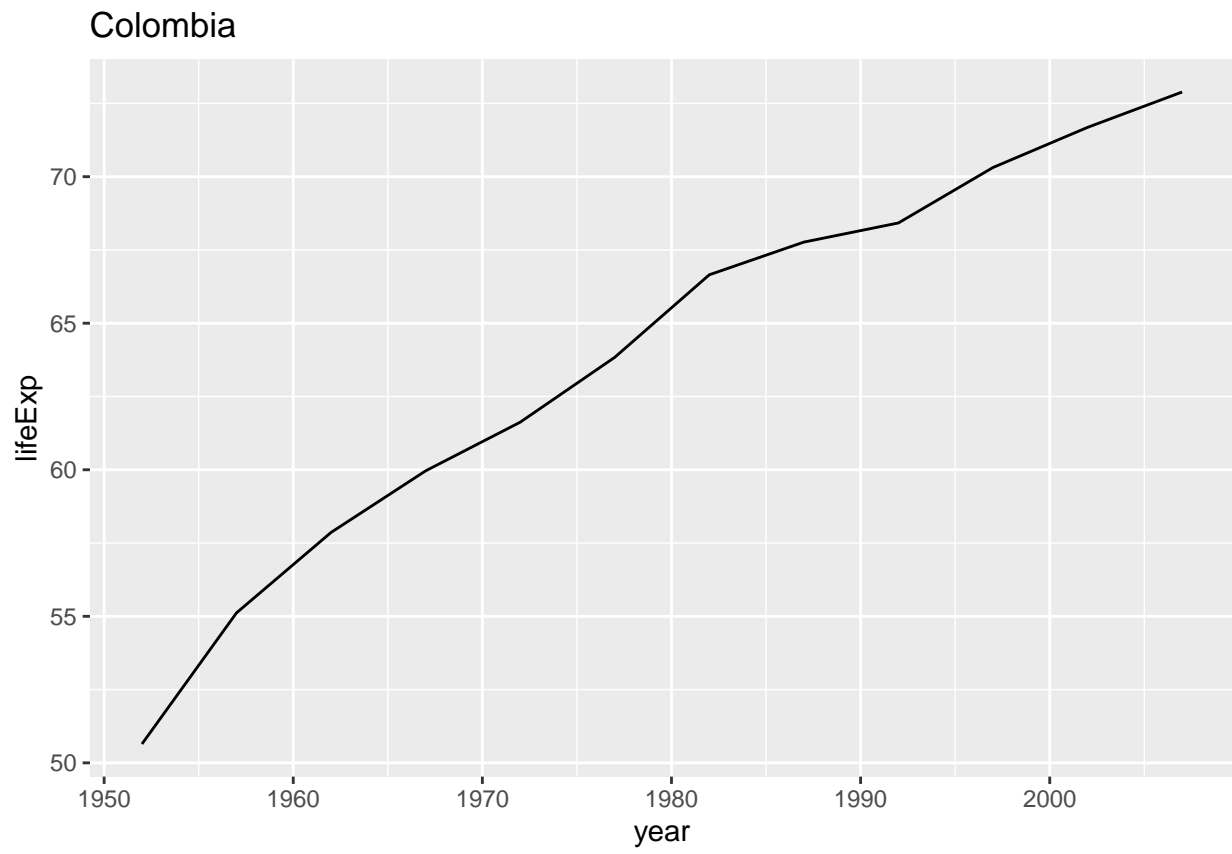
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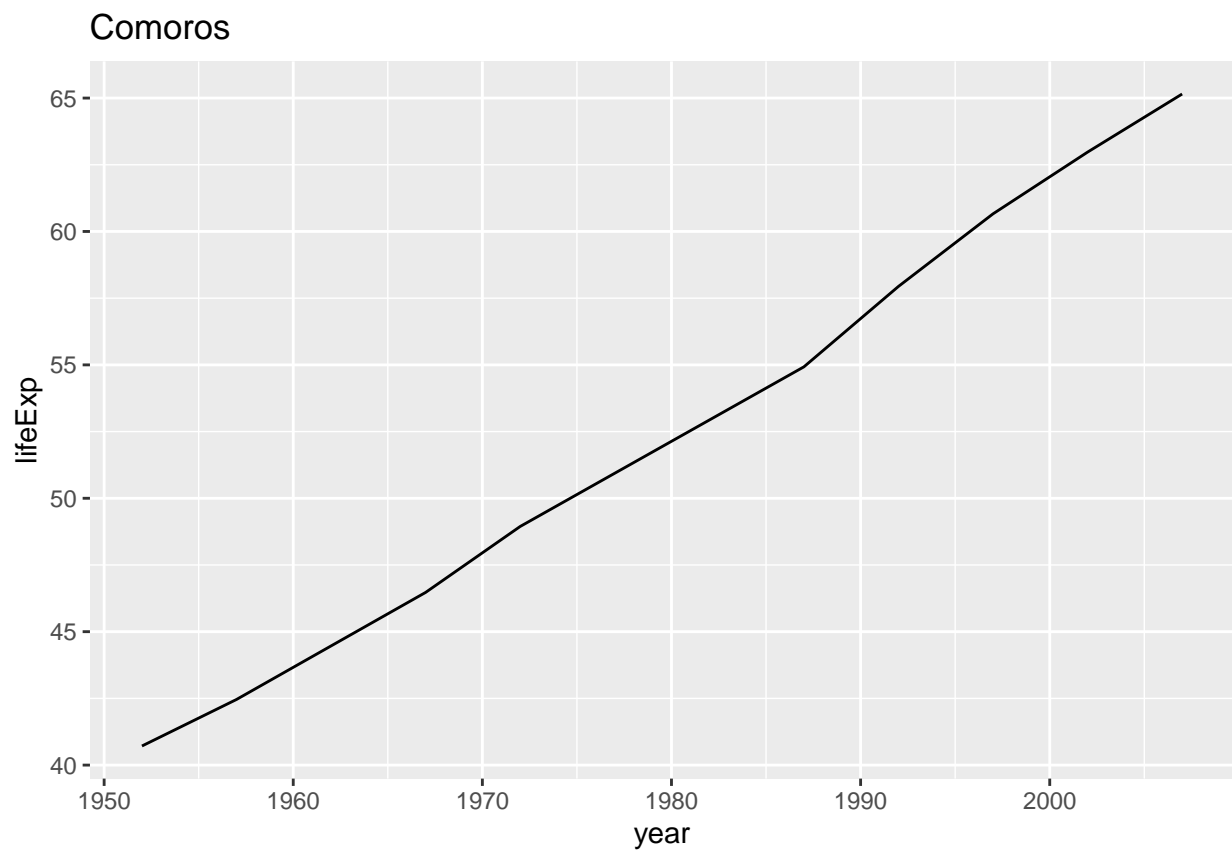
\$China



\$Colombia

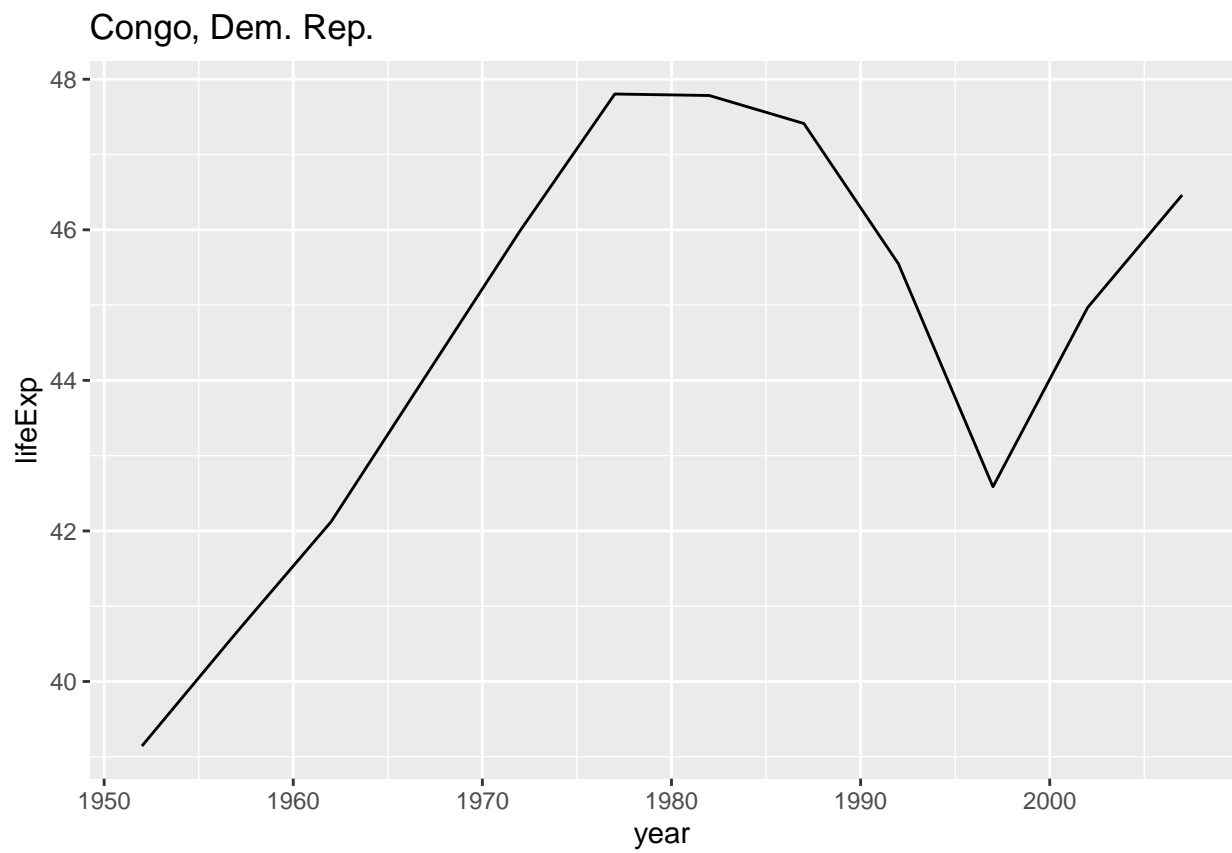


\$Comoros

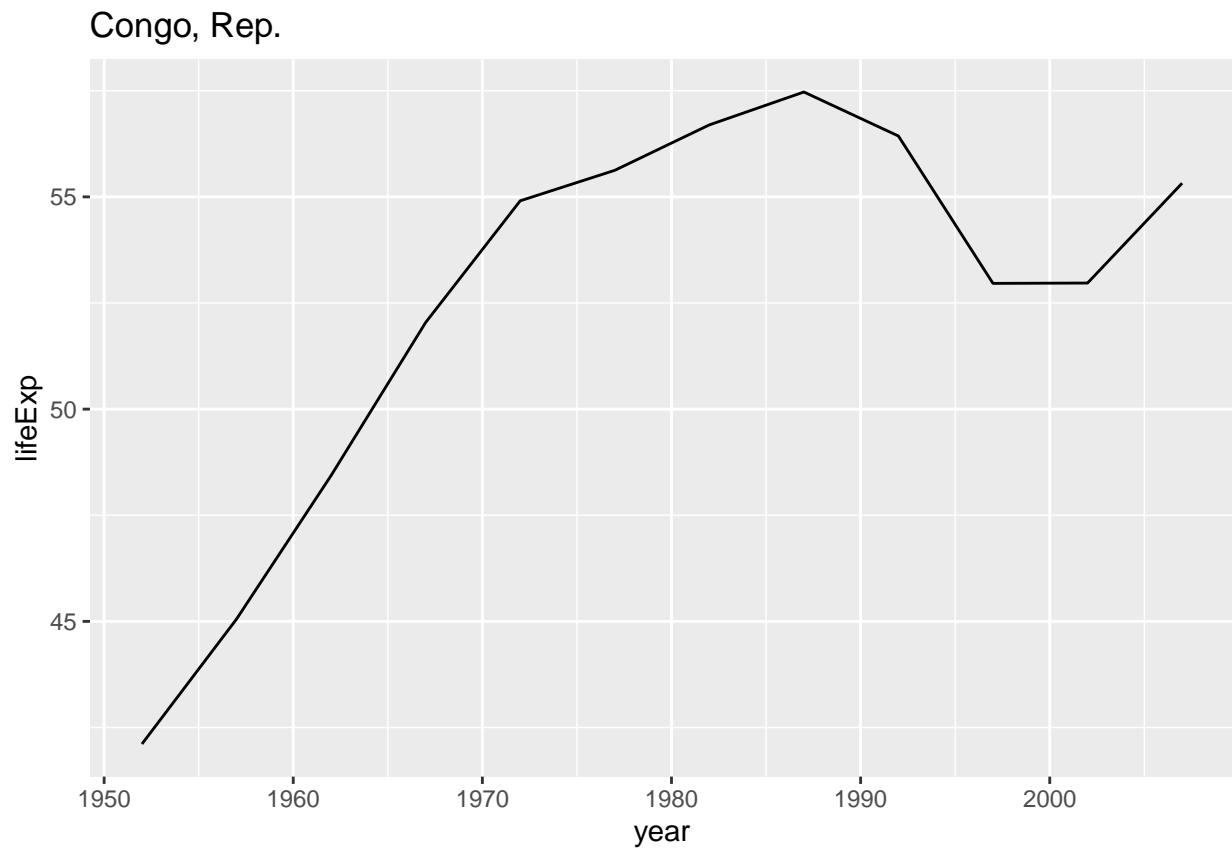


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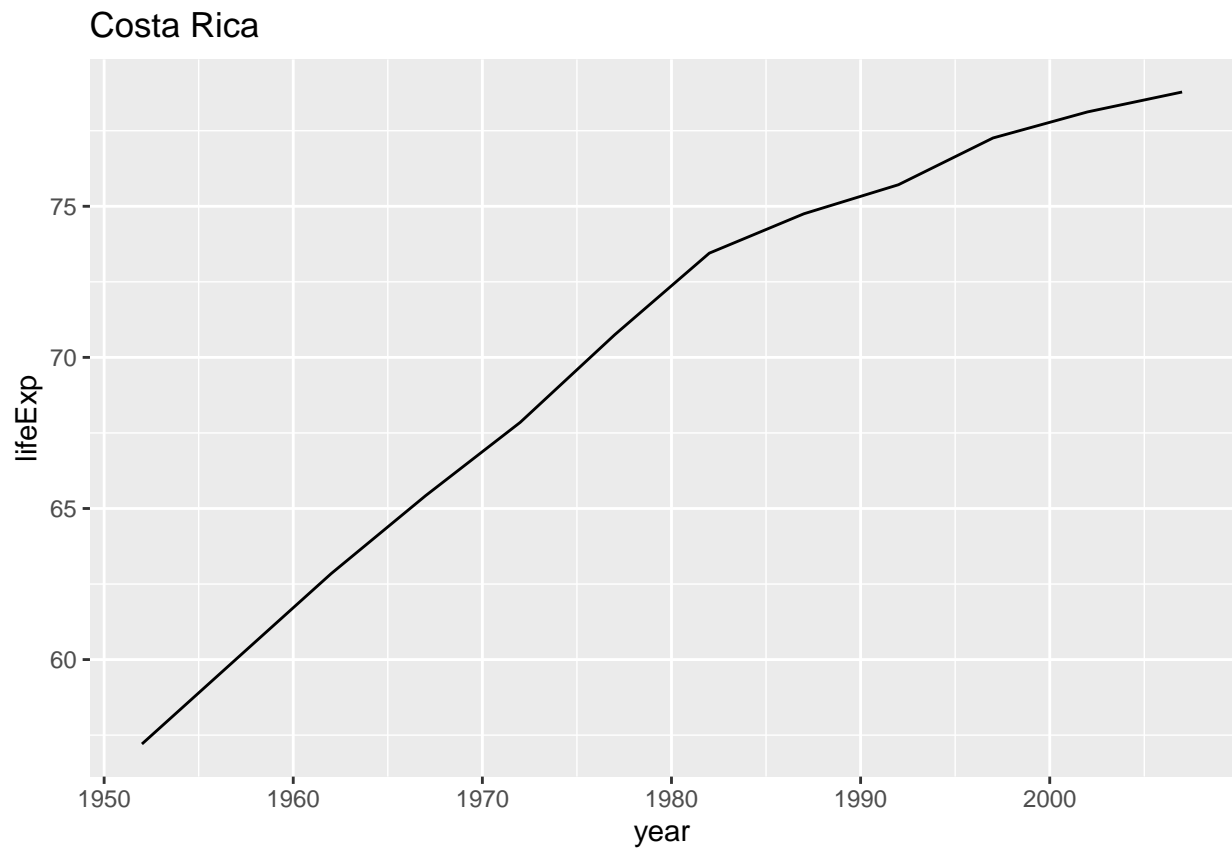
\$`Congo, Dem. Rep.`



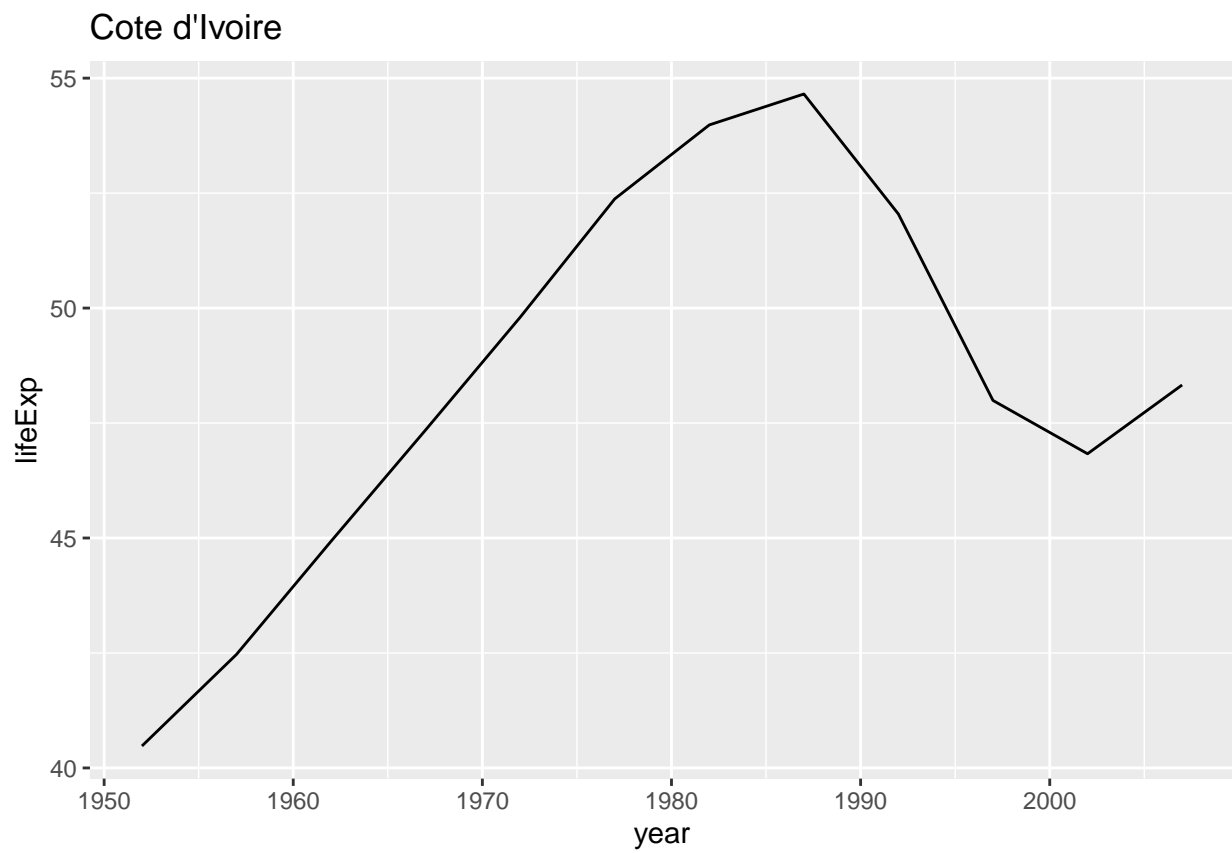
\$`Congo, Rep.`



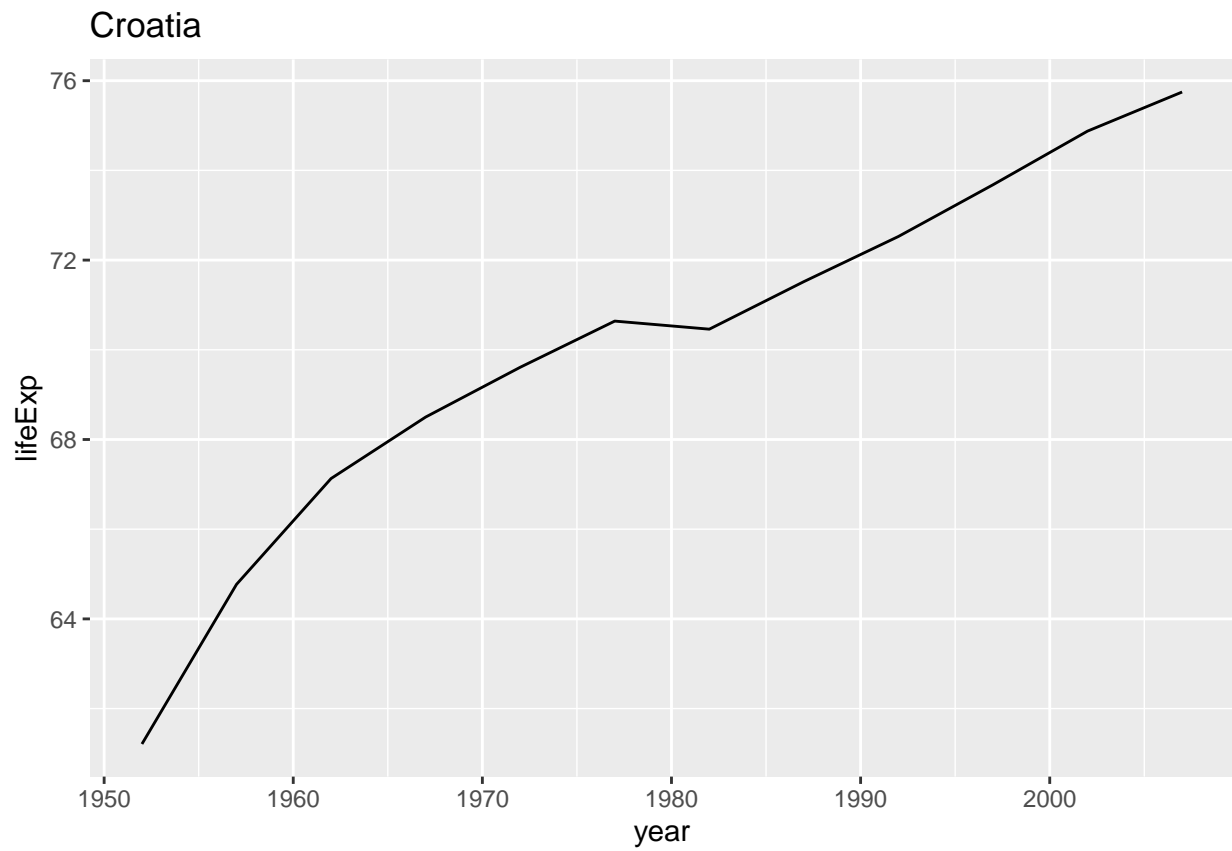
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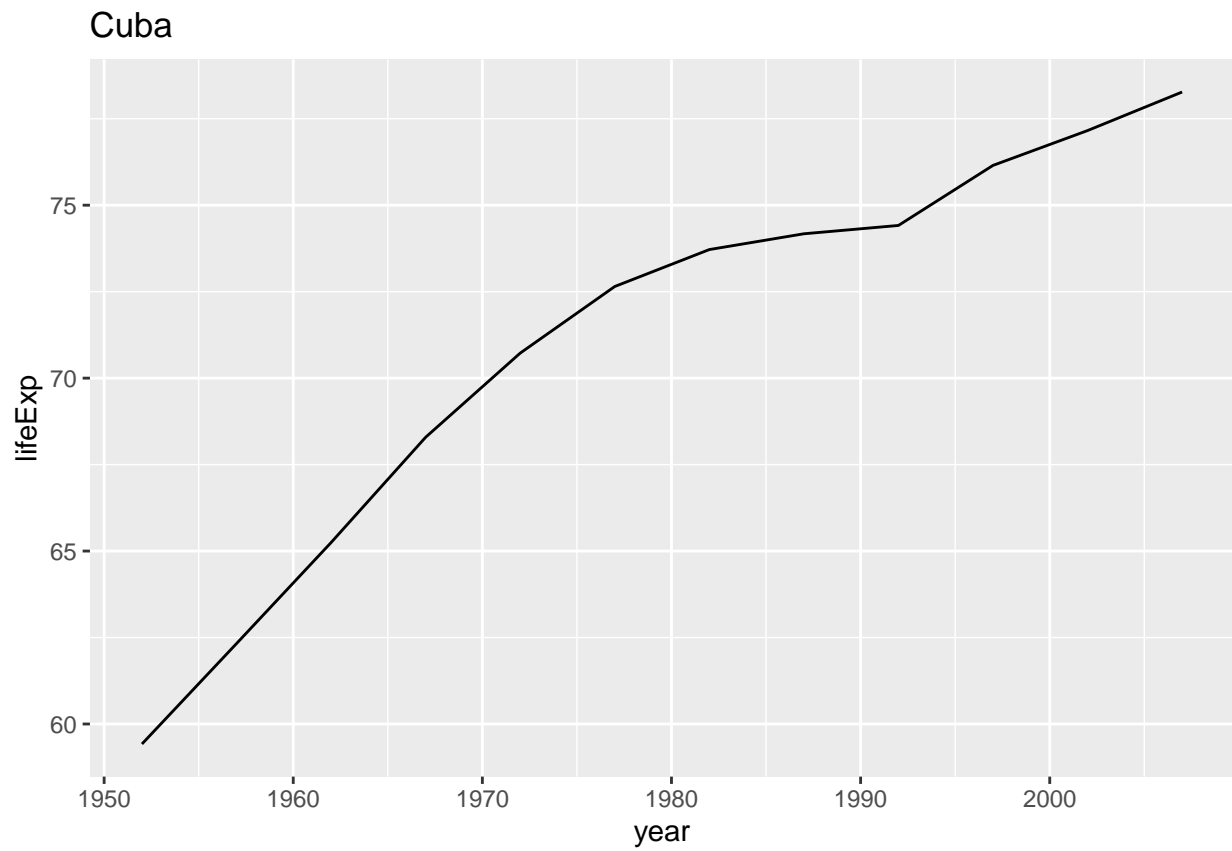
\$`Cote d'Ivoire`



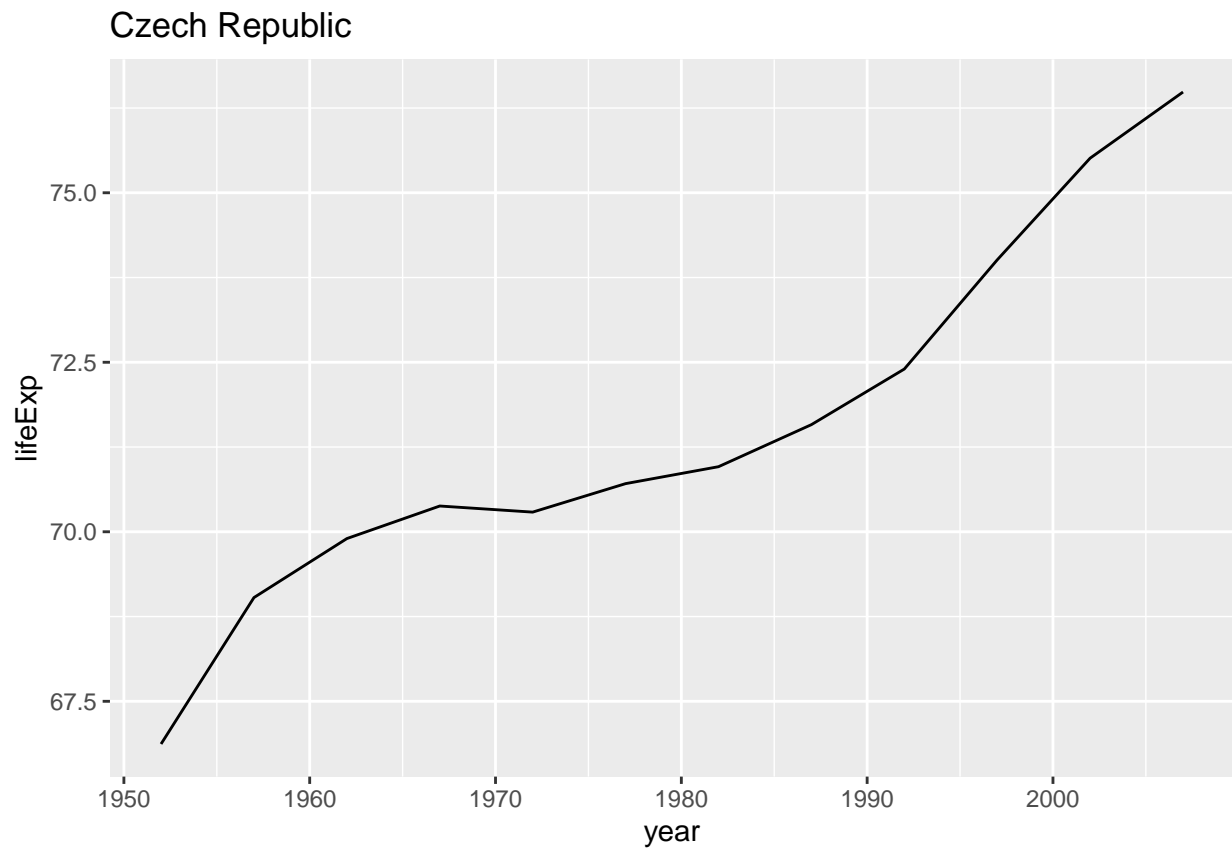
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##  
## $Croatia
```



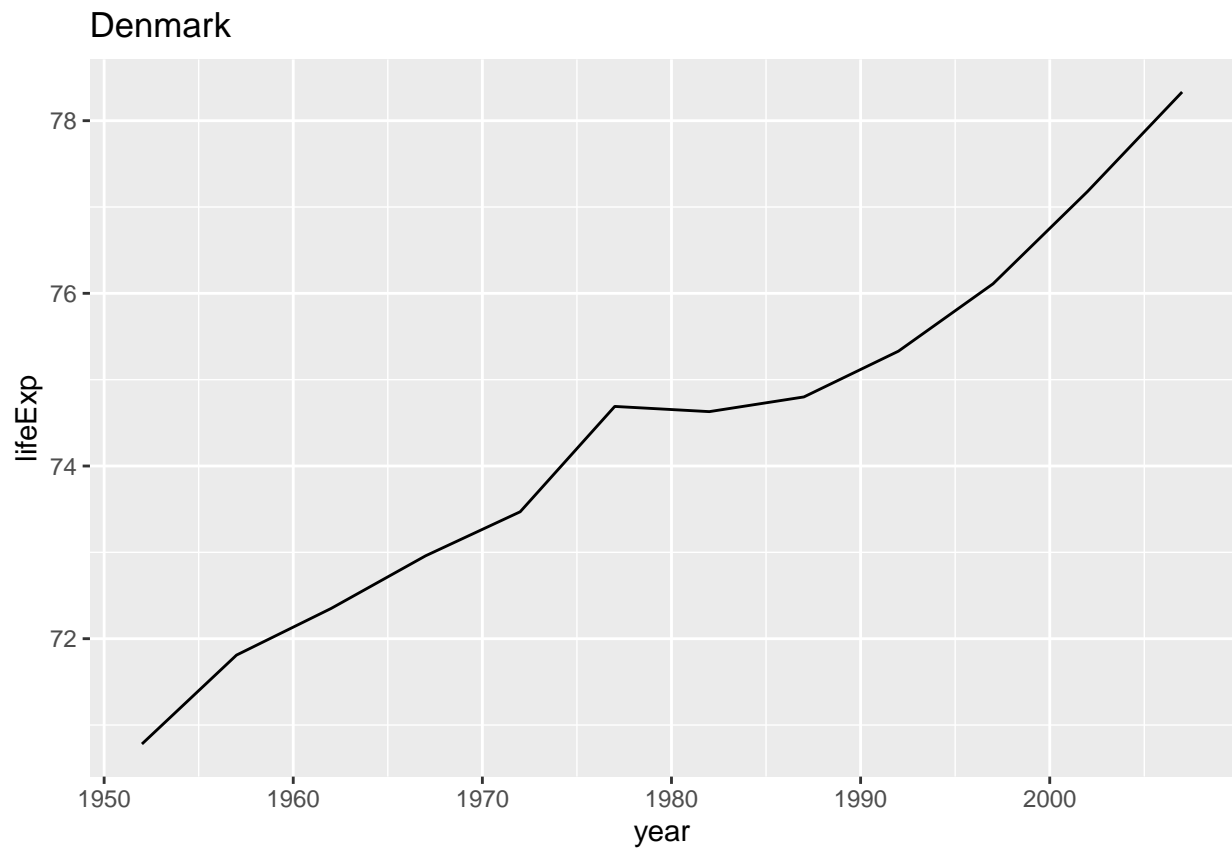
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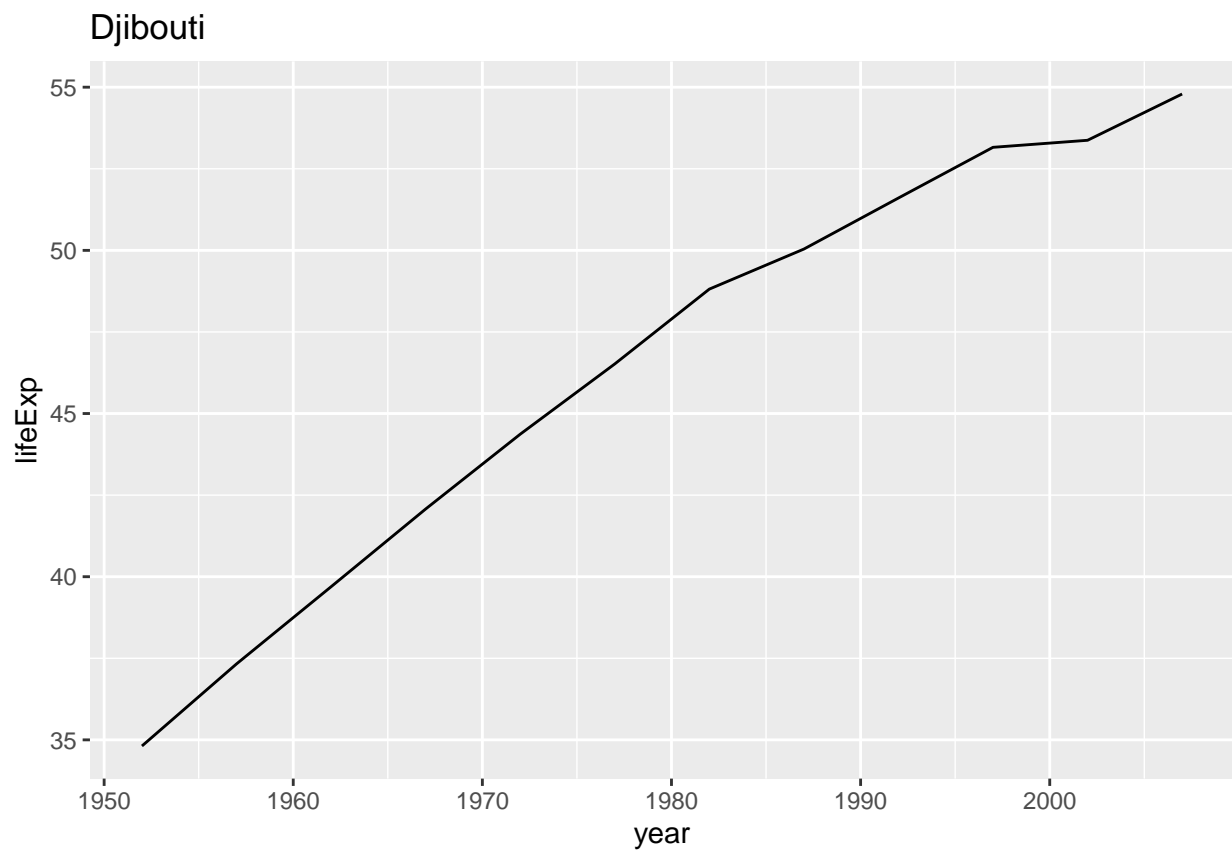
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##  
## $`Czech Republic`
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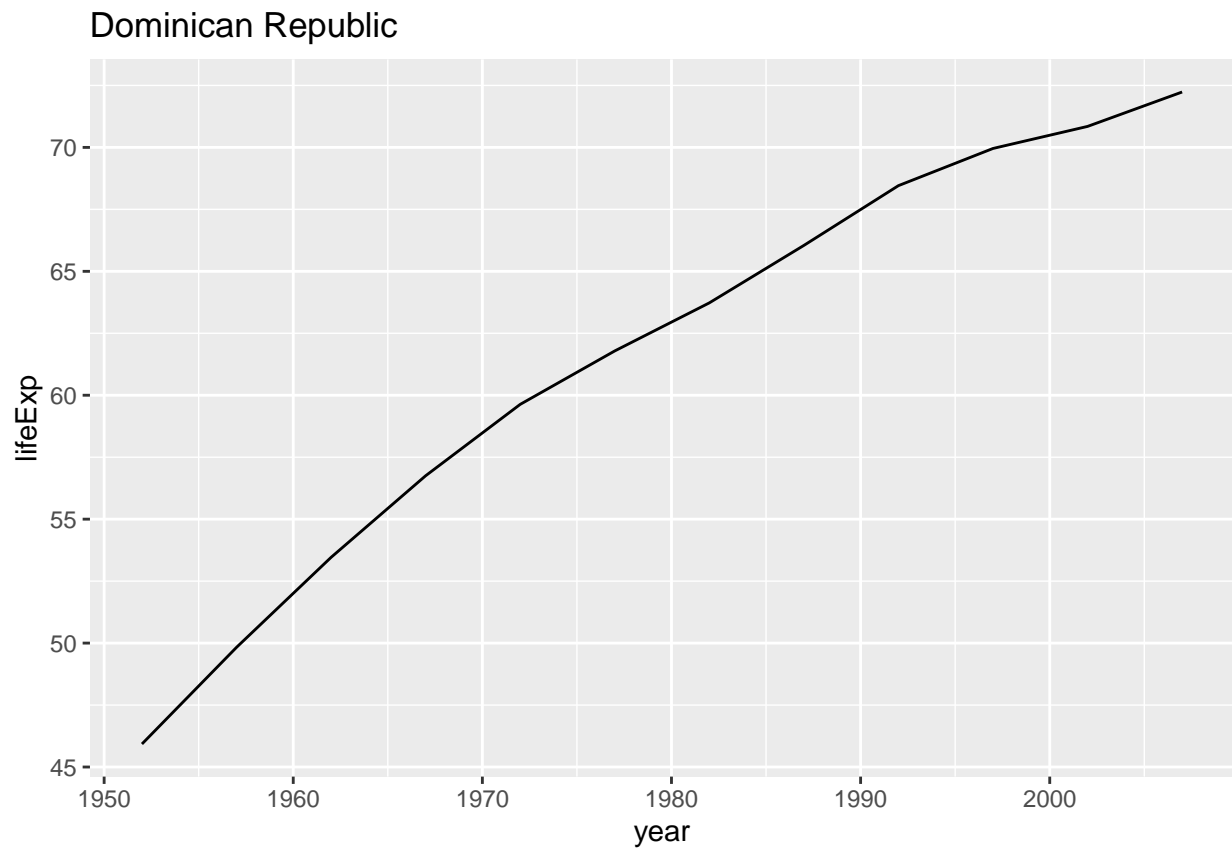
\$Denmark



\$Djibouti

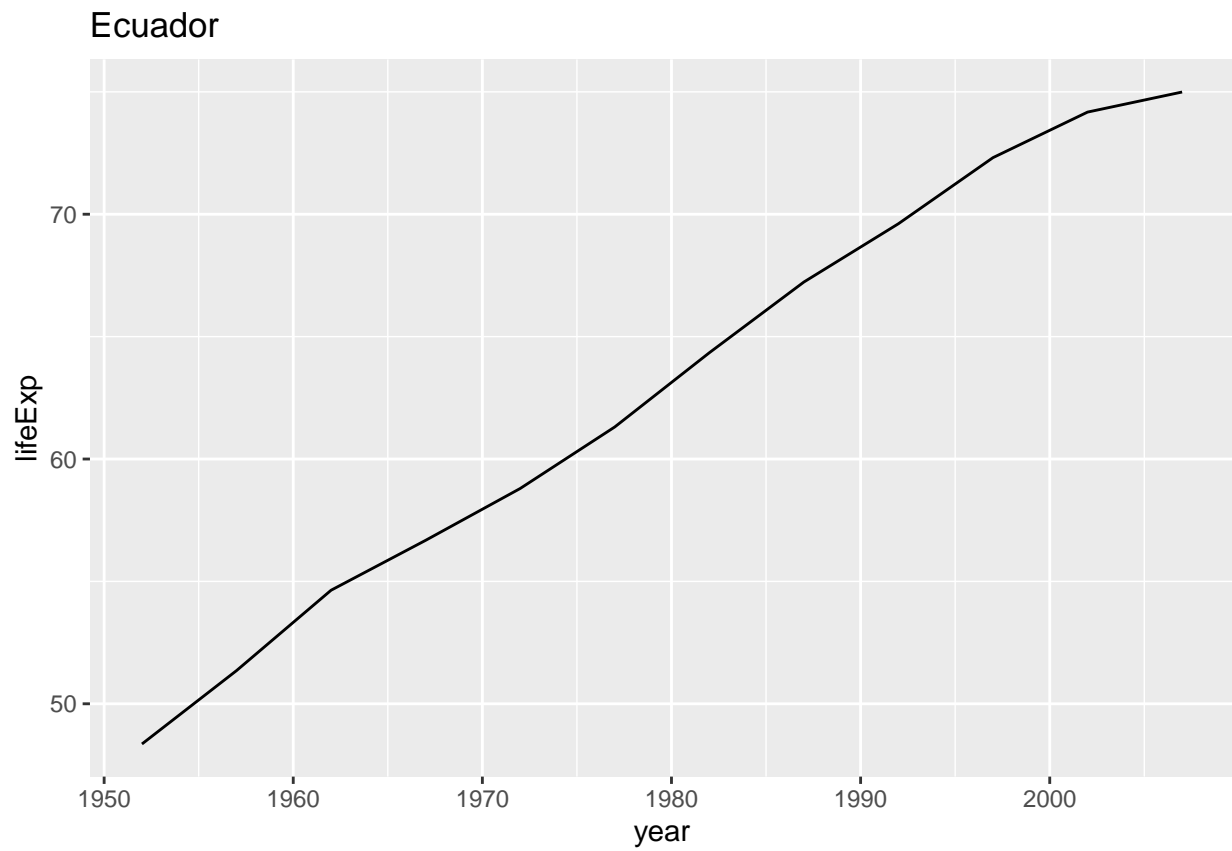


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##  
## $`Dominican Republic`
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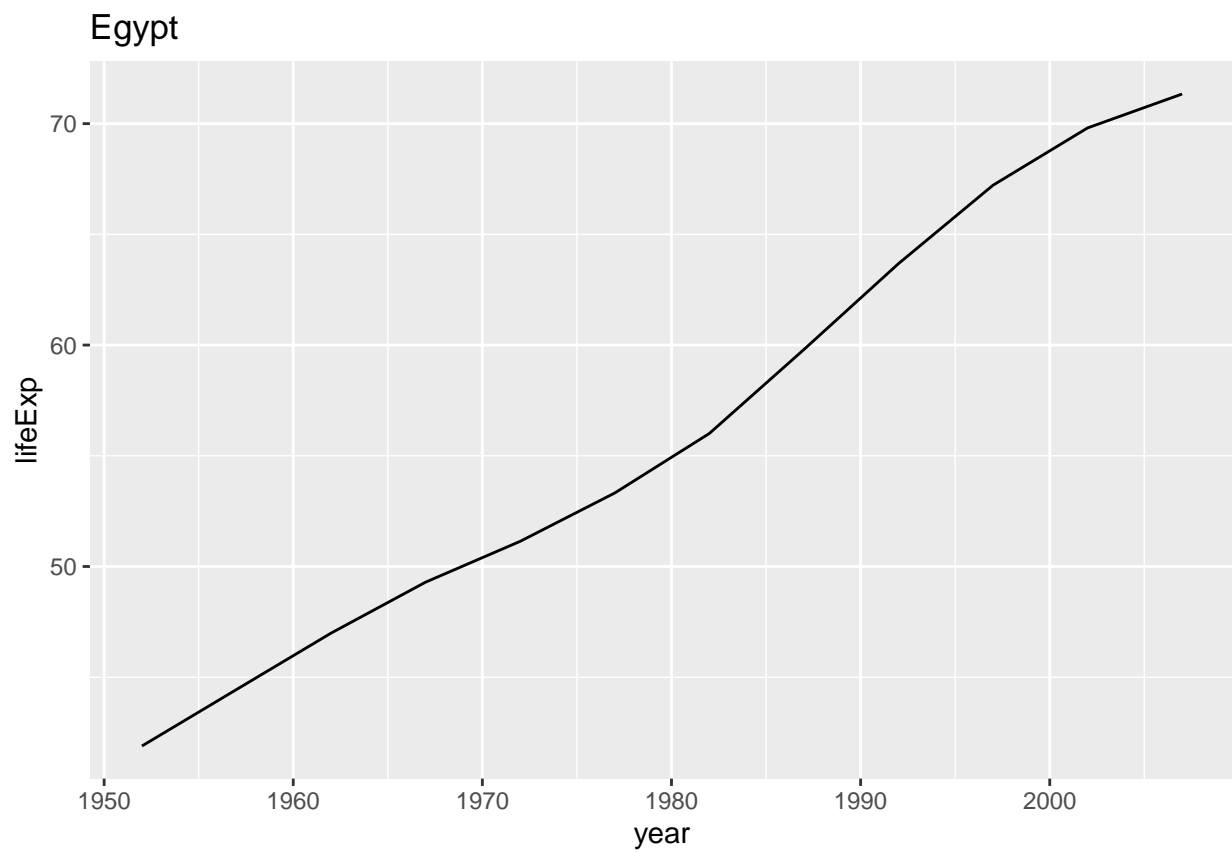


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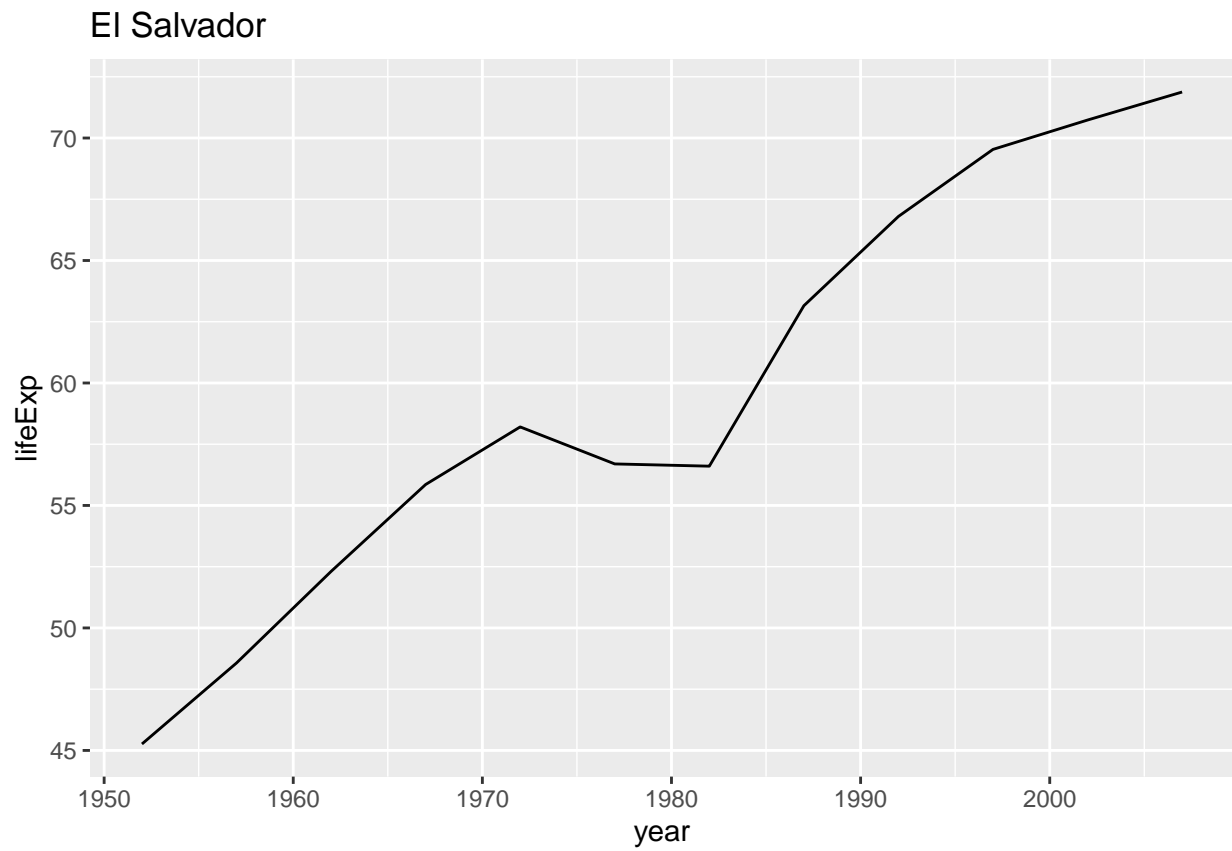
\$Ecuador



\$Egypt

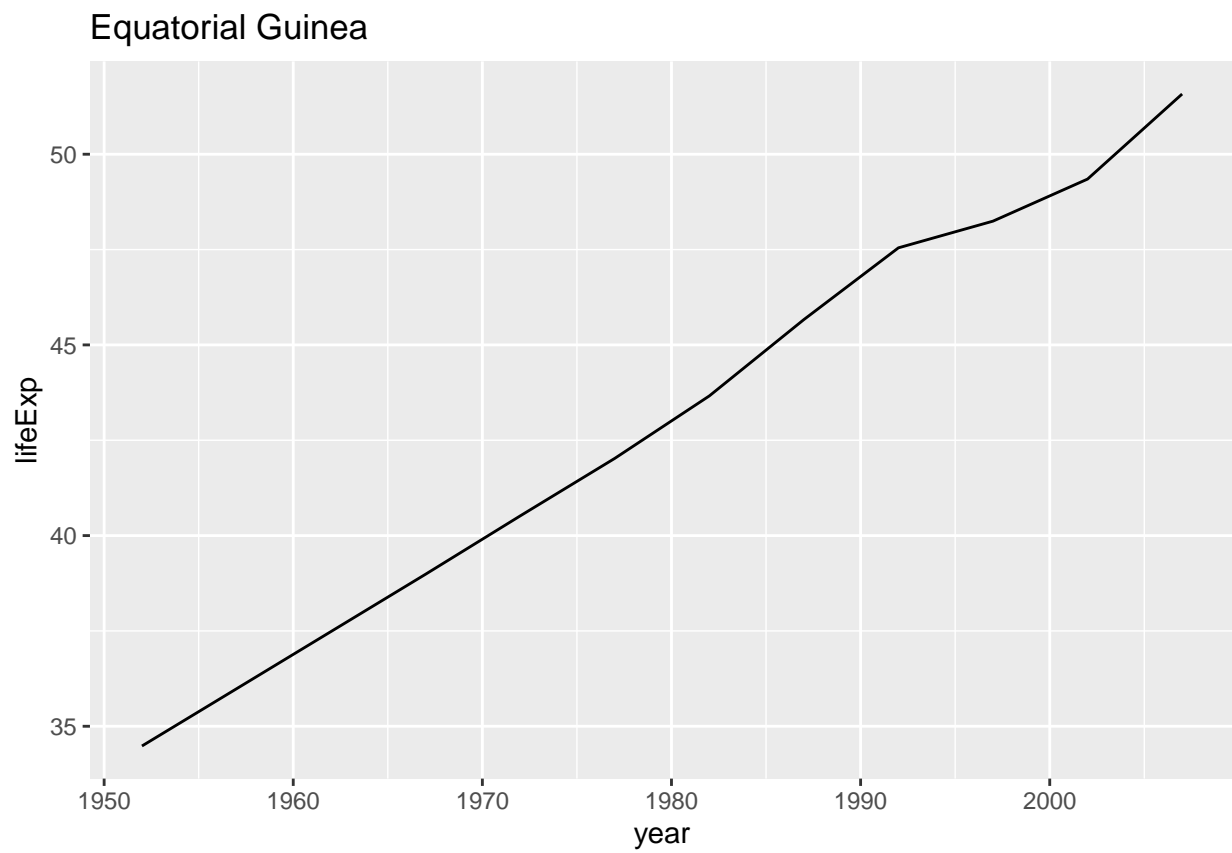


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##  
## $`El Salvador`
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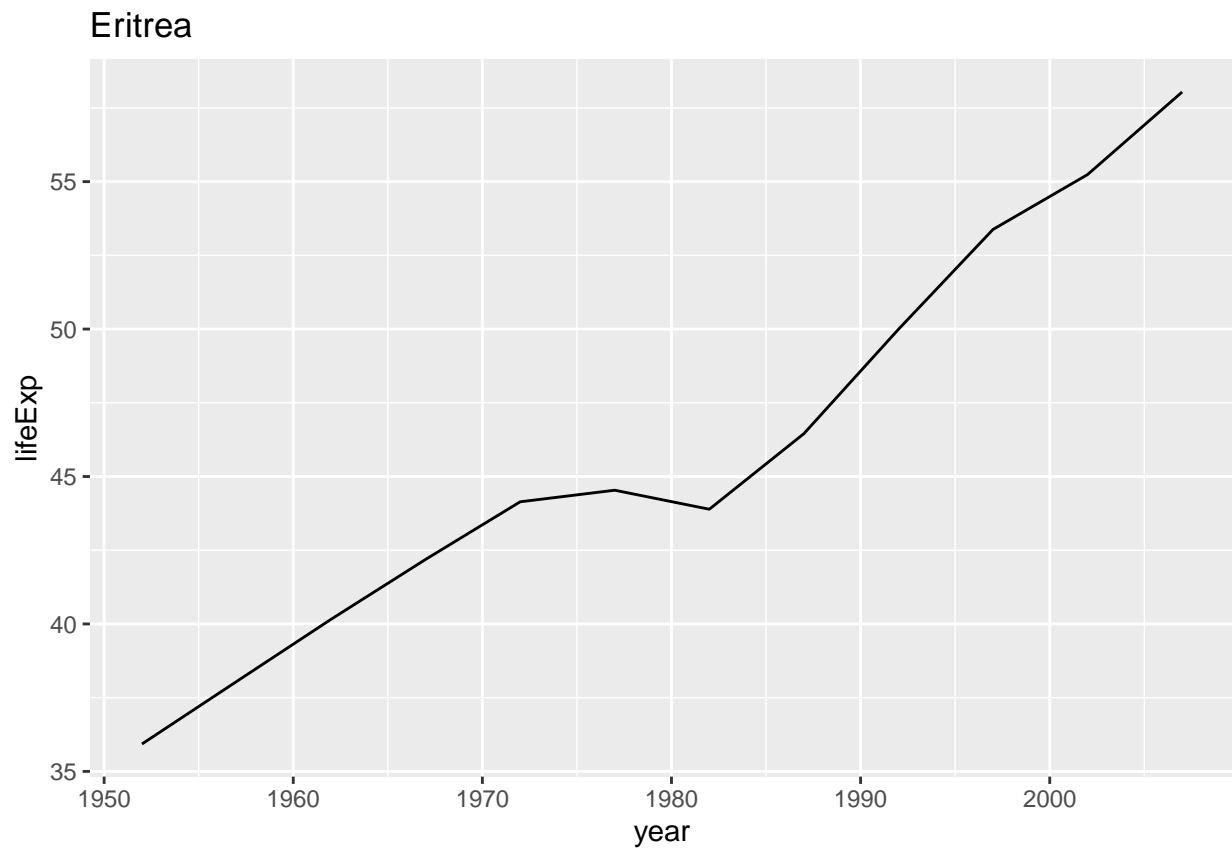


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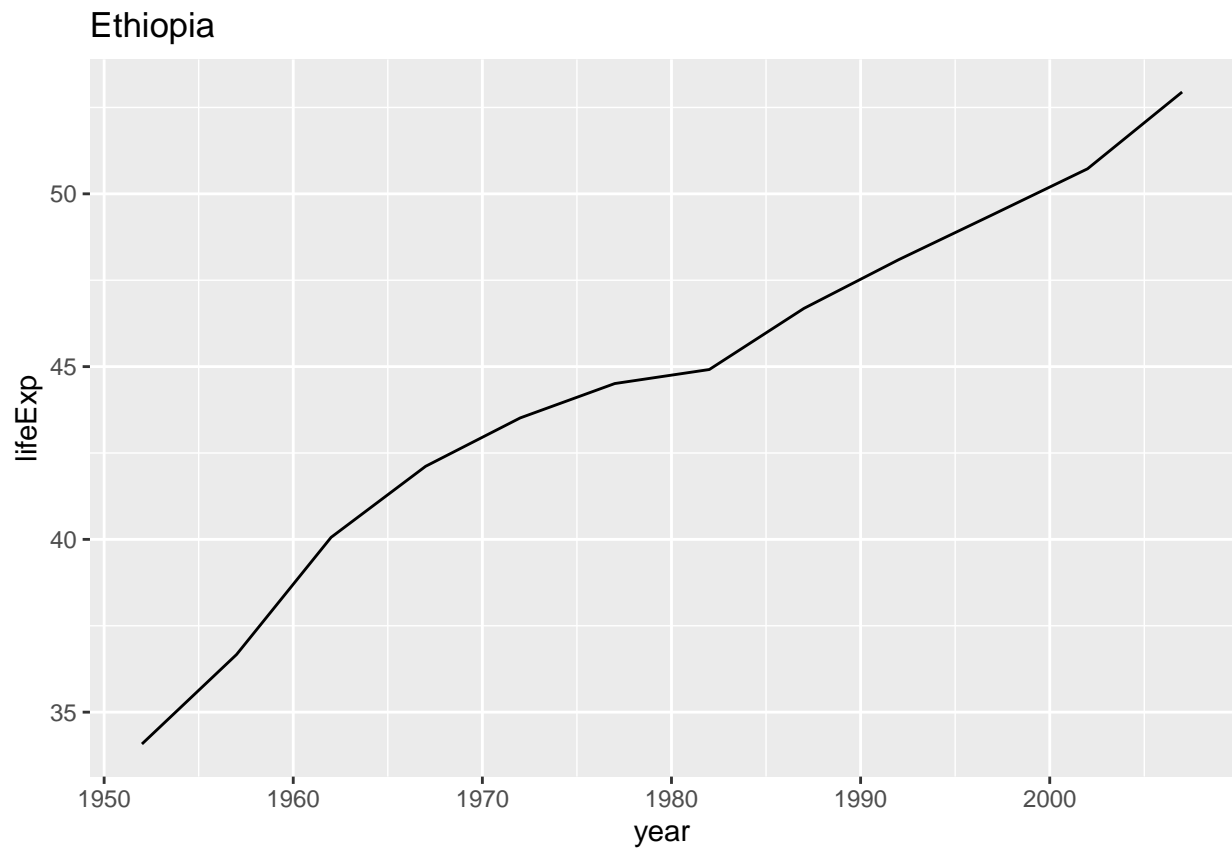
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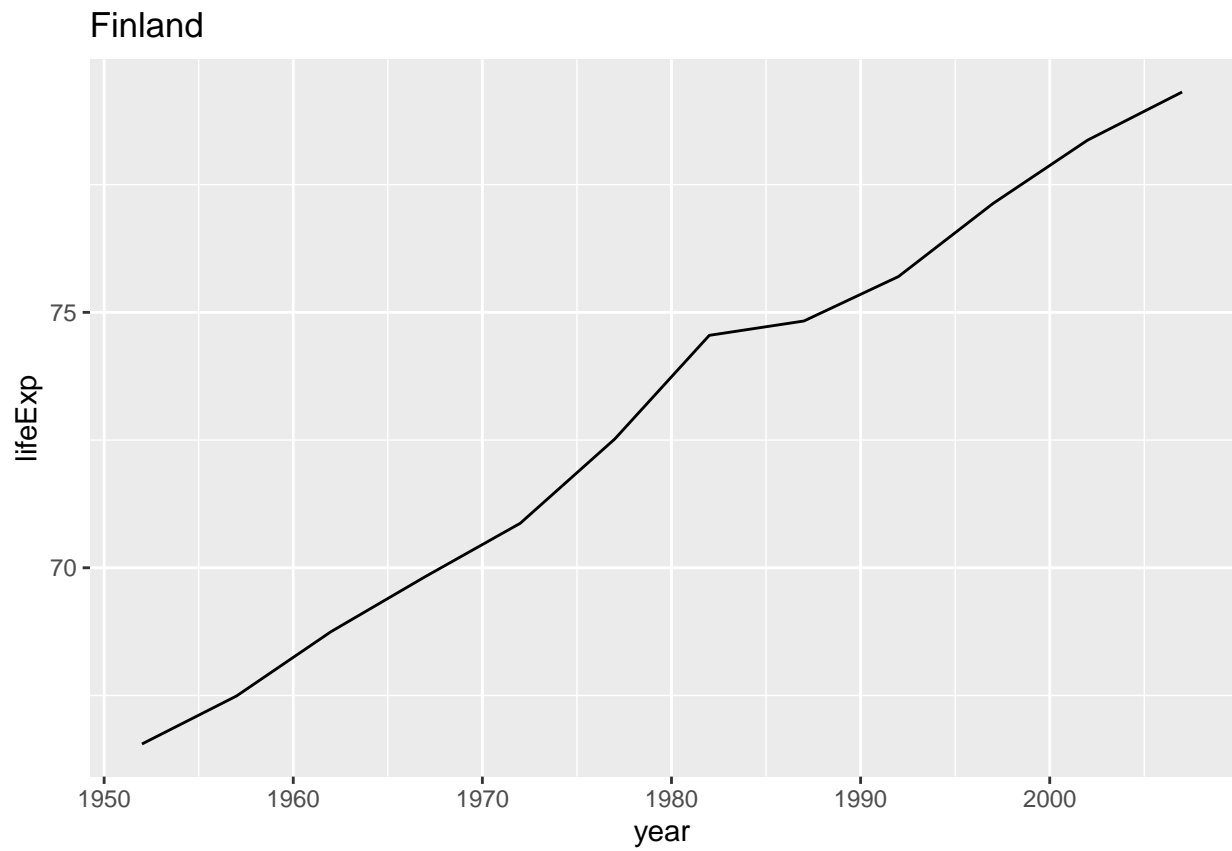
\$Eritrea



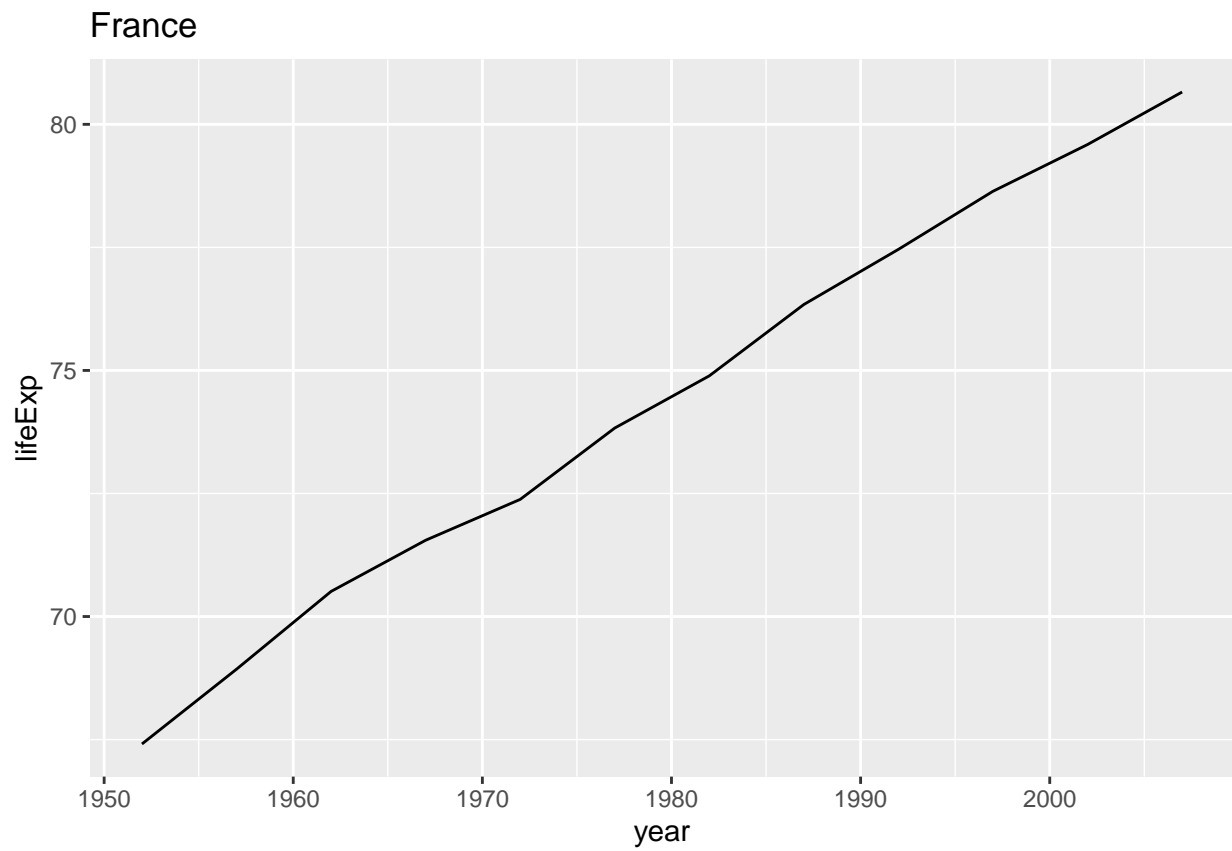
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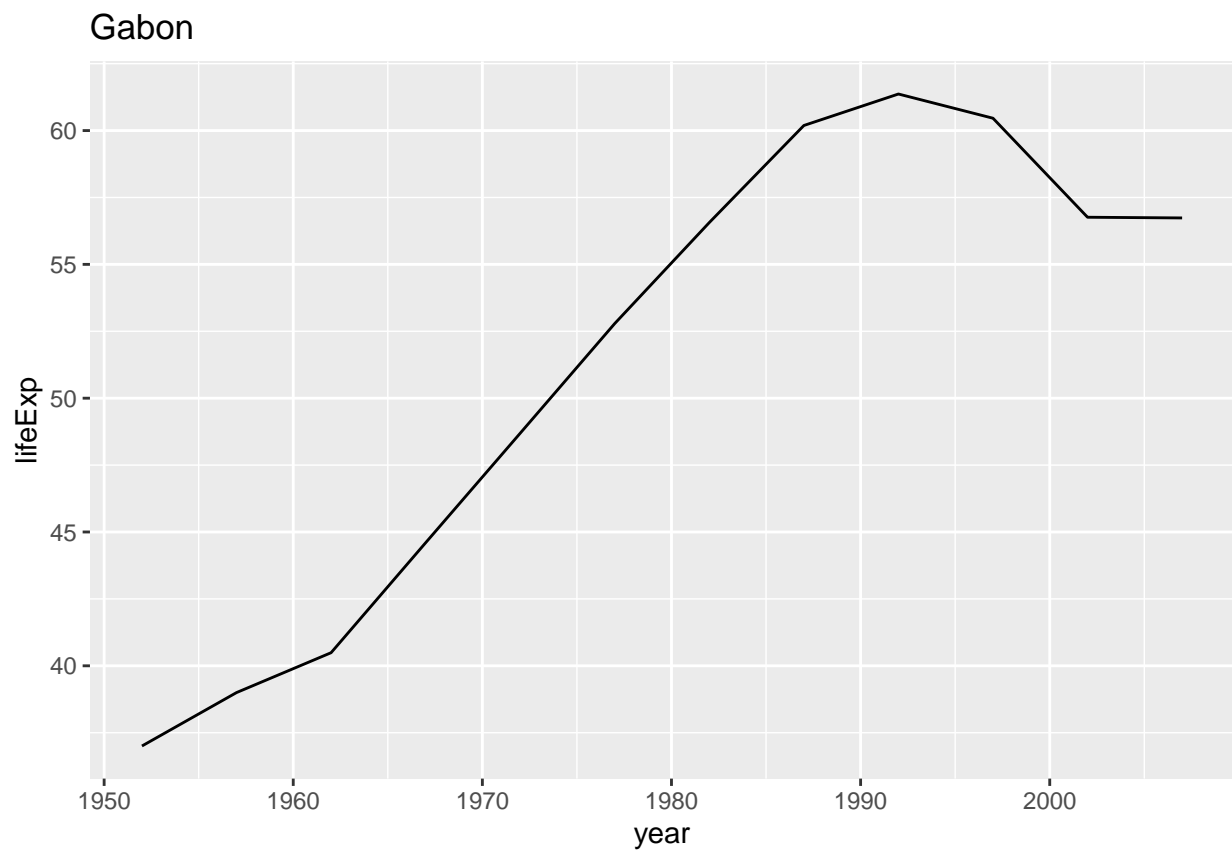
\$Finland



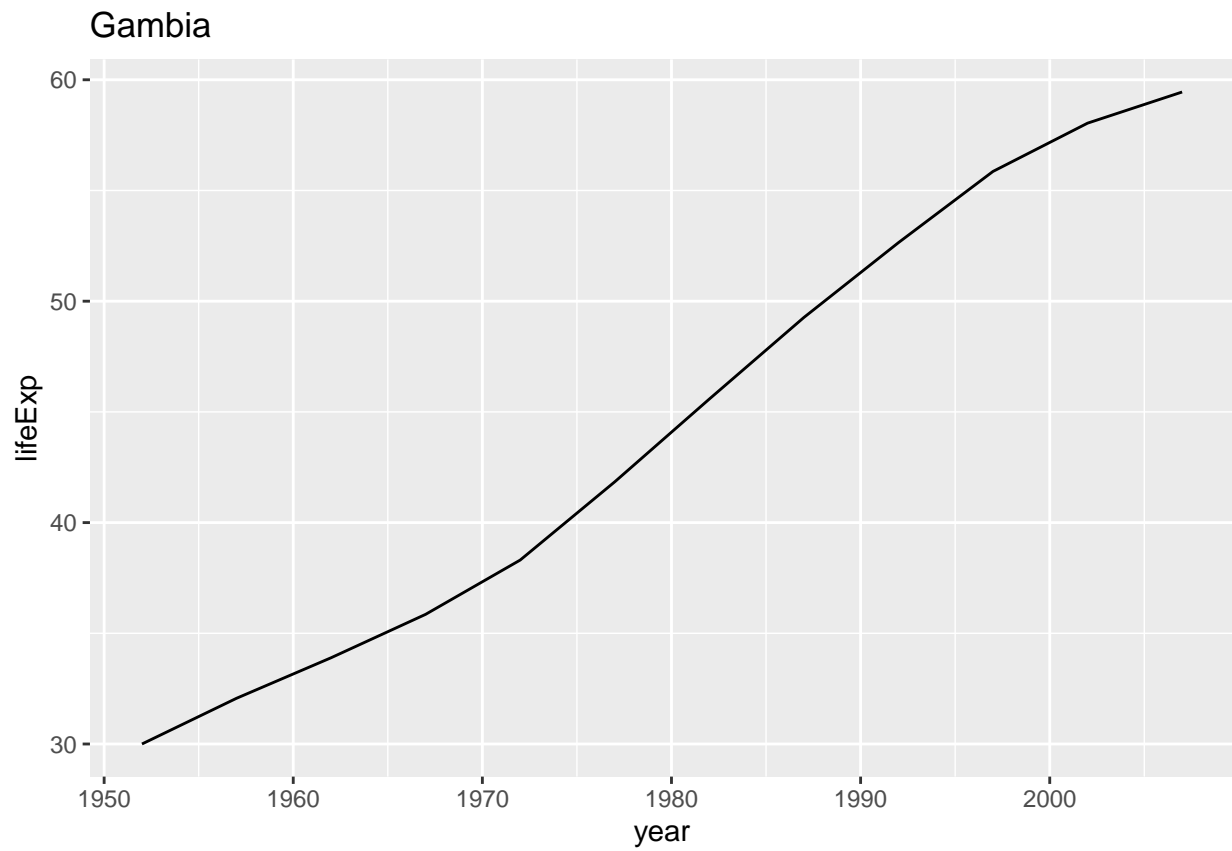
\$France



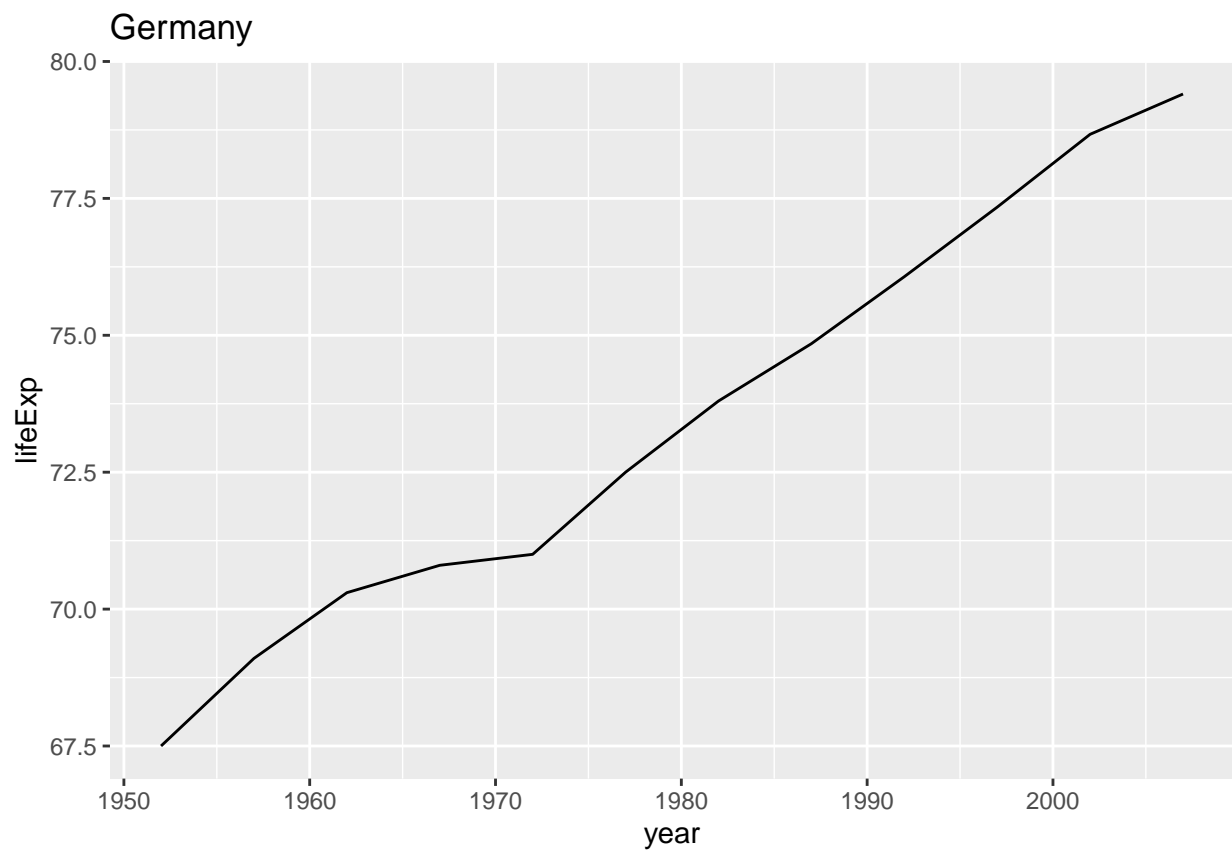
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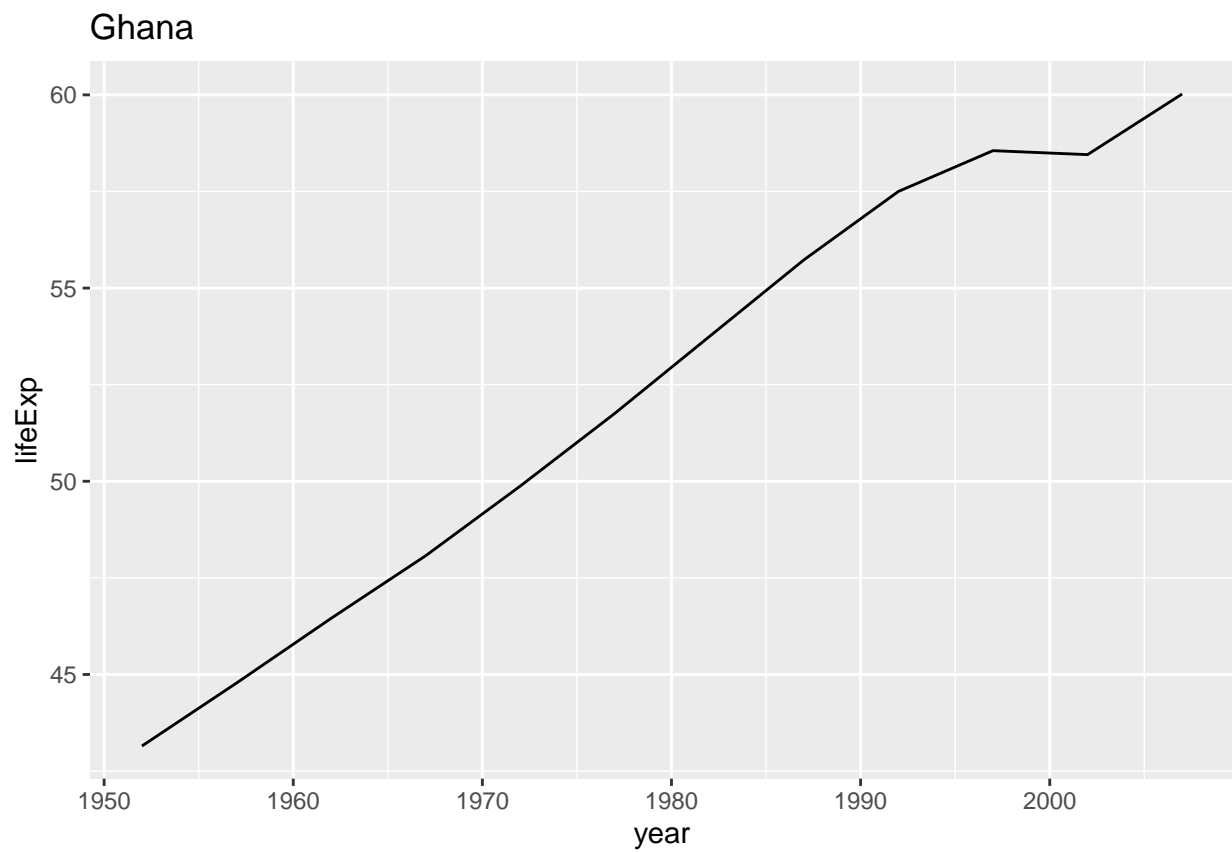
\$Gambia



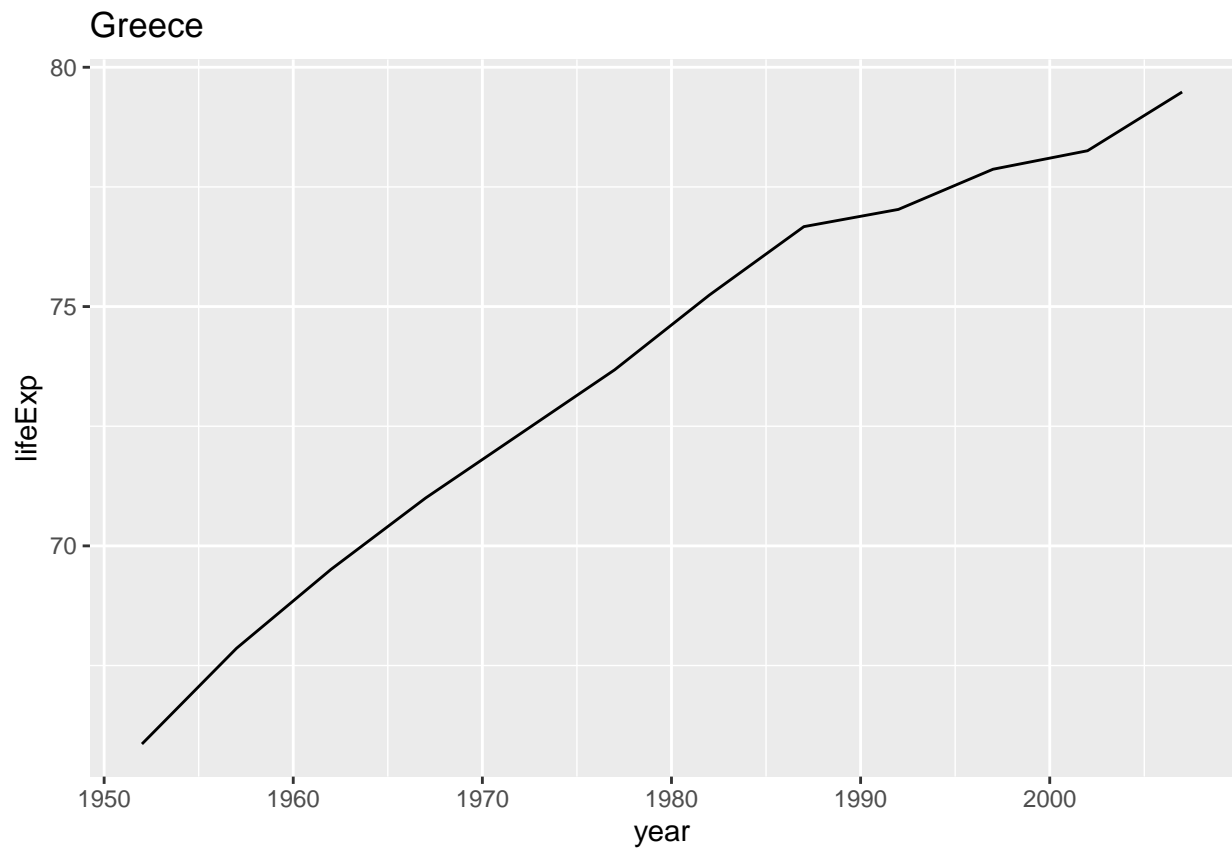
\$Germany



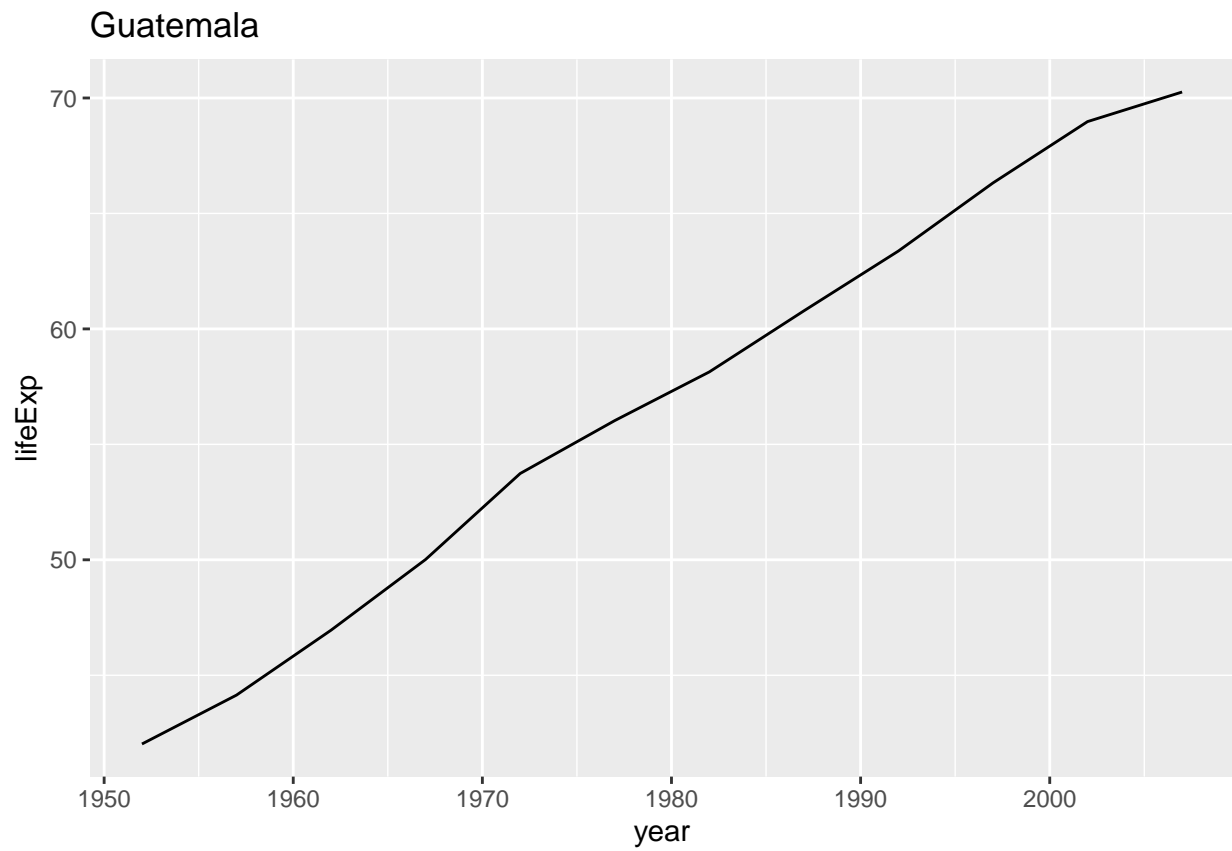
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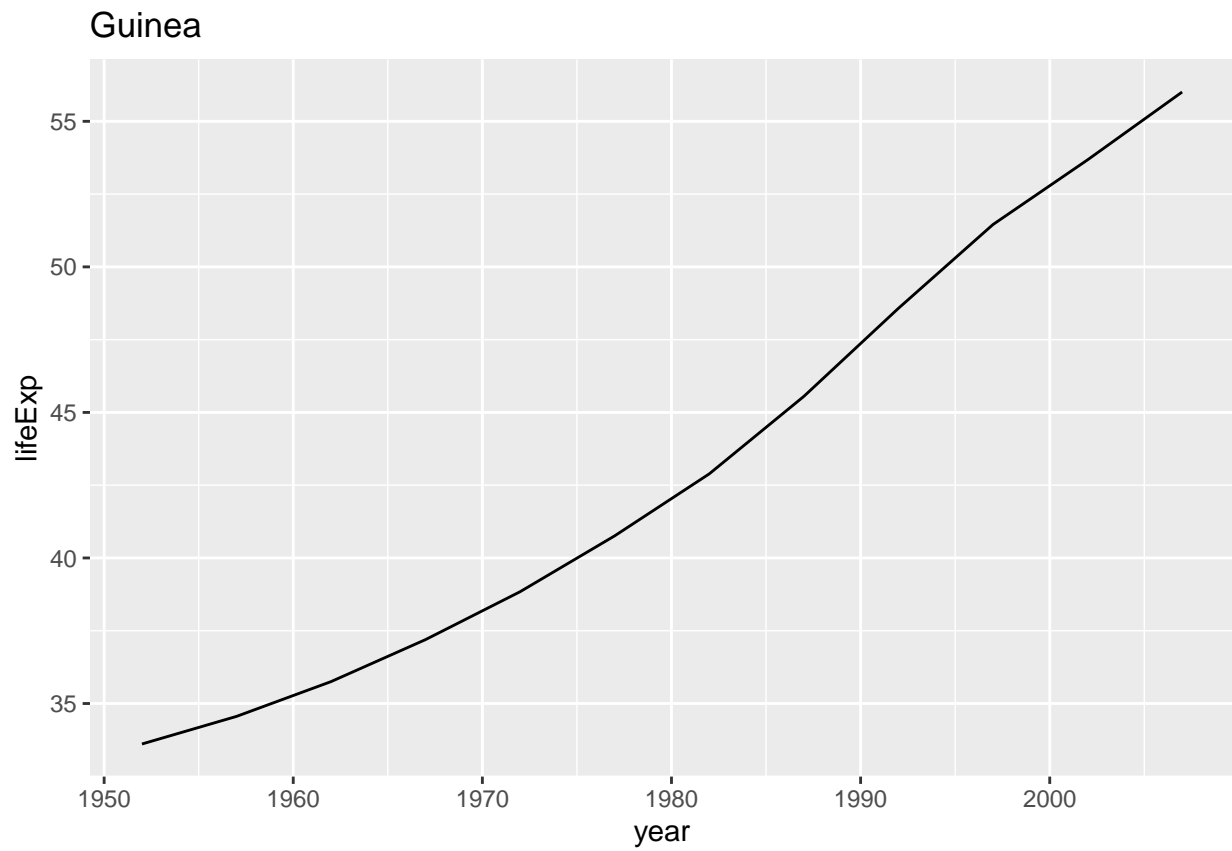
\$Greece



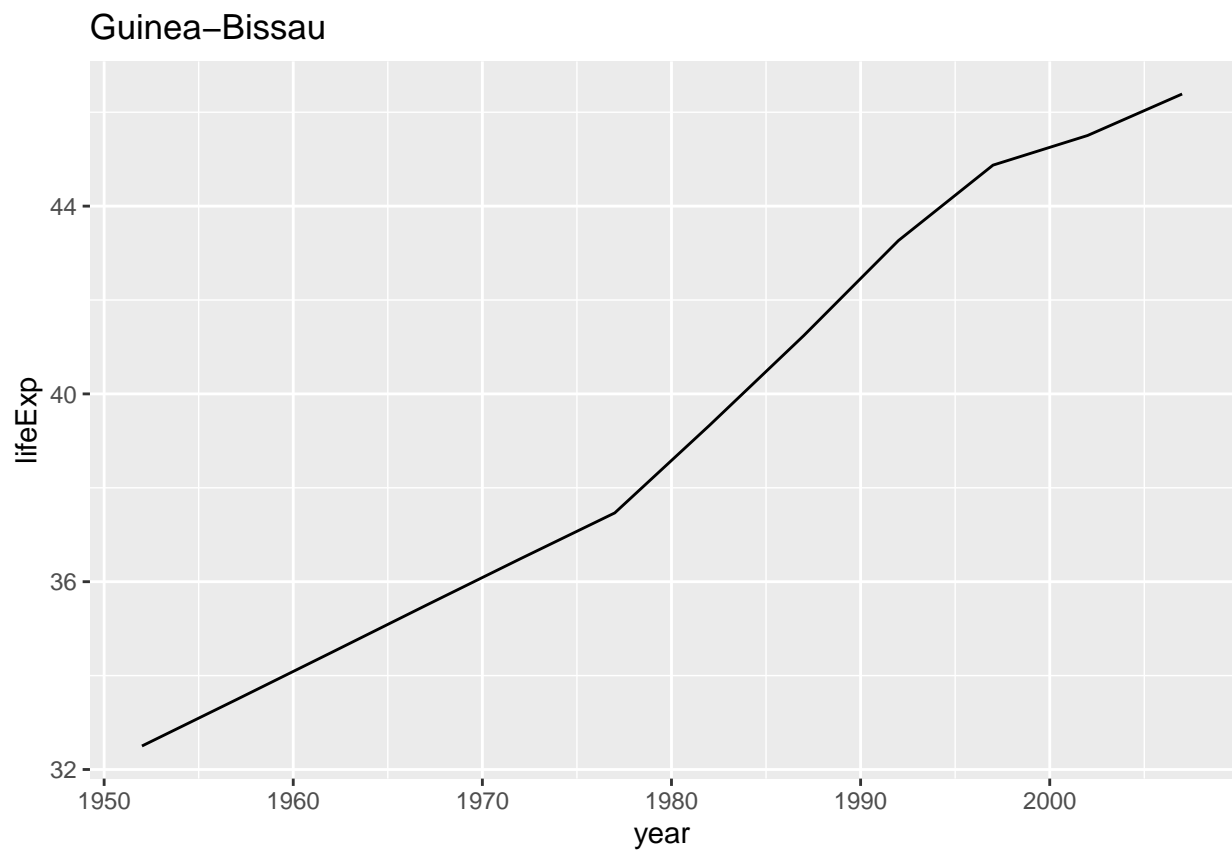
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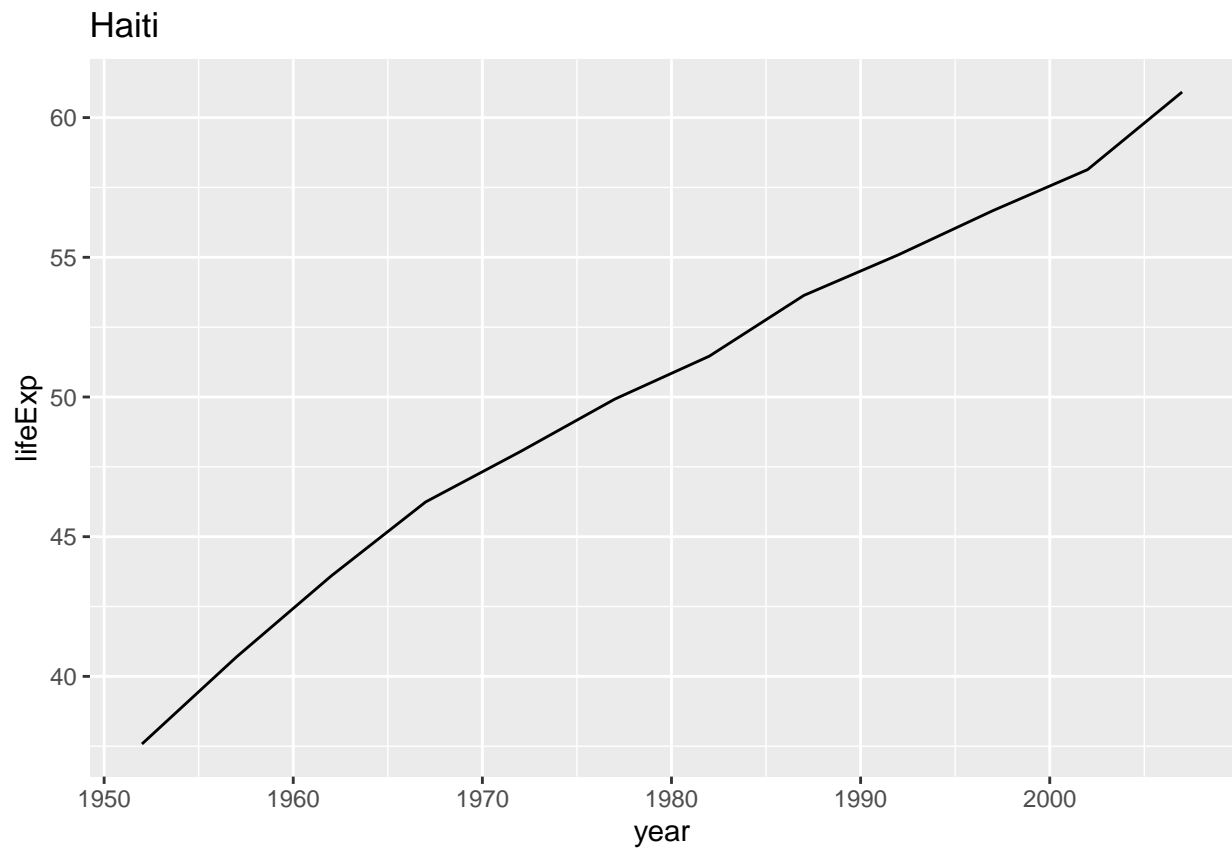
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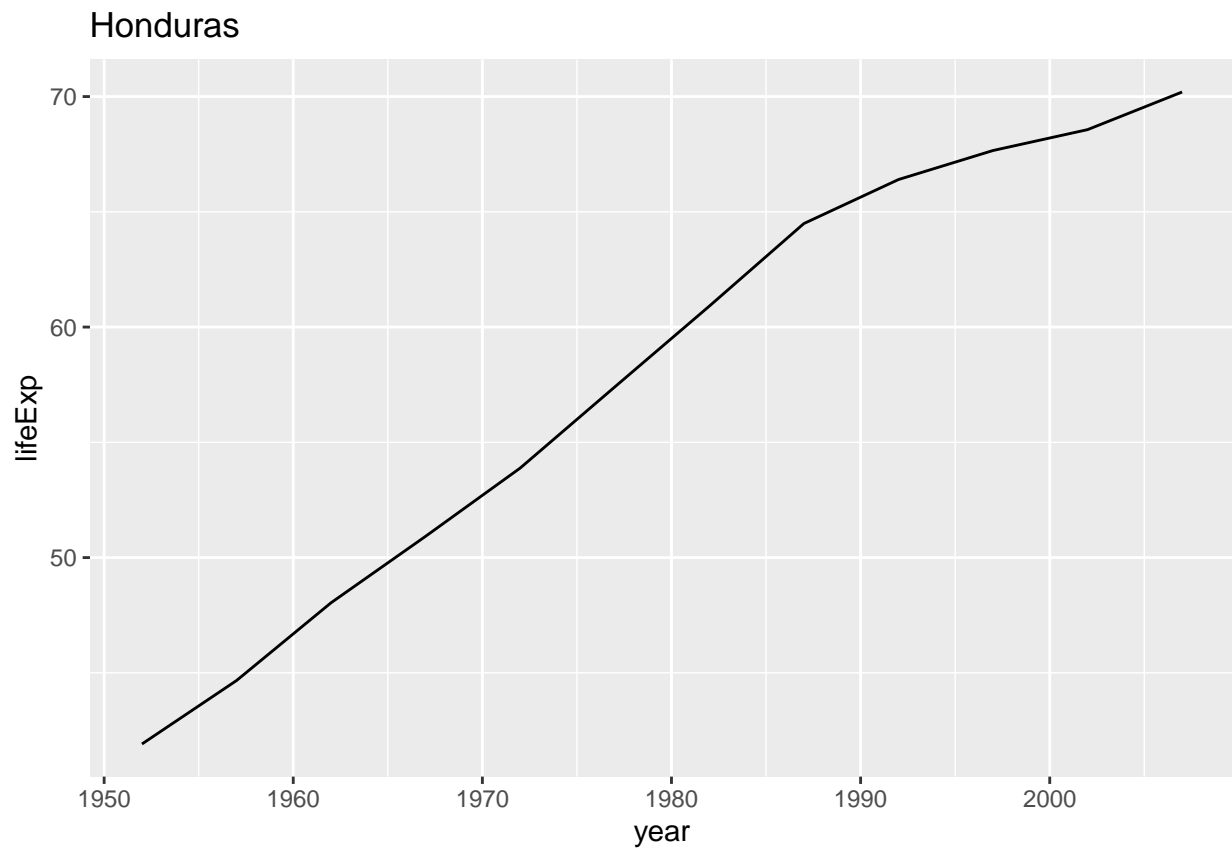
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##  
## $`Guinea-Bissau`
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\$Haiti

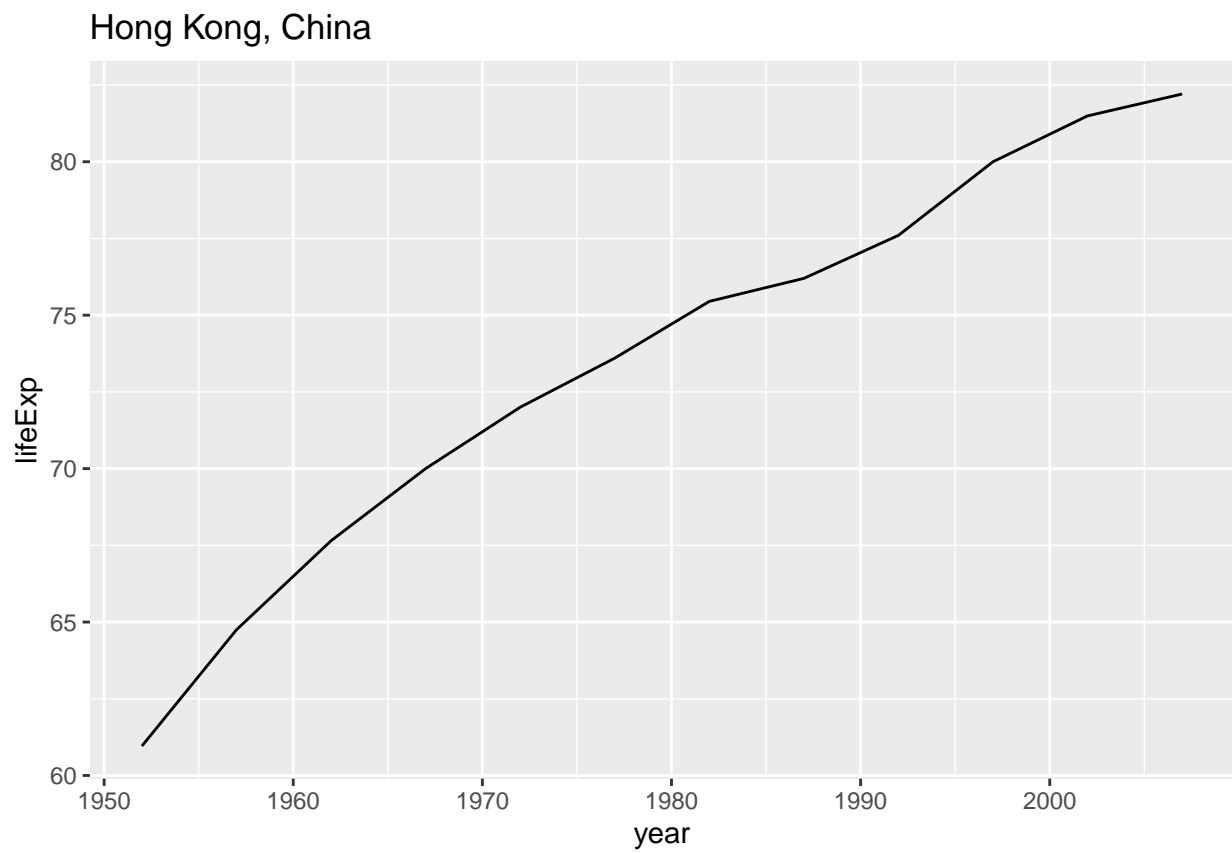


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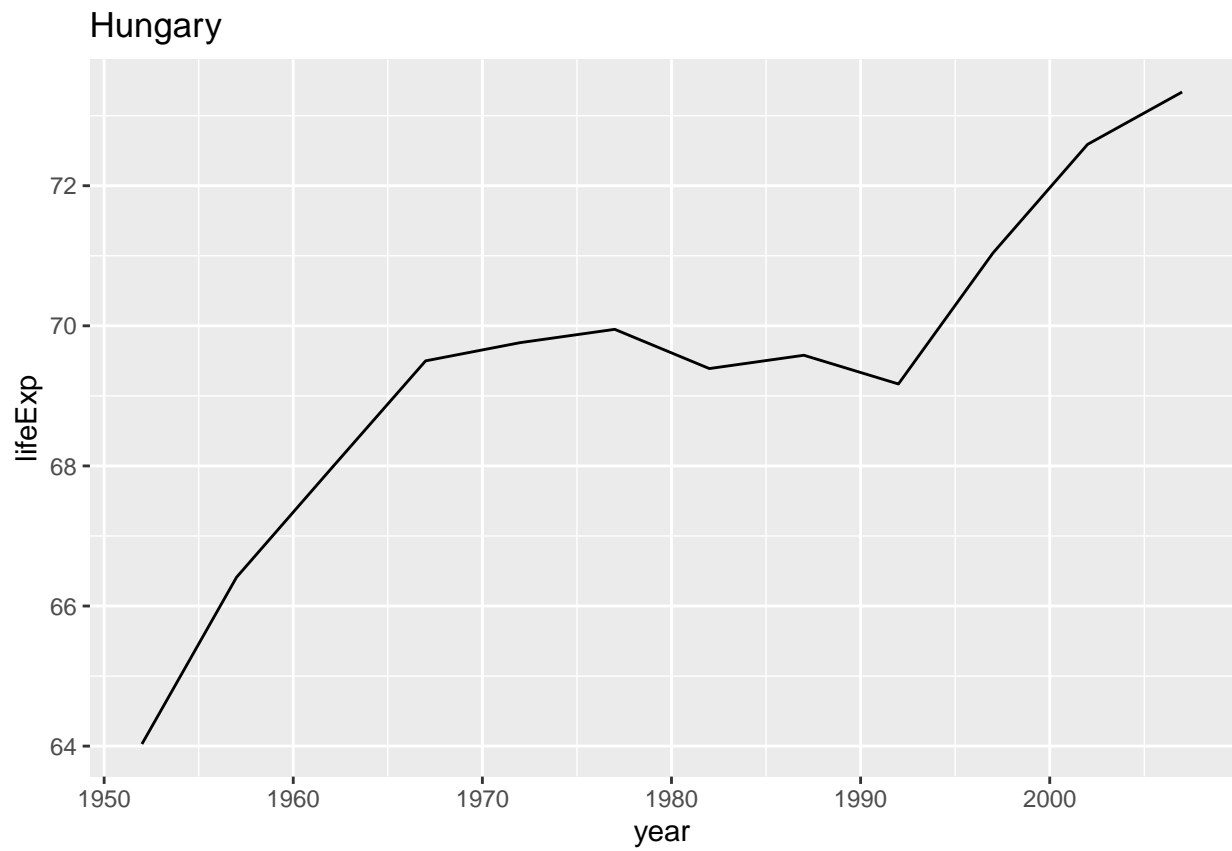


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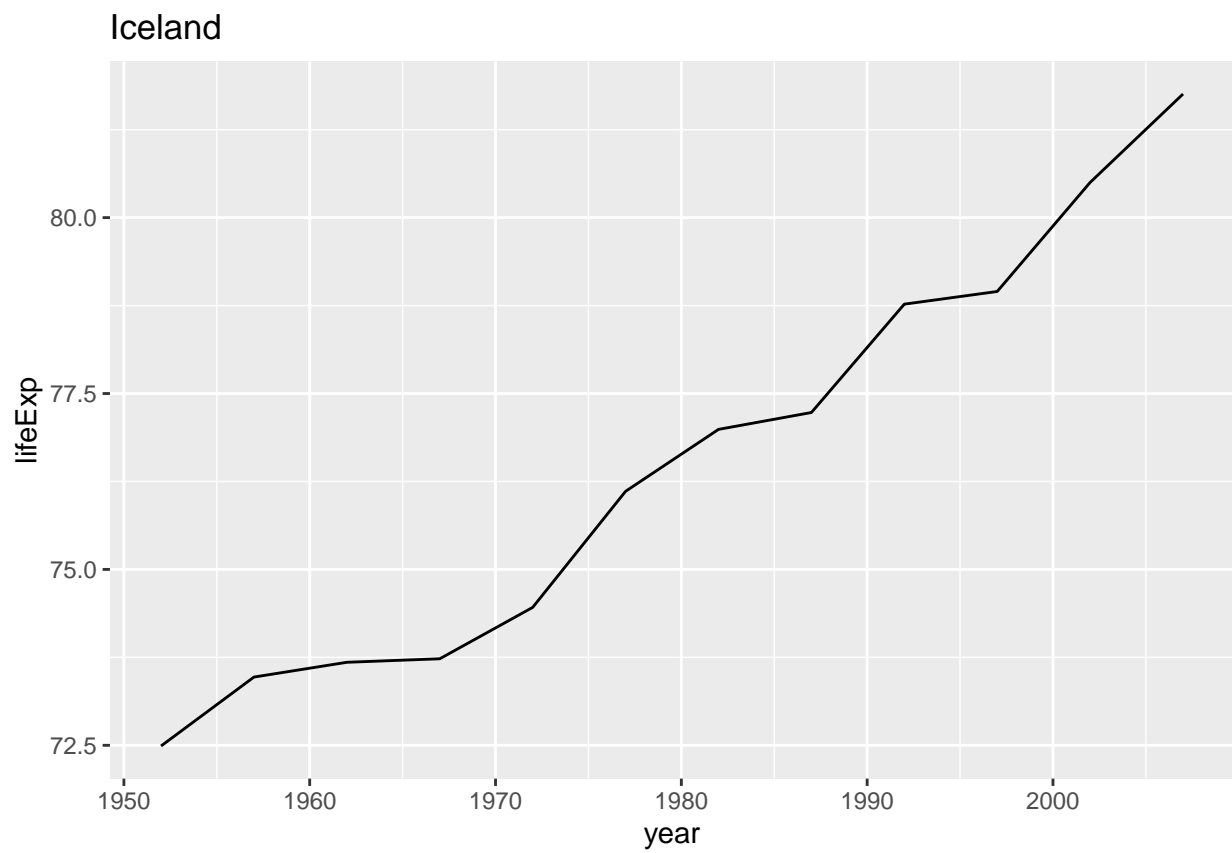
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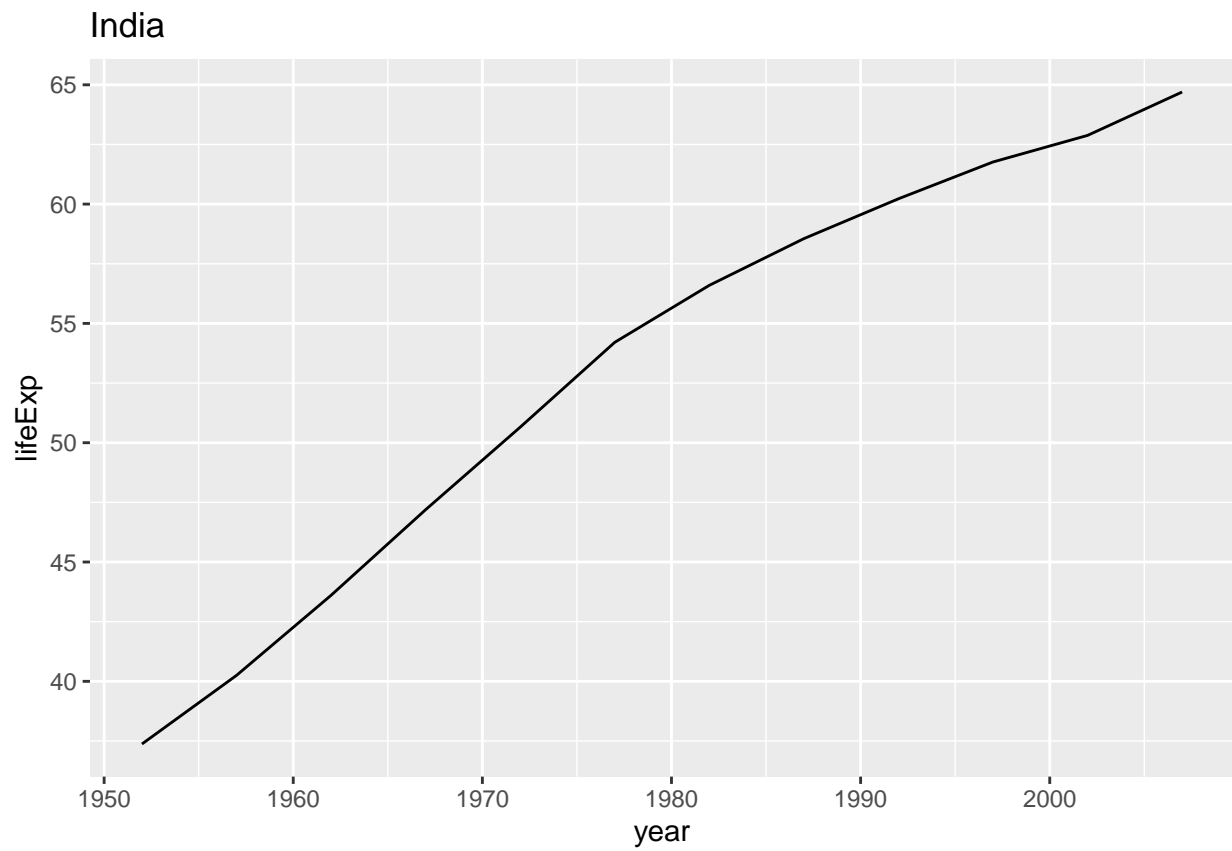
\$Hungary



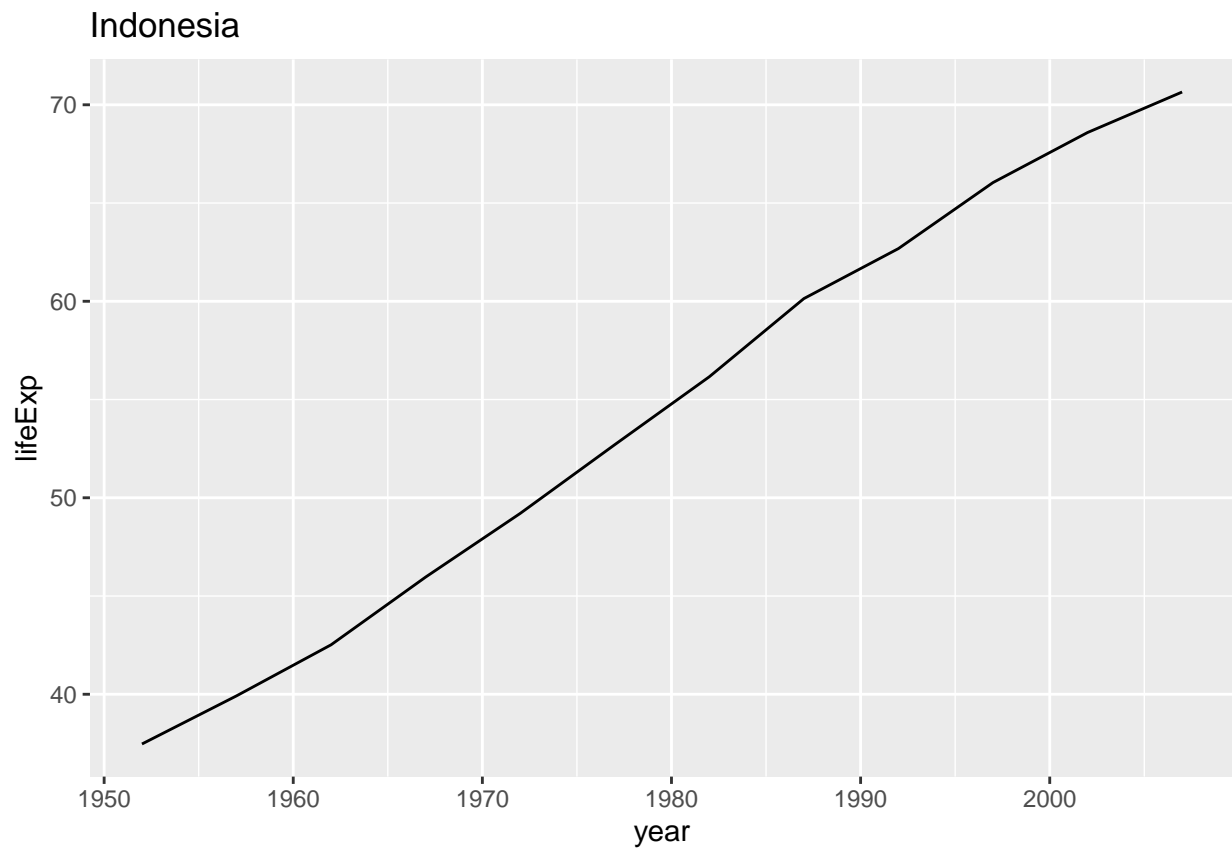
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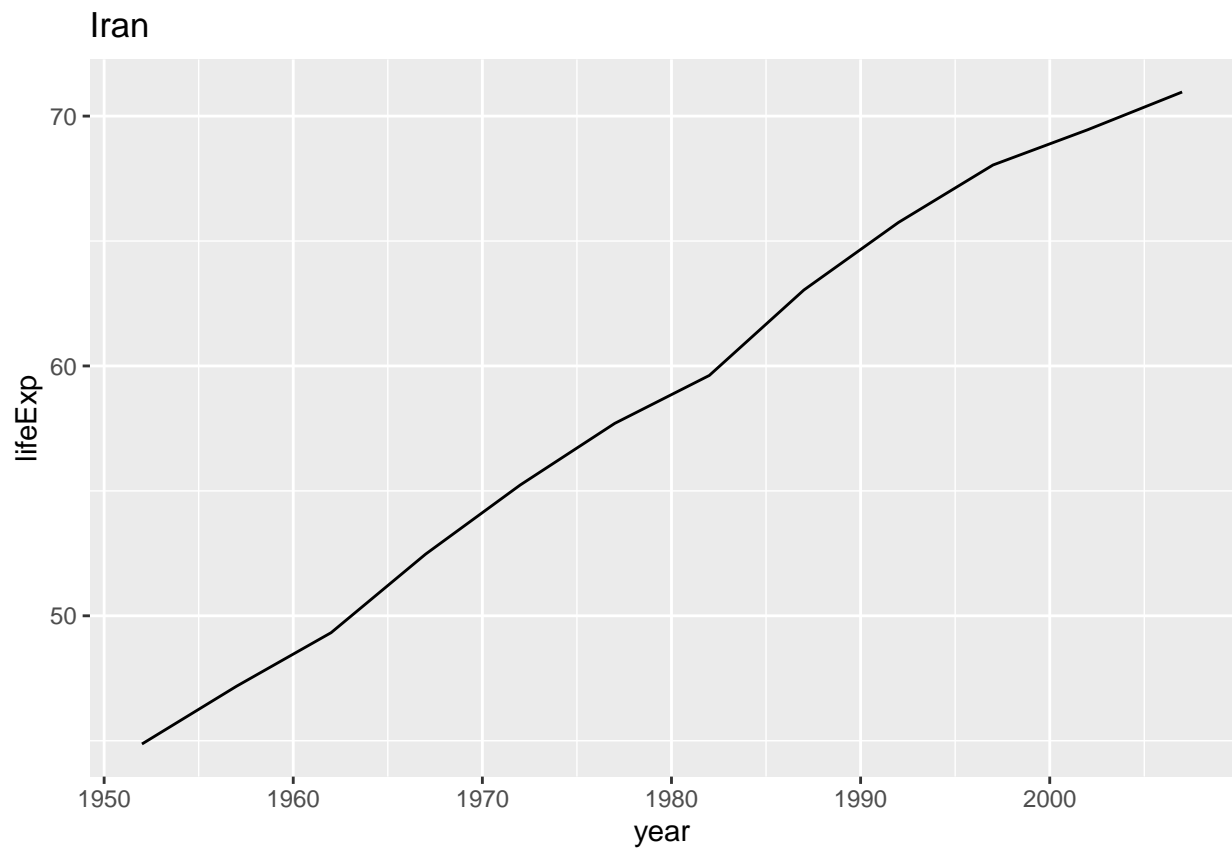
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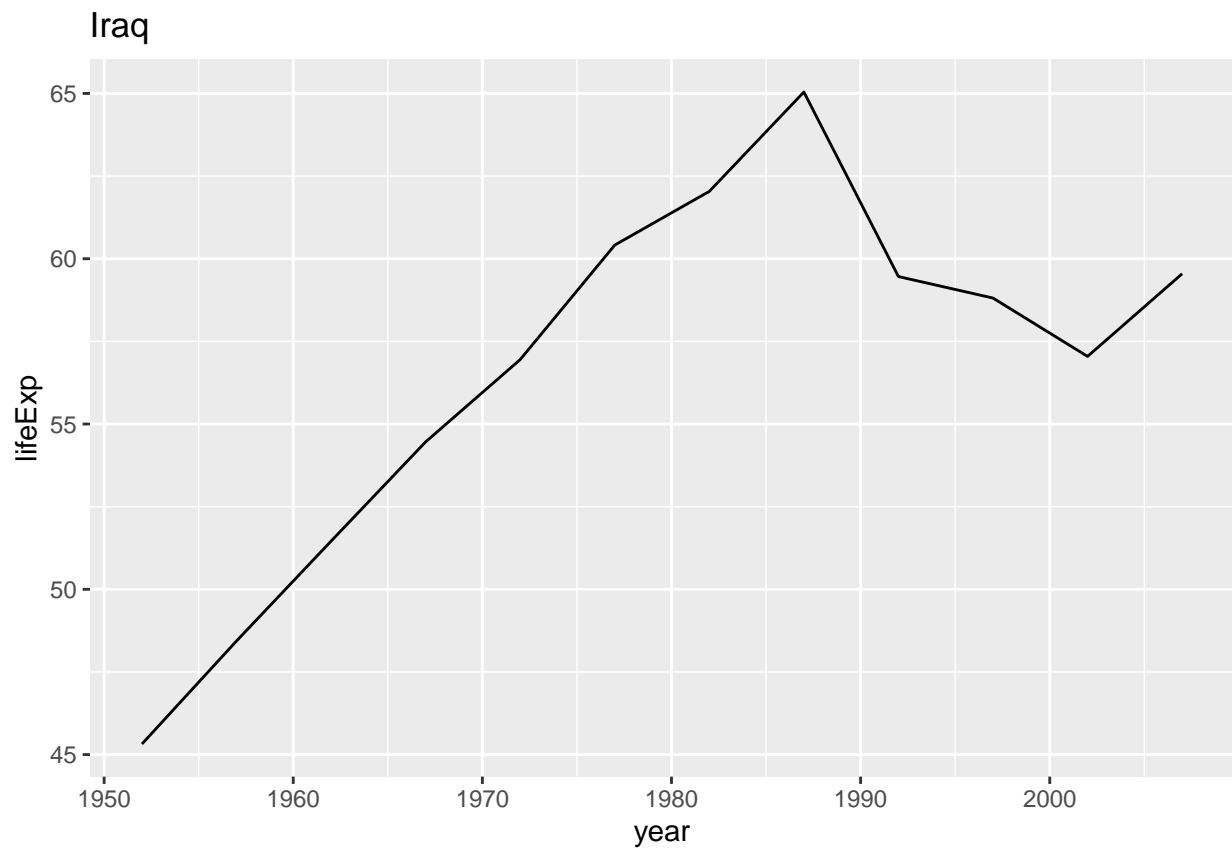
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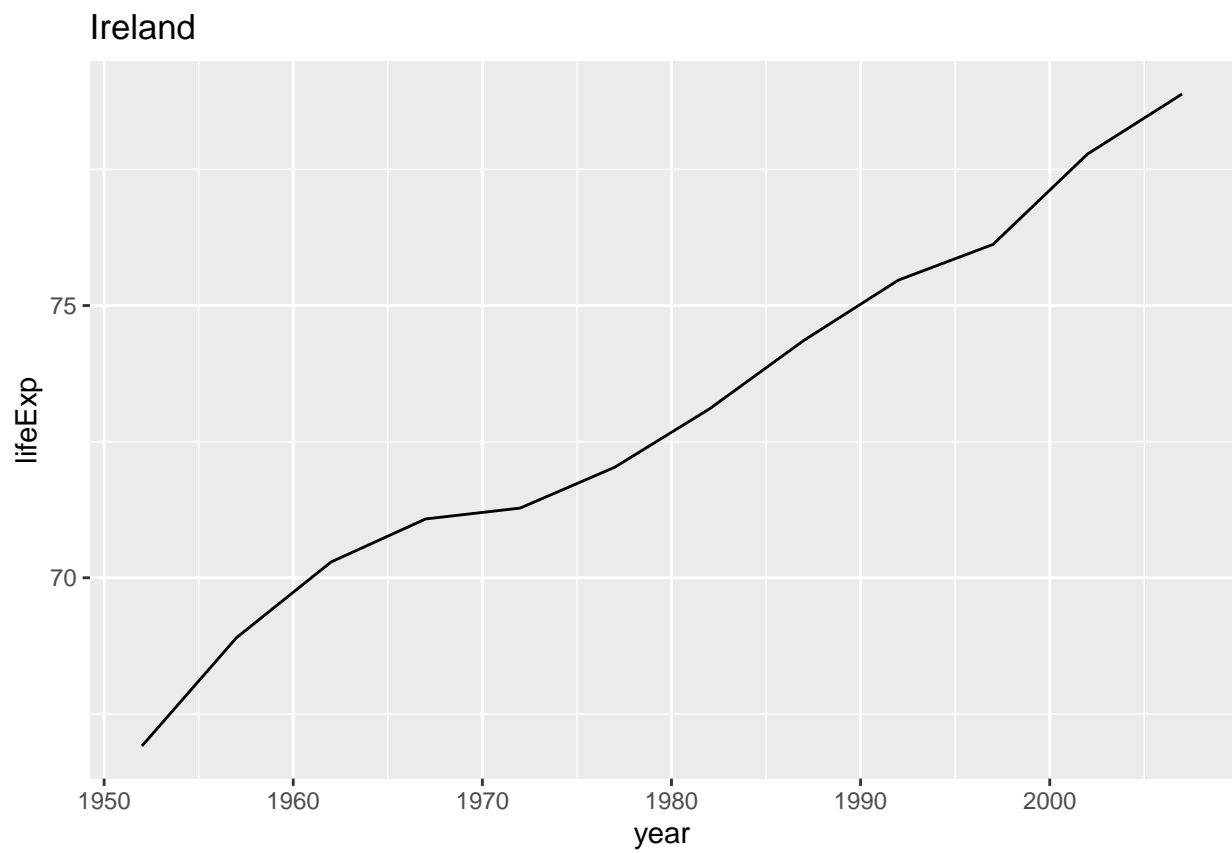
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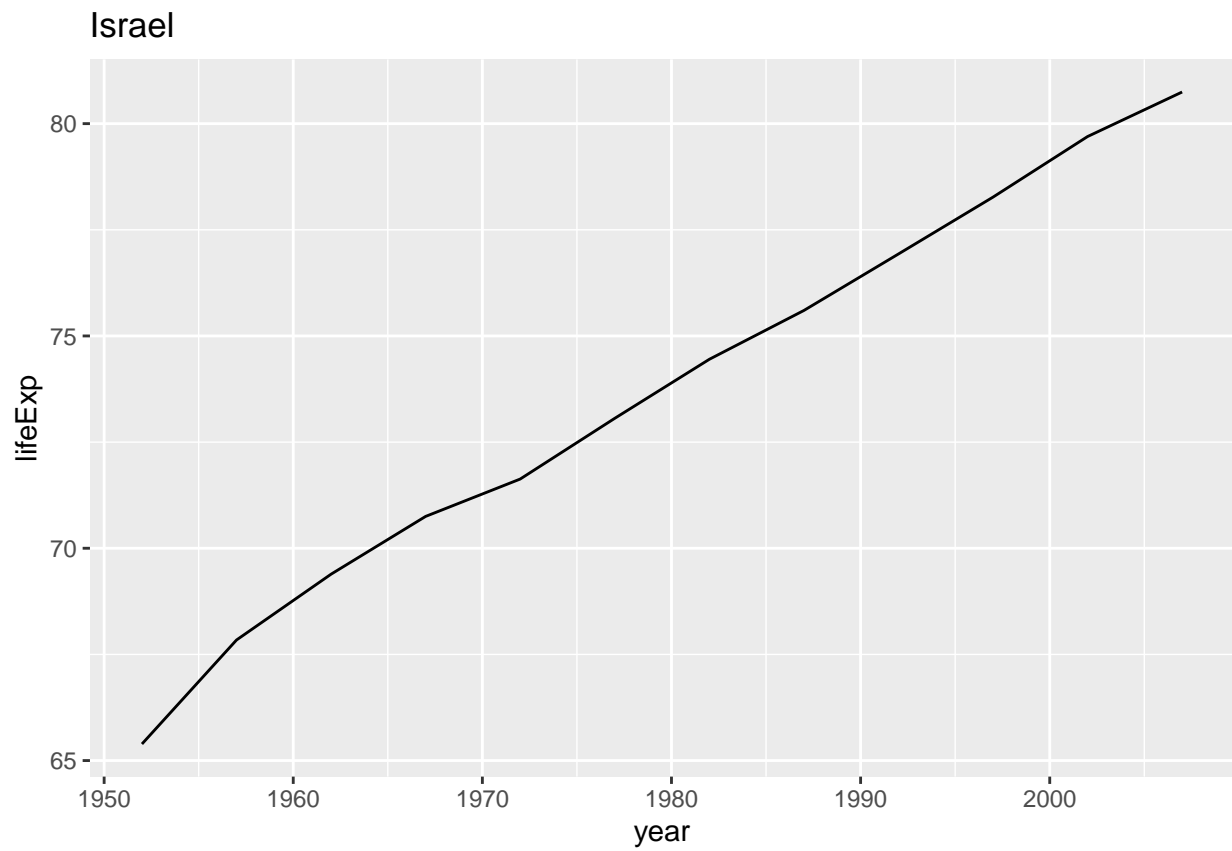
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##  
## $Iraq
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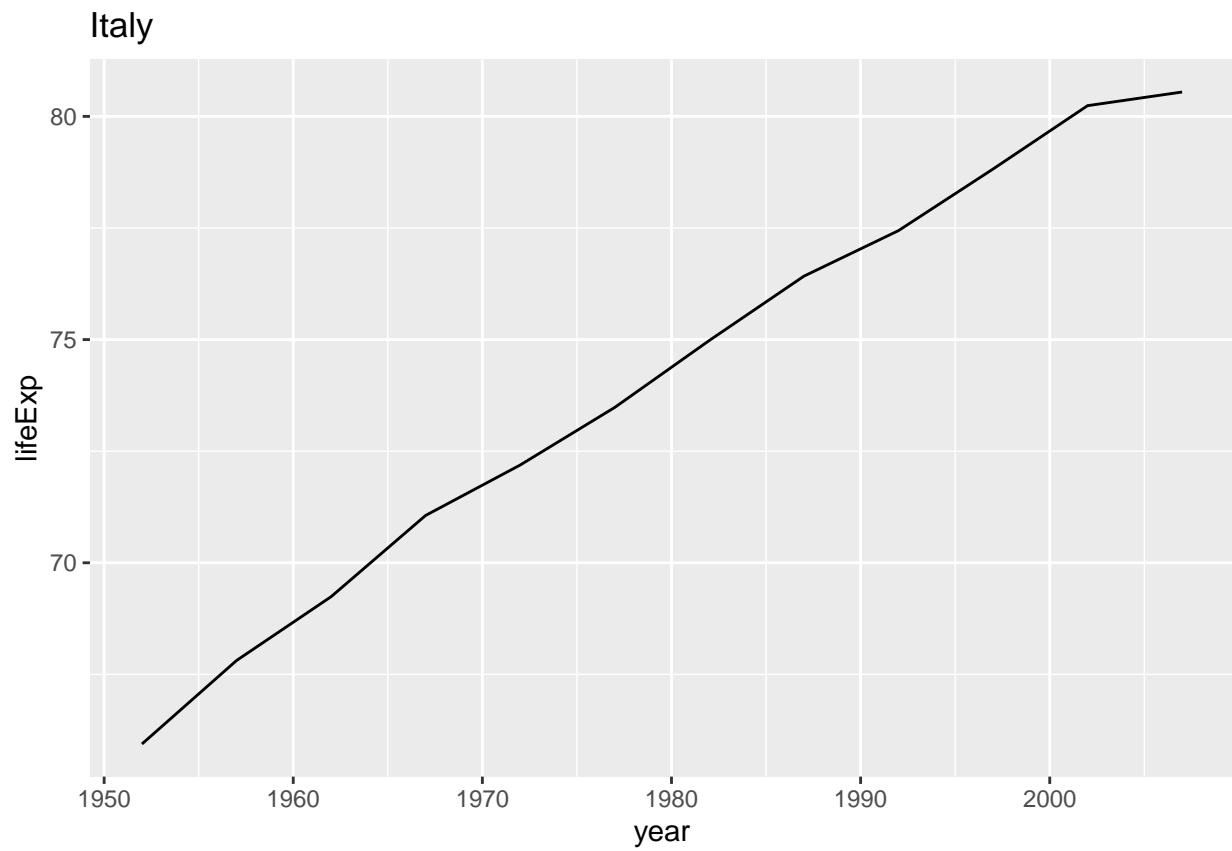
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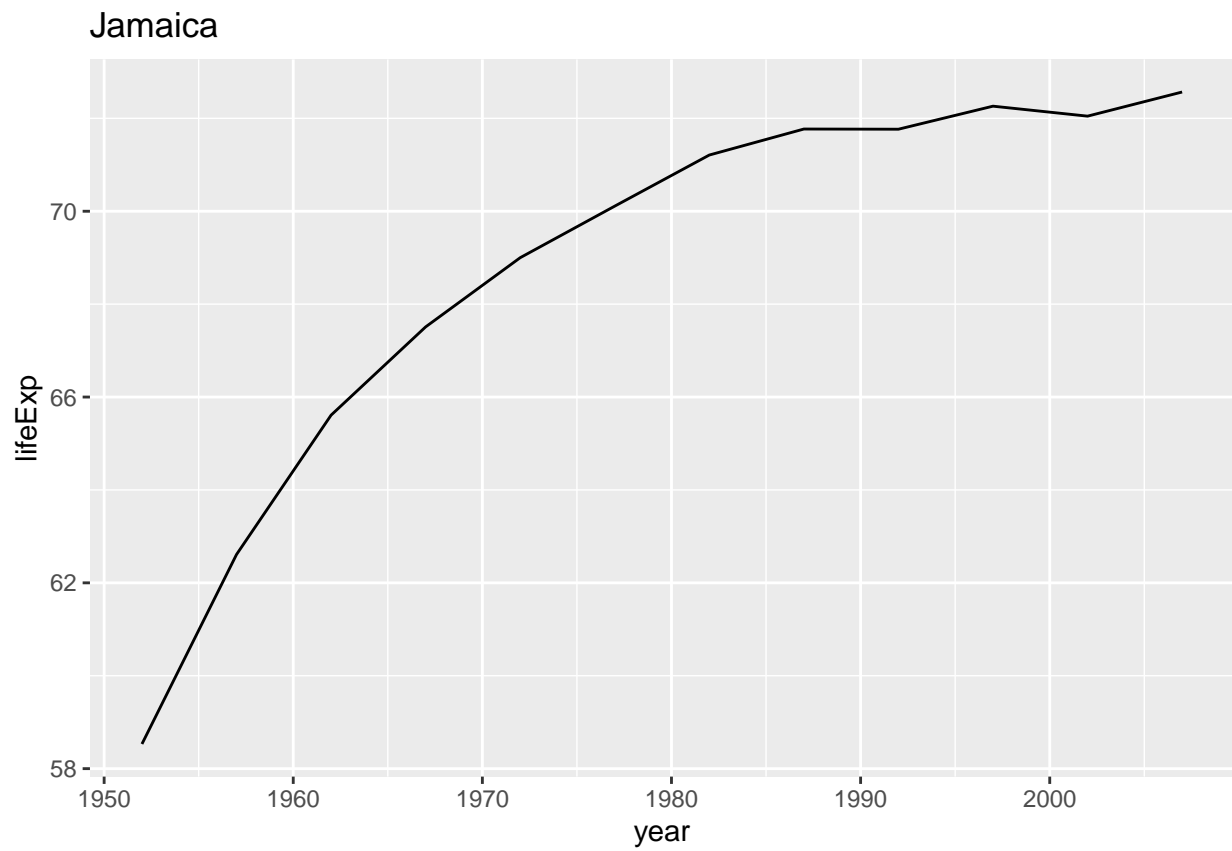
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##  
## $Israel
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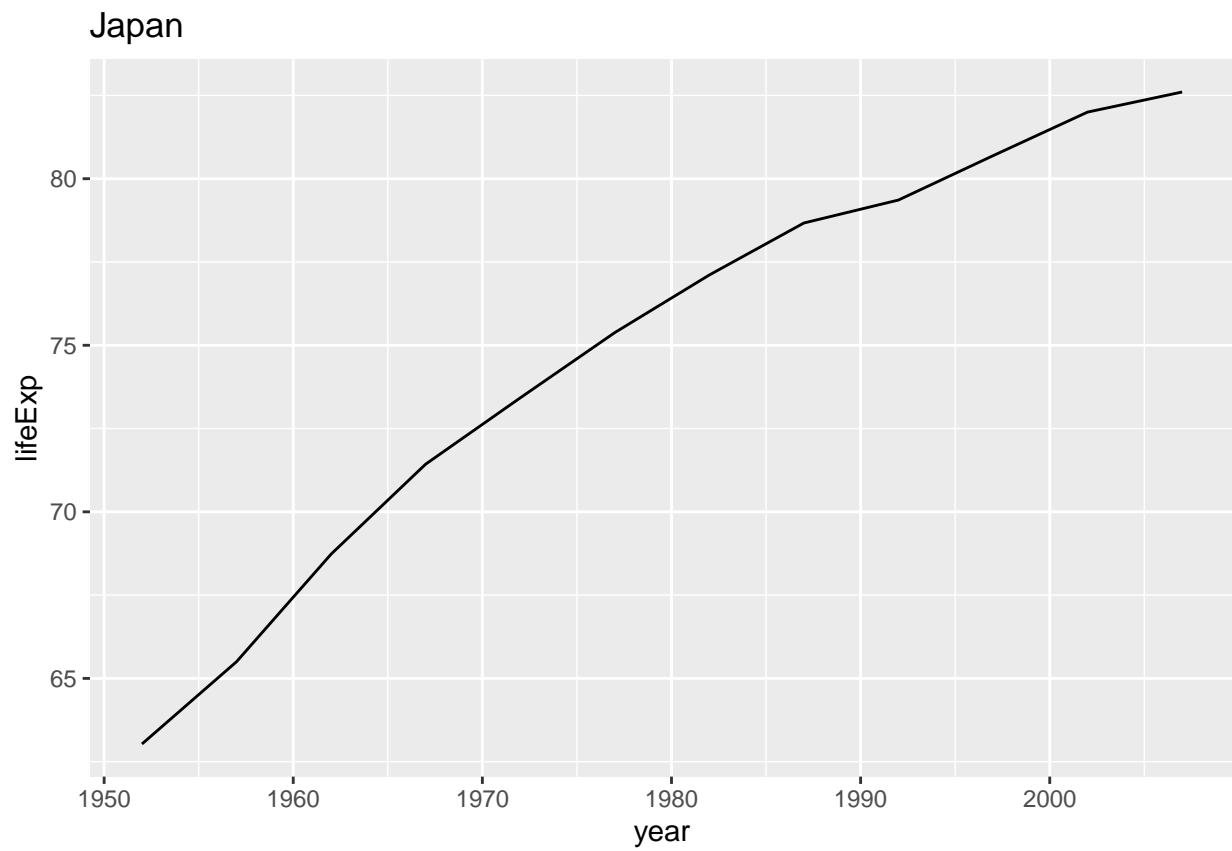
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##  
## $Italy
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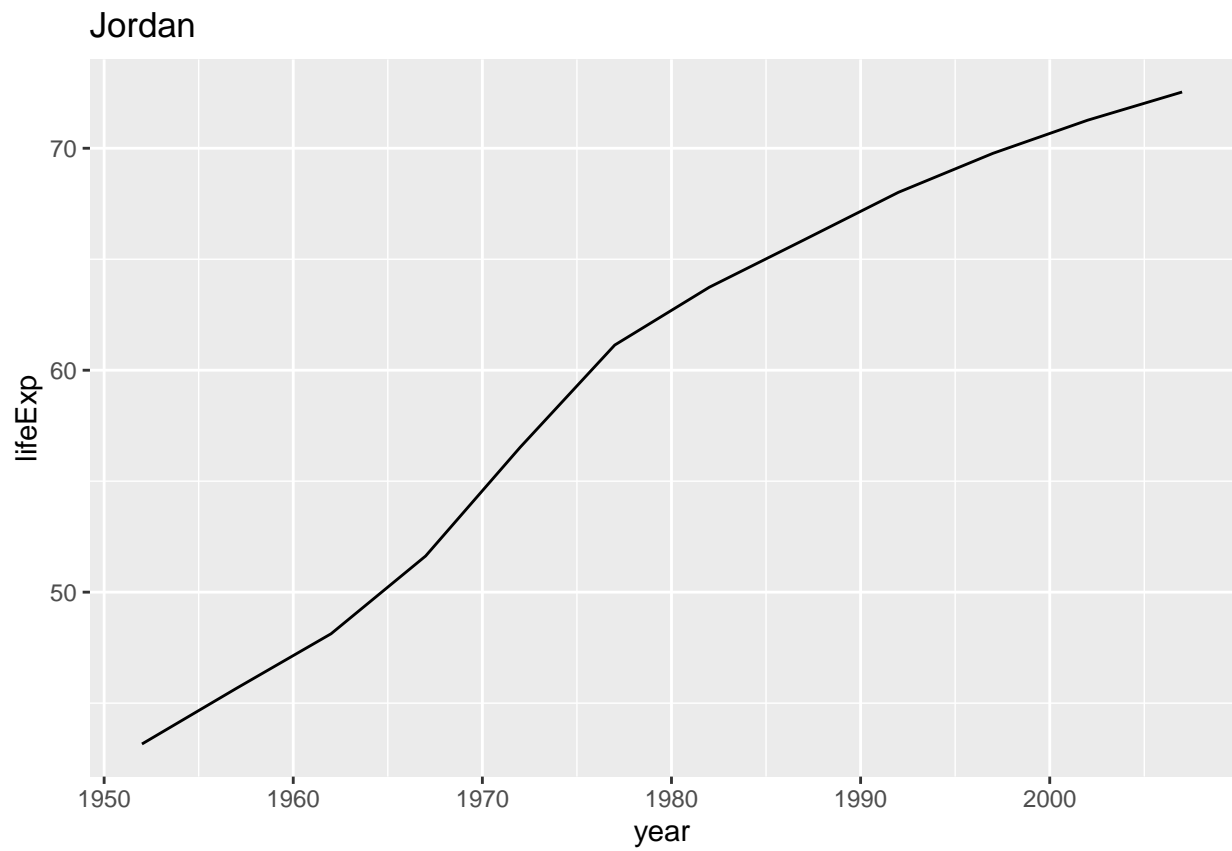
\$Jamaica



\$Japan

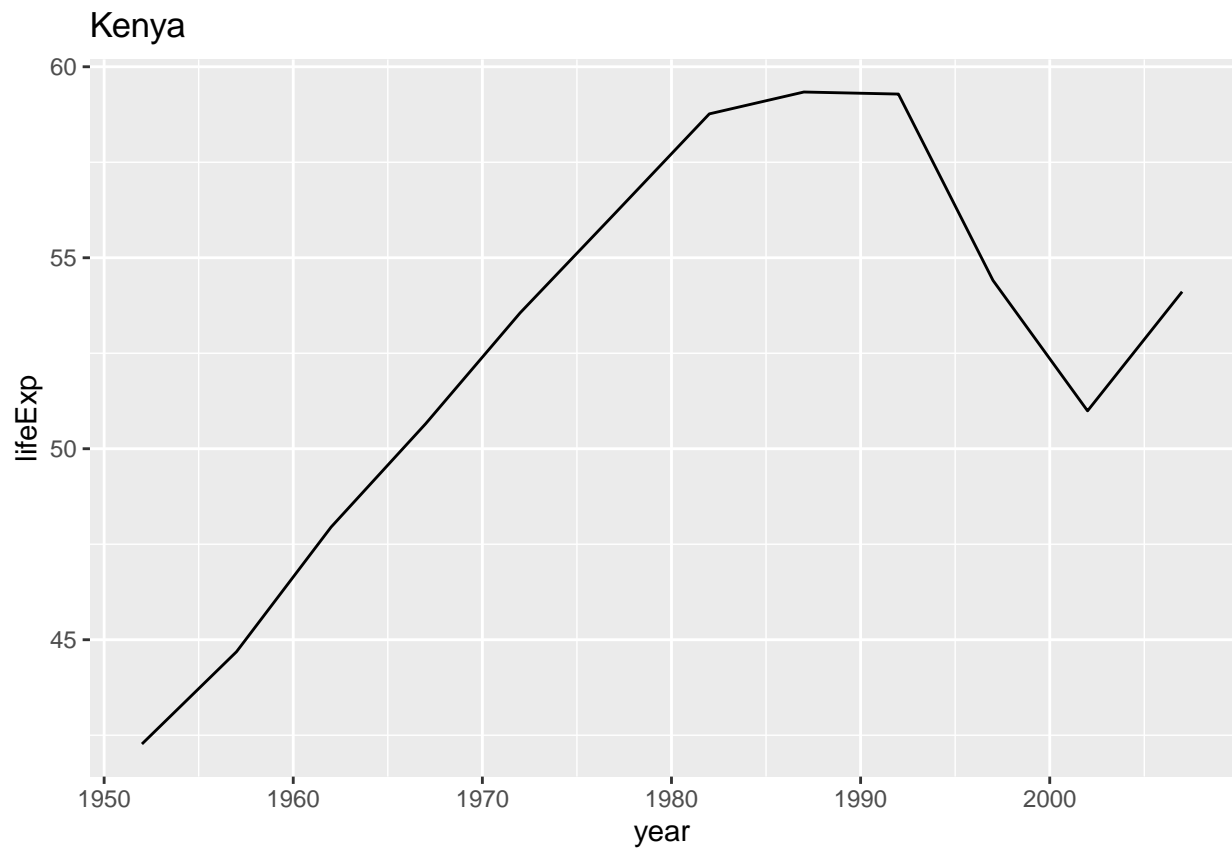


\$Jordan



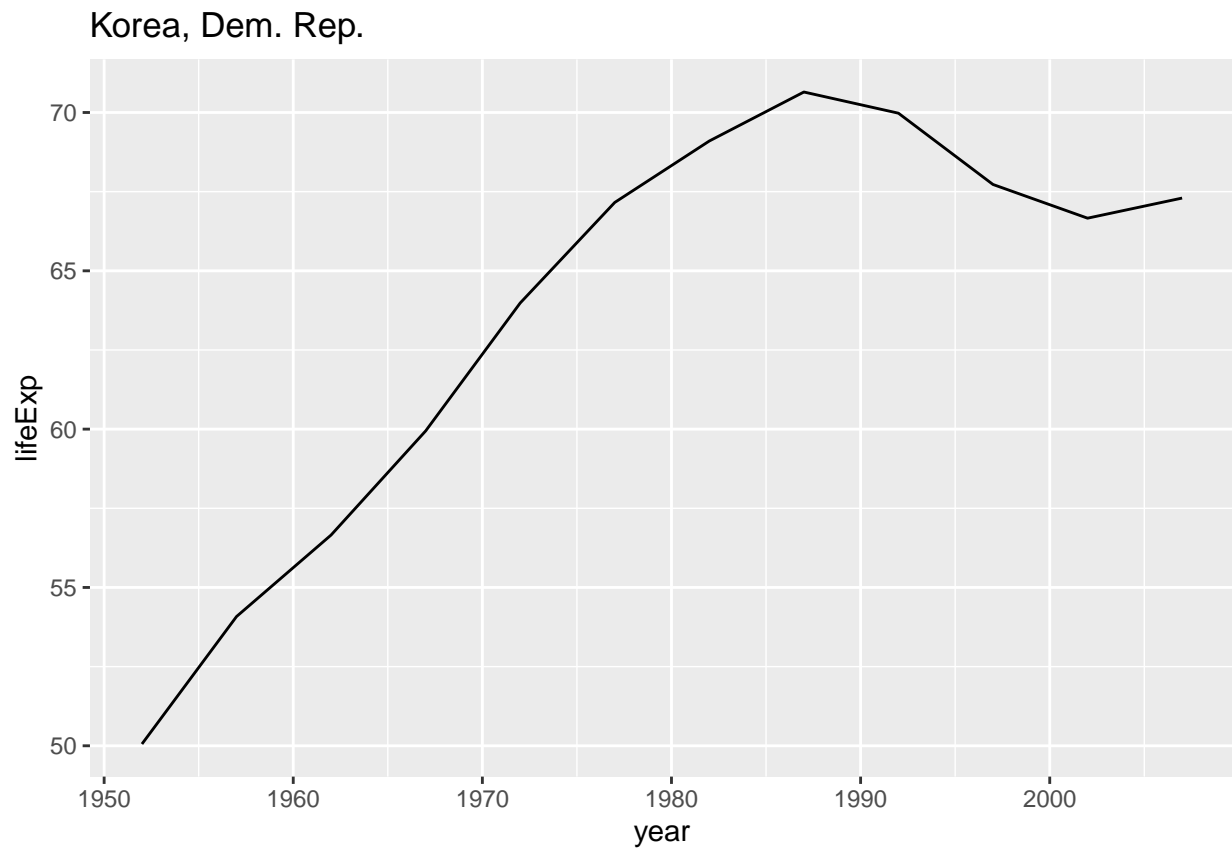
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\$Kenya



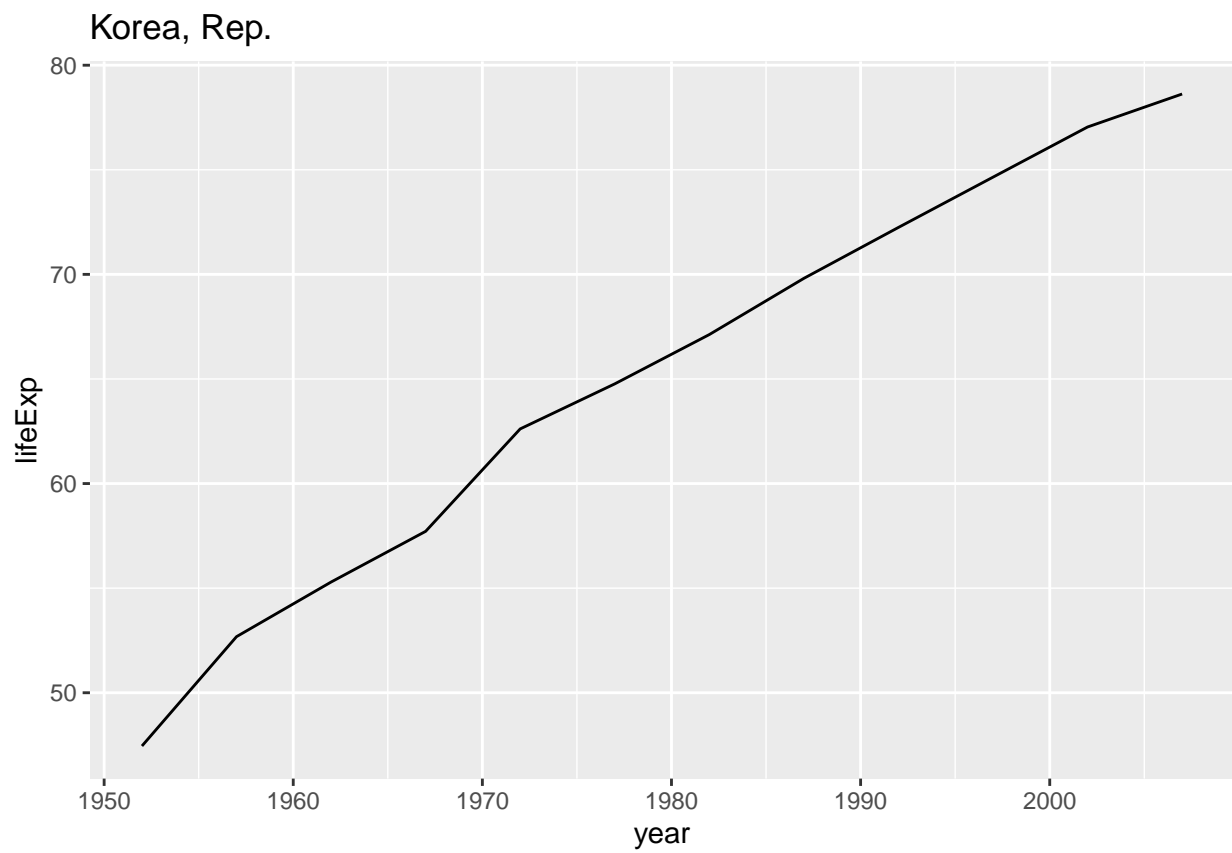
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\$`Korea, Dem. Rep.`

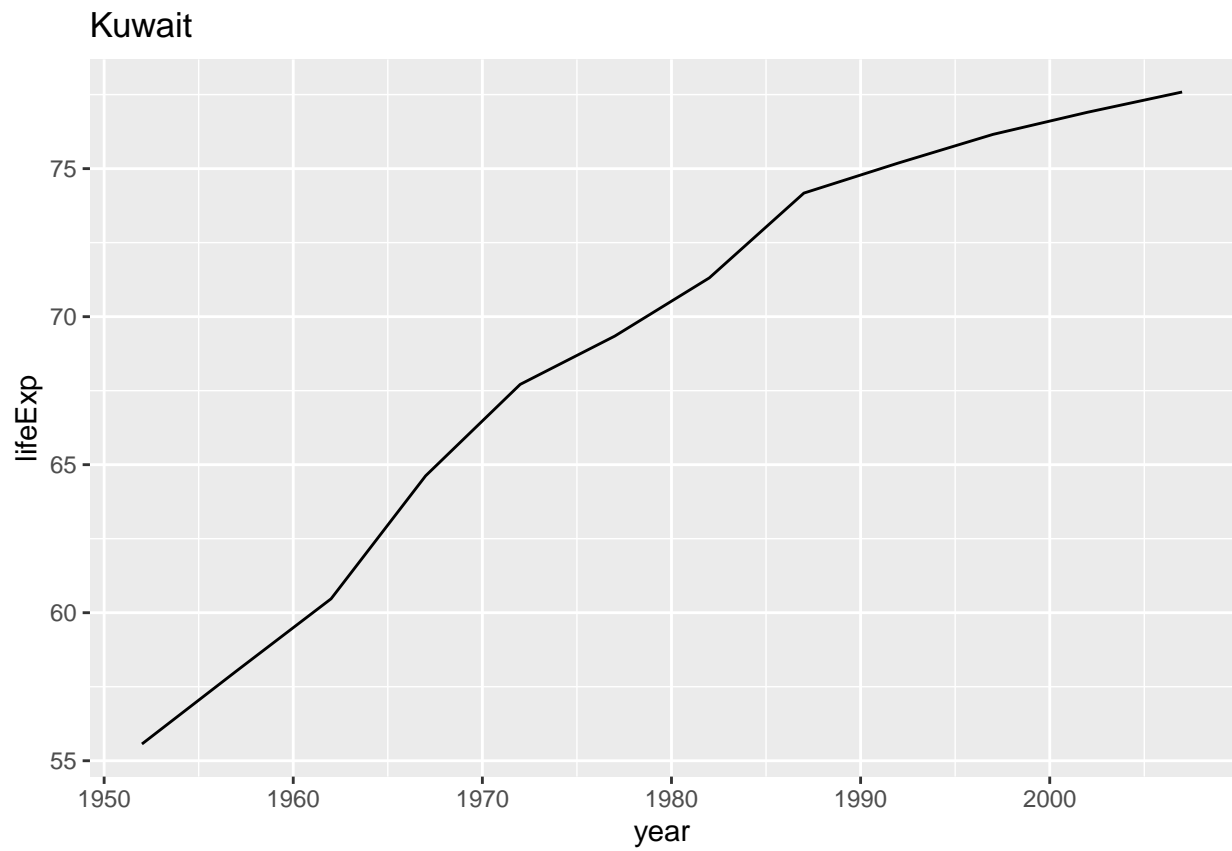


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\$`Korea, Rep.`

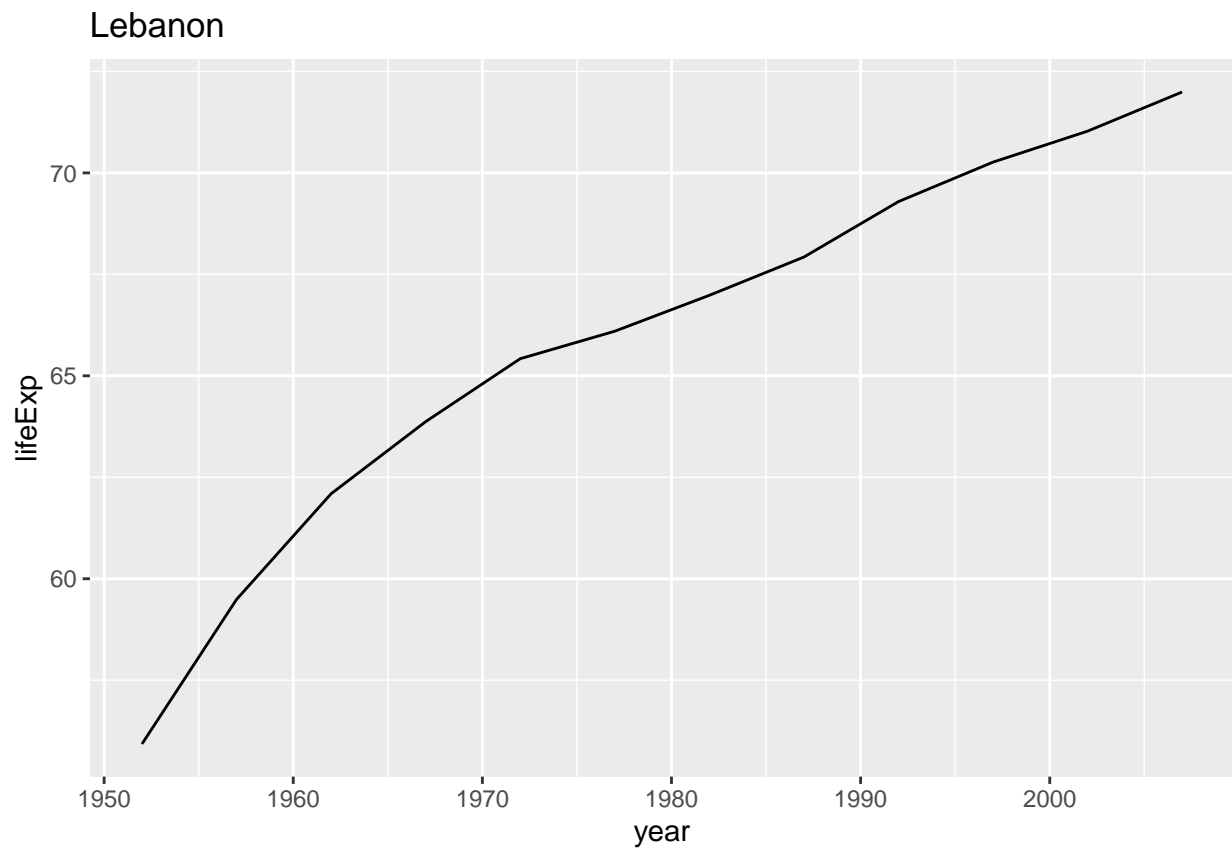


\$Kuwait

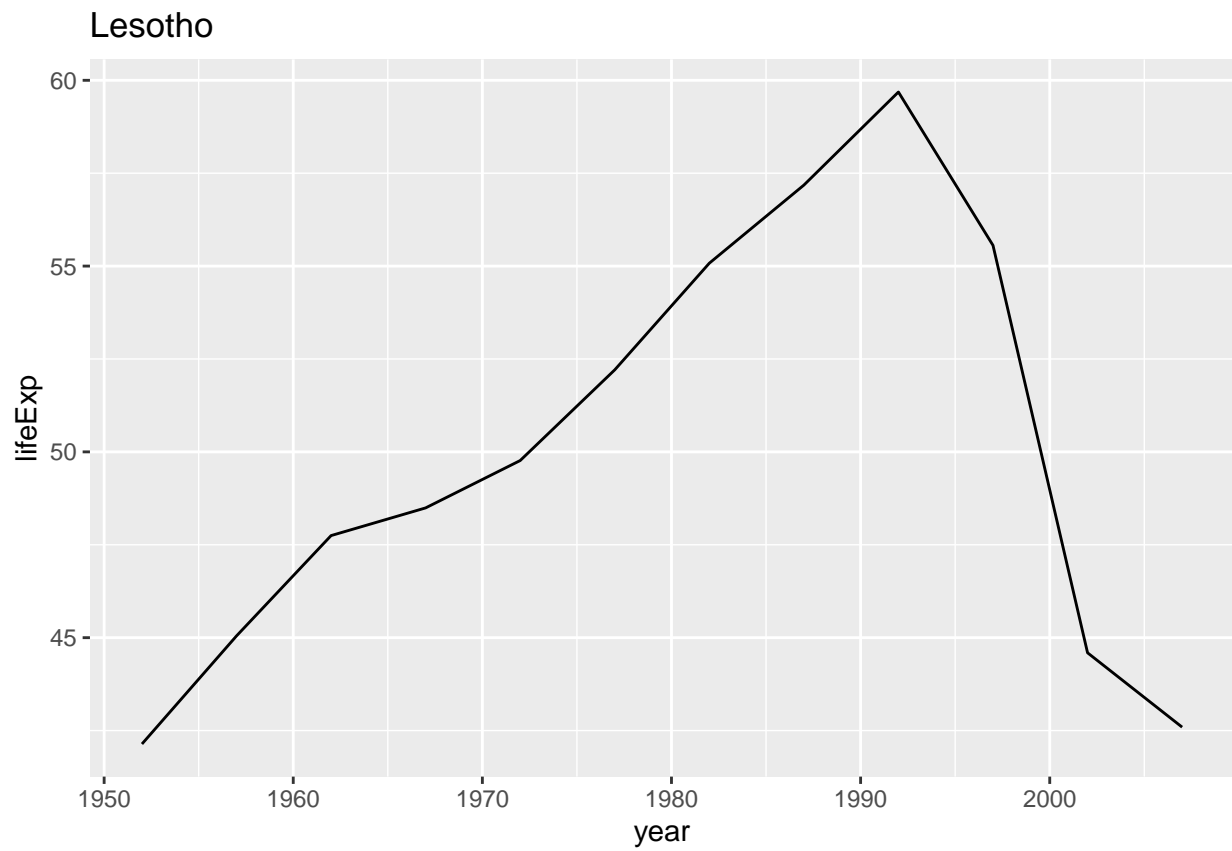


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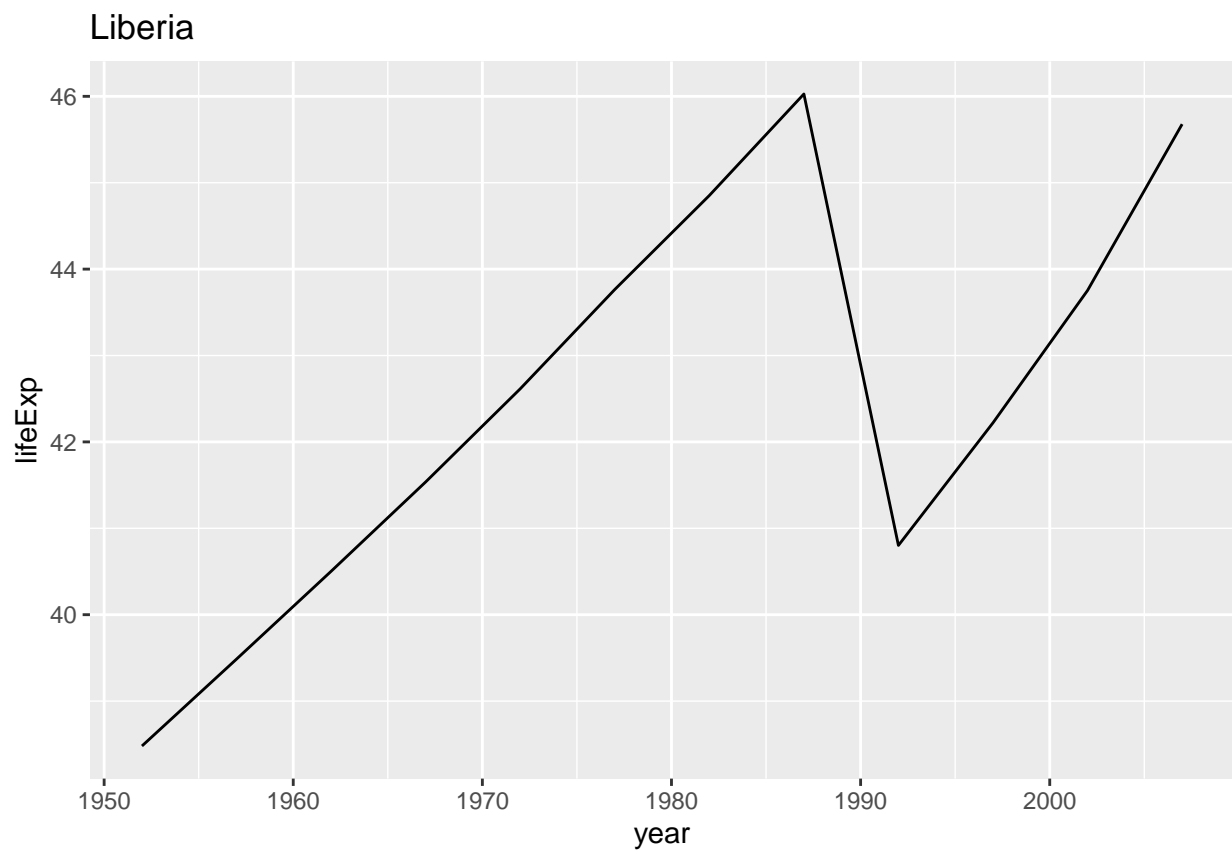
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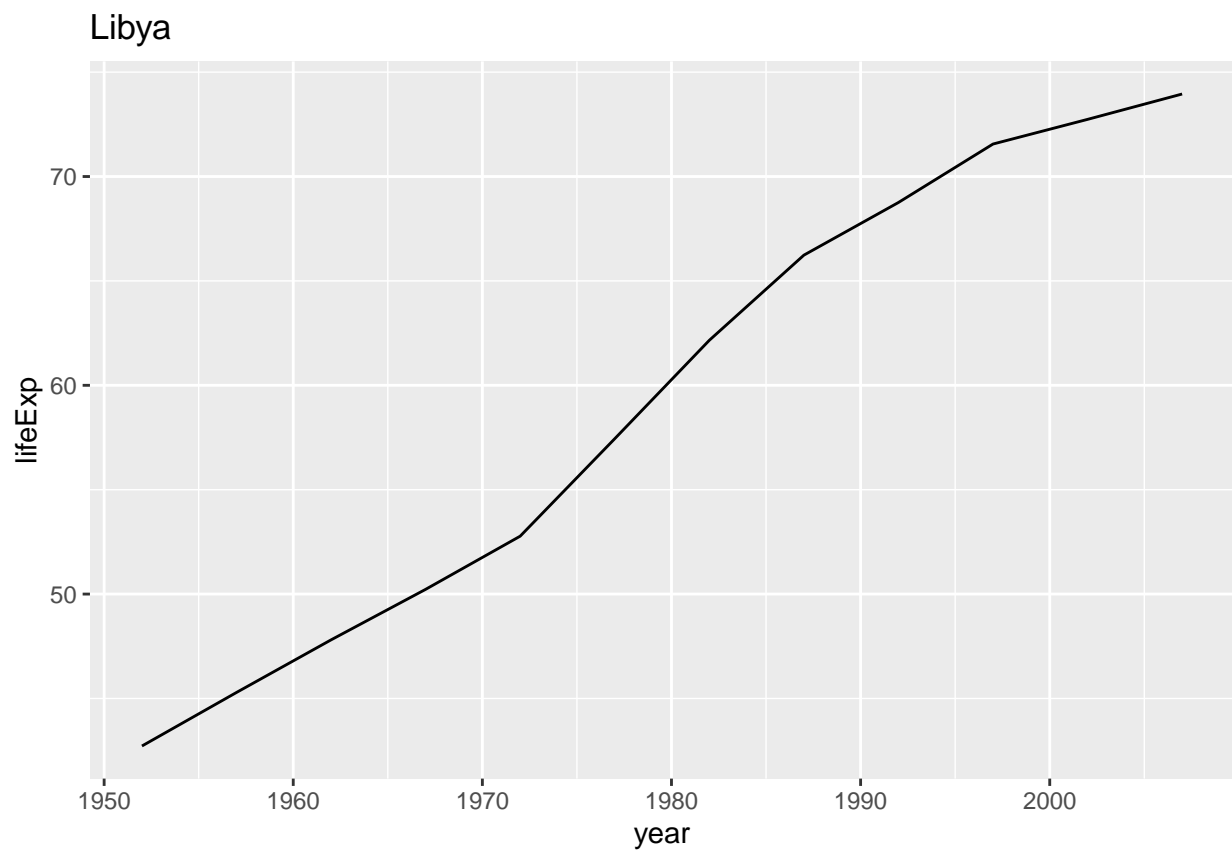
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##  
## $Lesotho
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\$Liberia

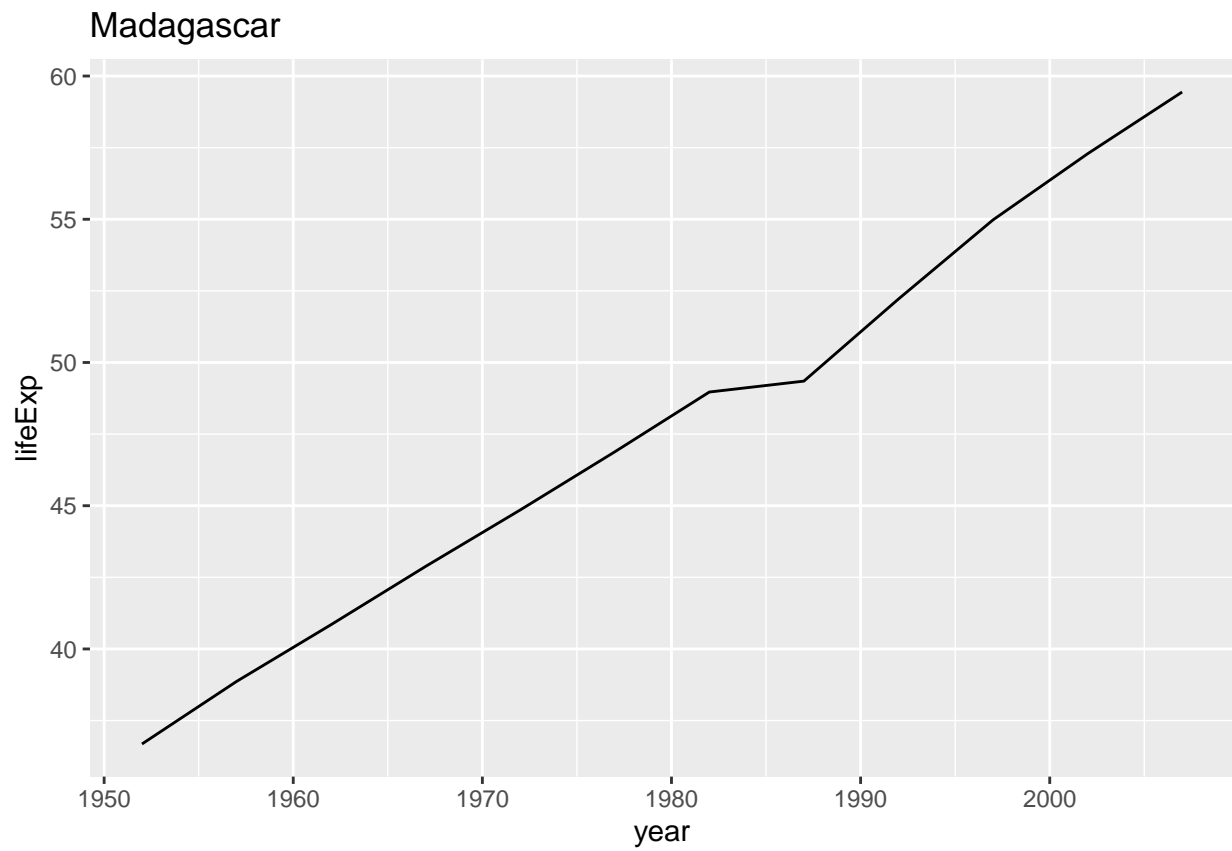


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##  
## $Libya
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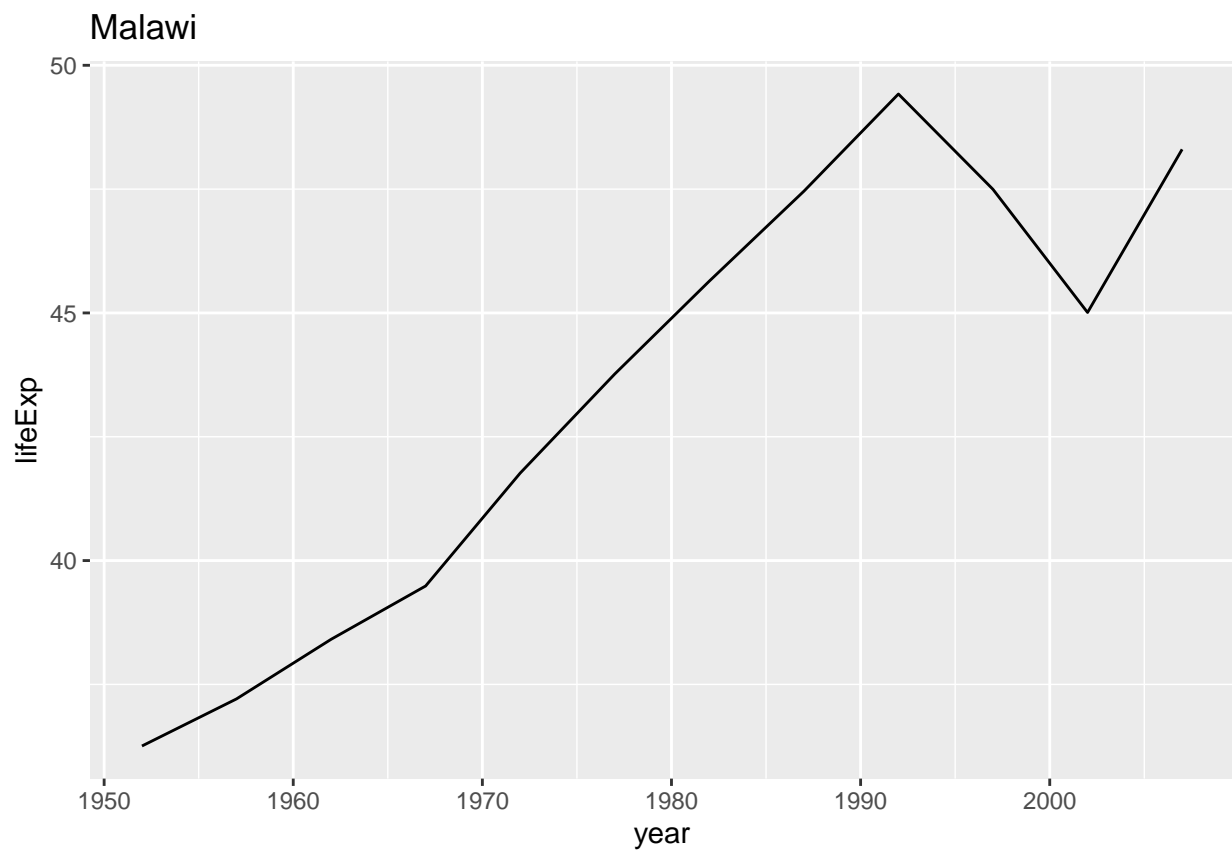


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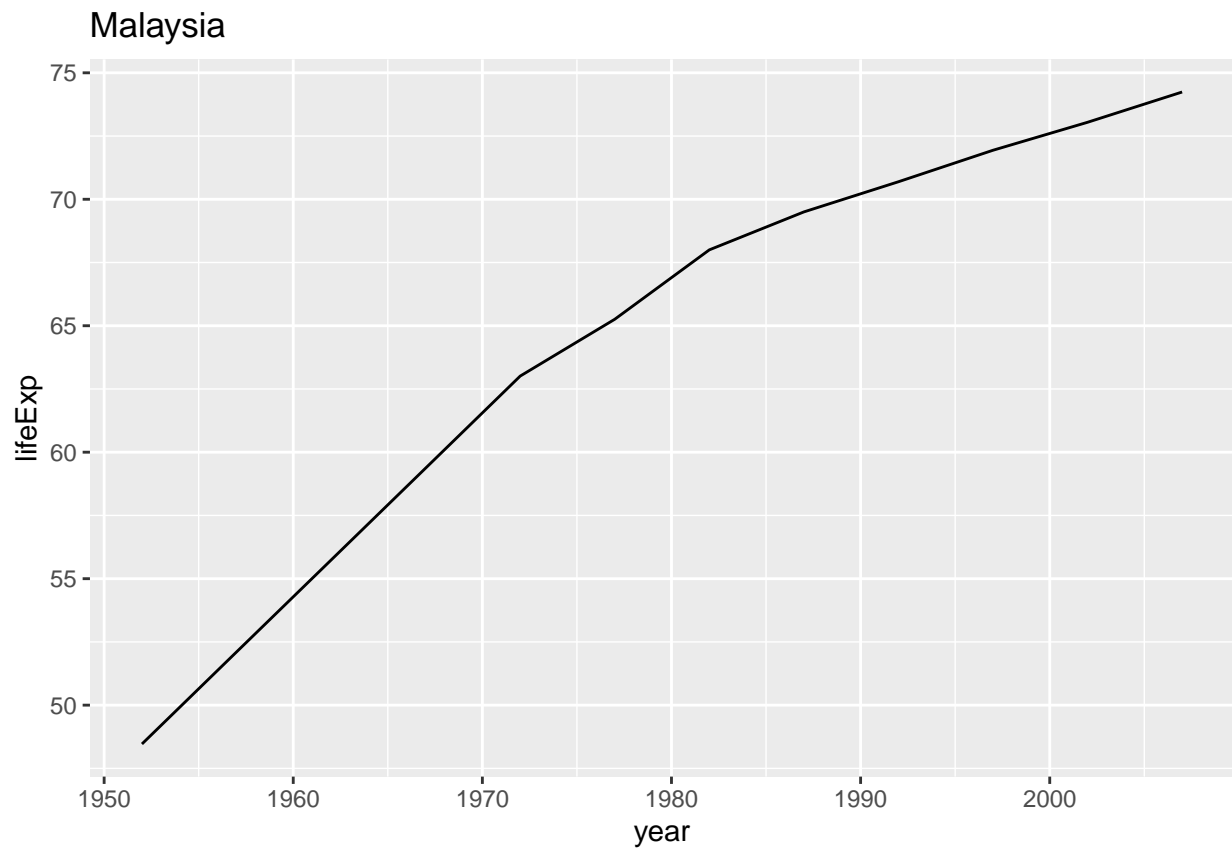
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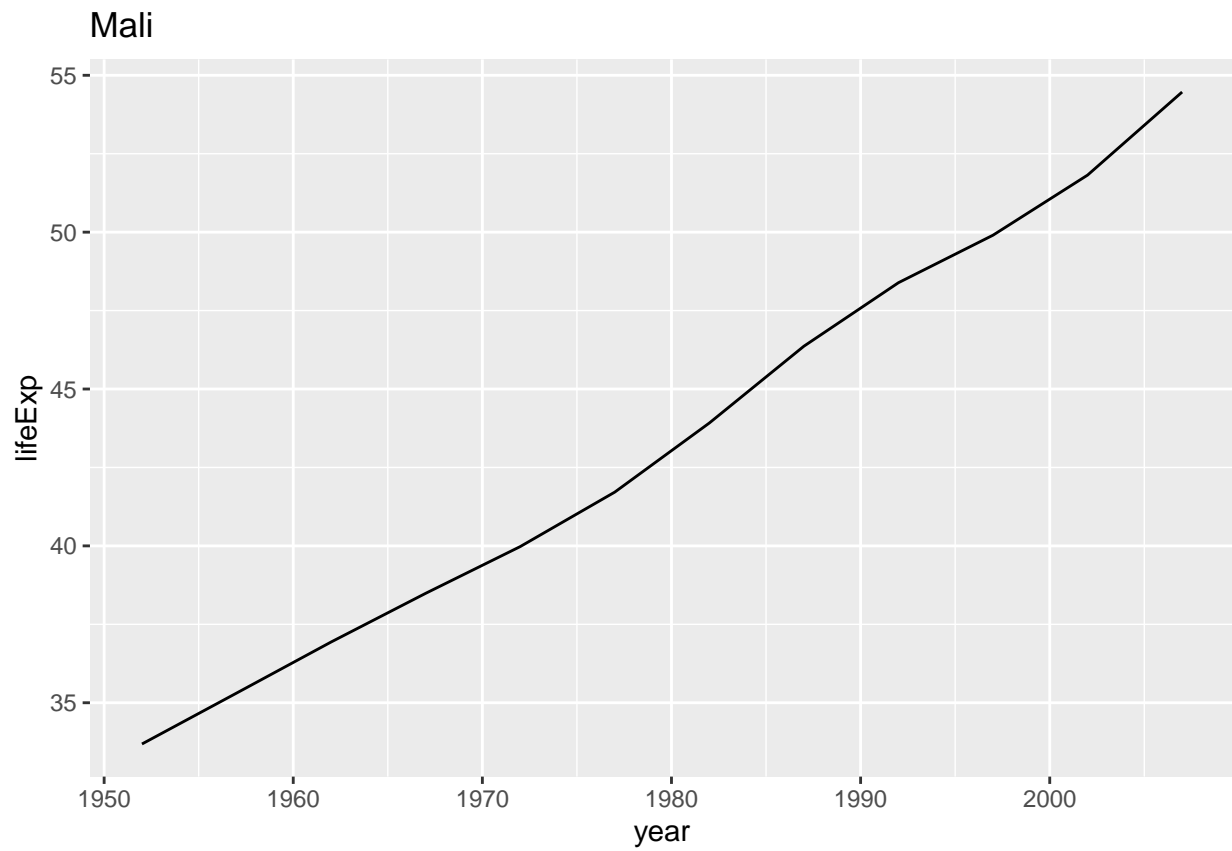
\$Malawi



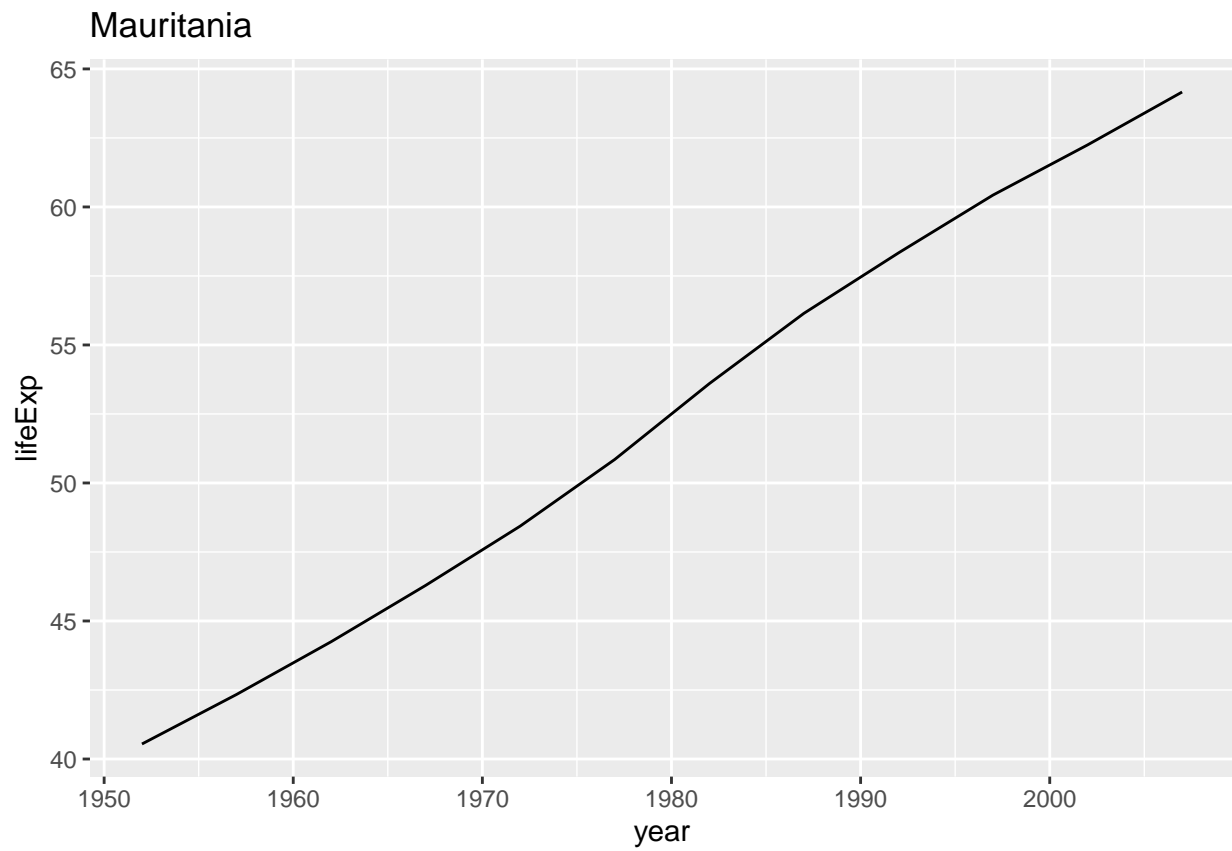
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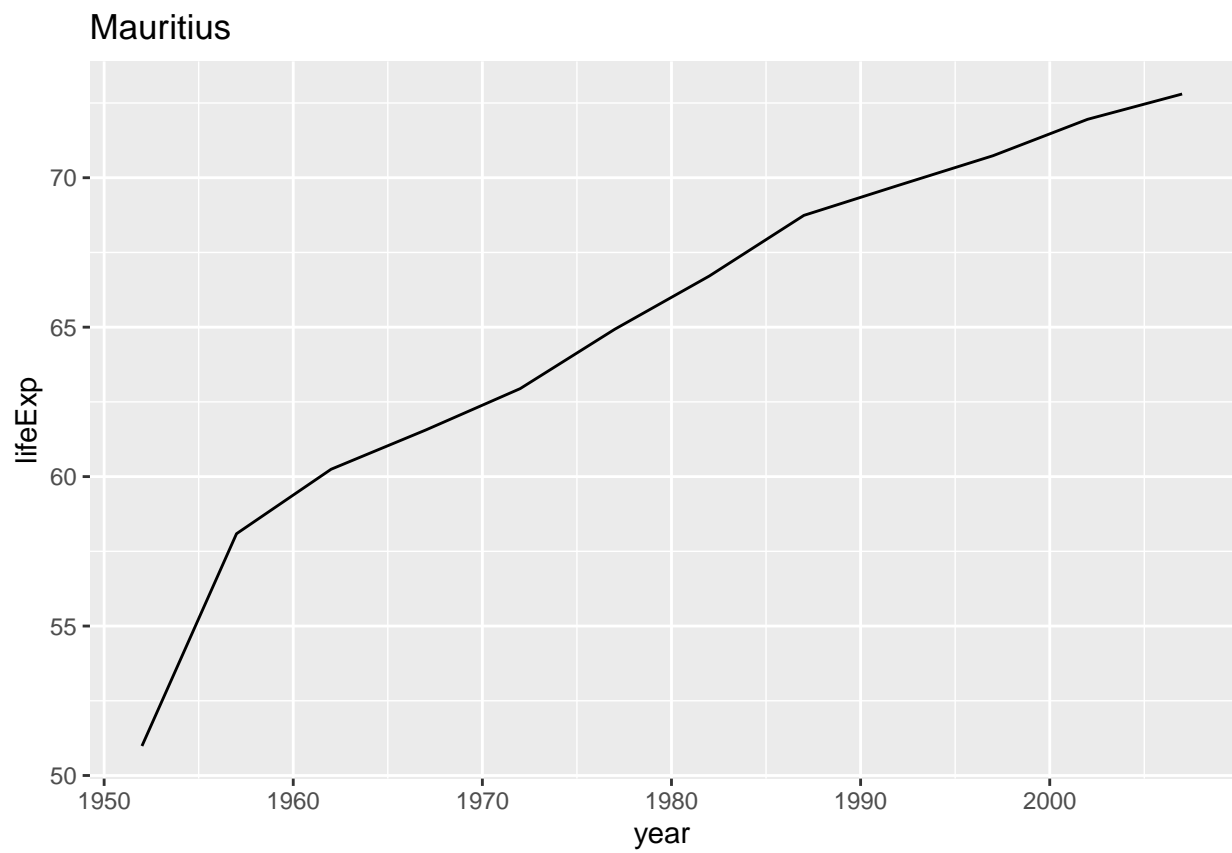
\$Mali



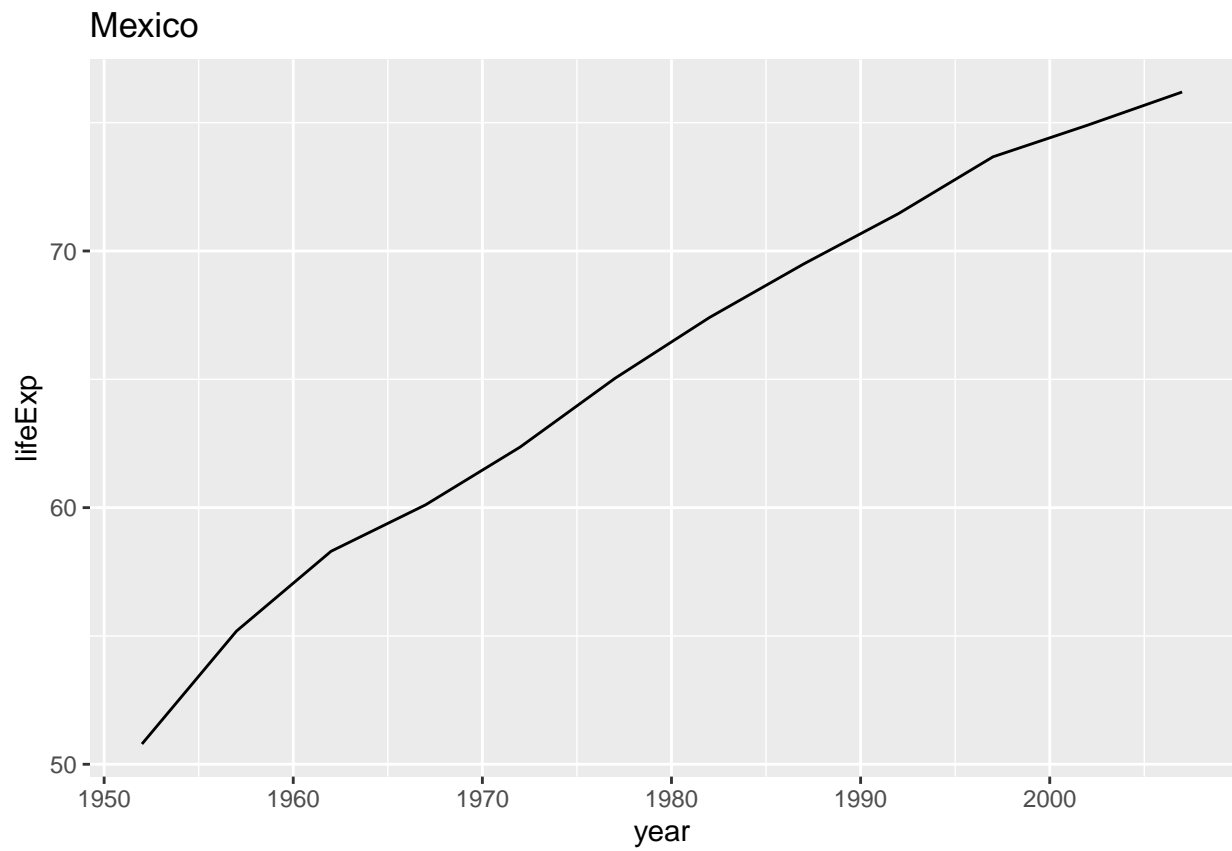
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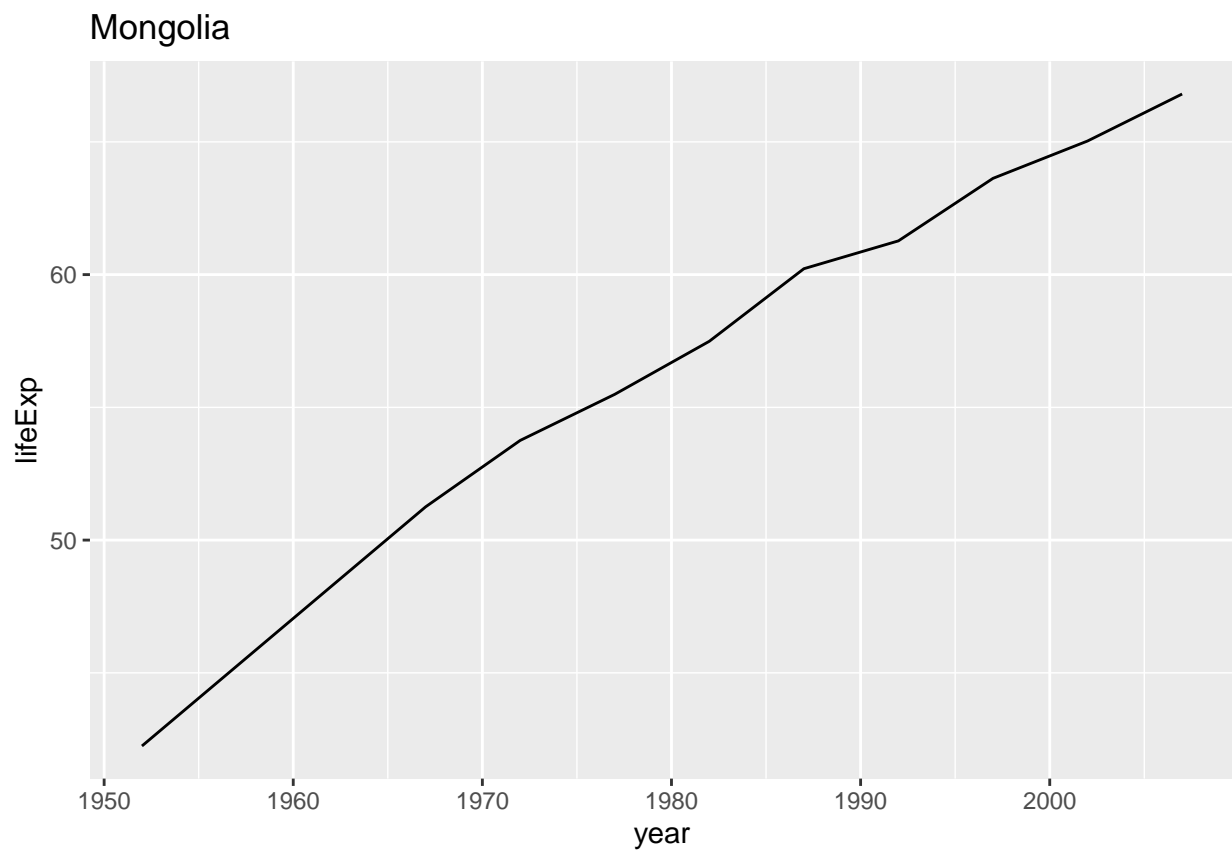
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##  
## $Mauritius
```



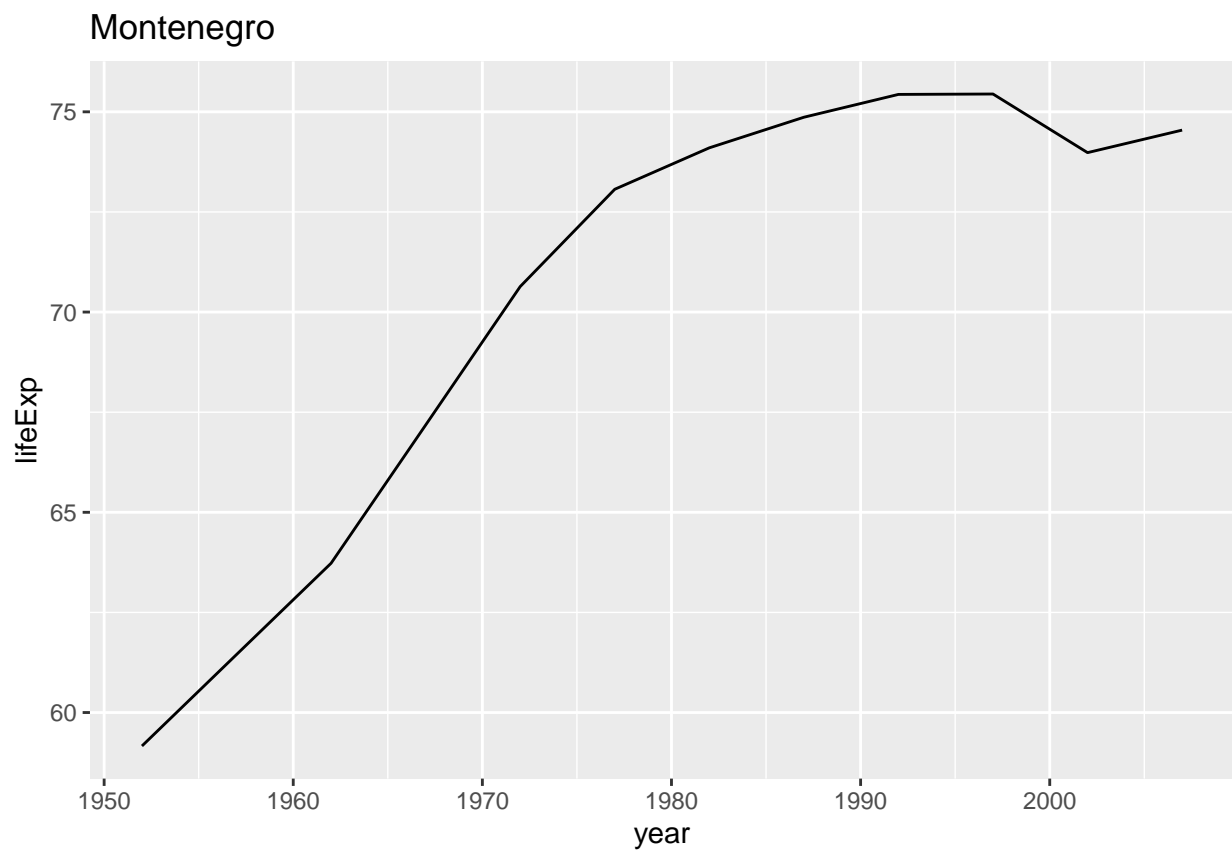
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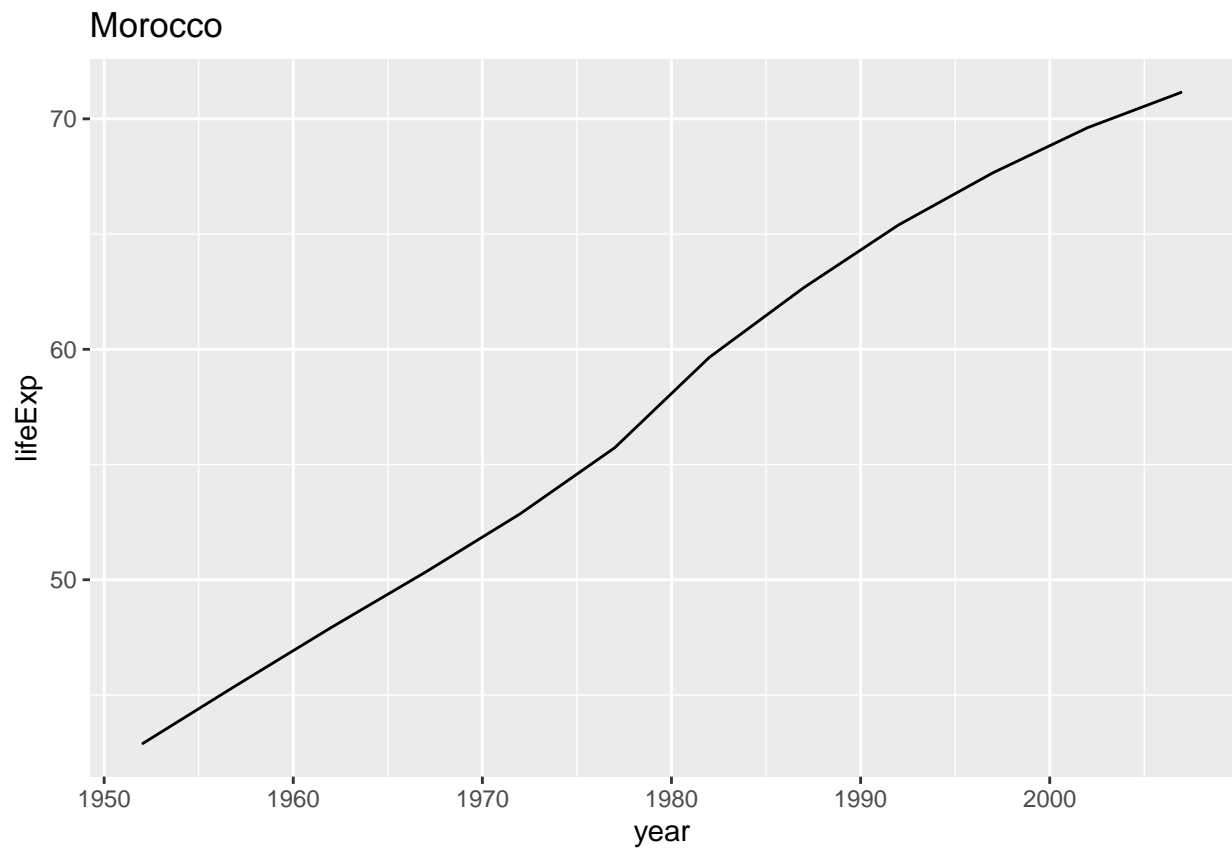
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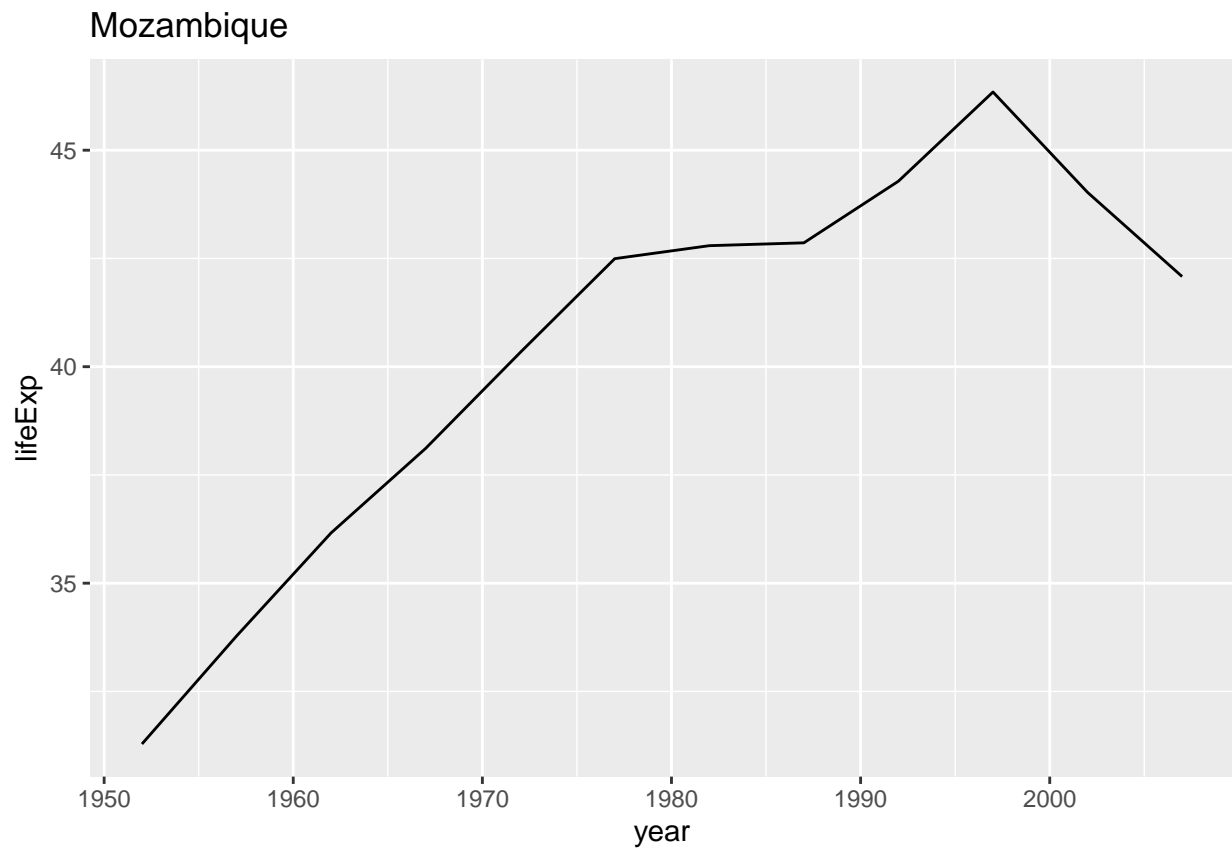
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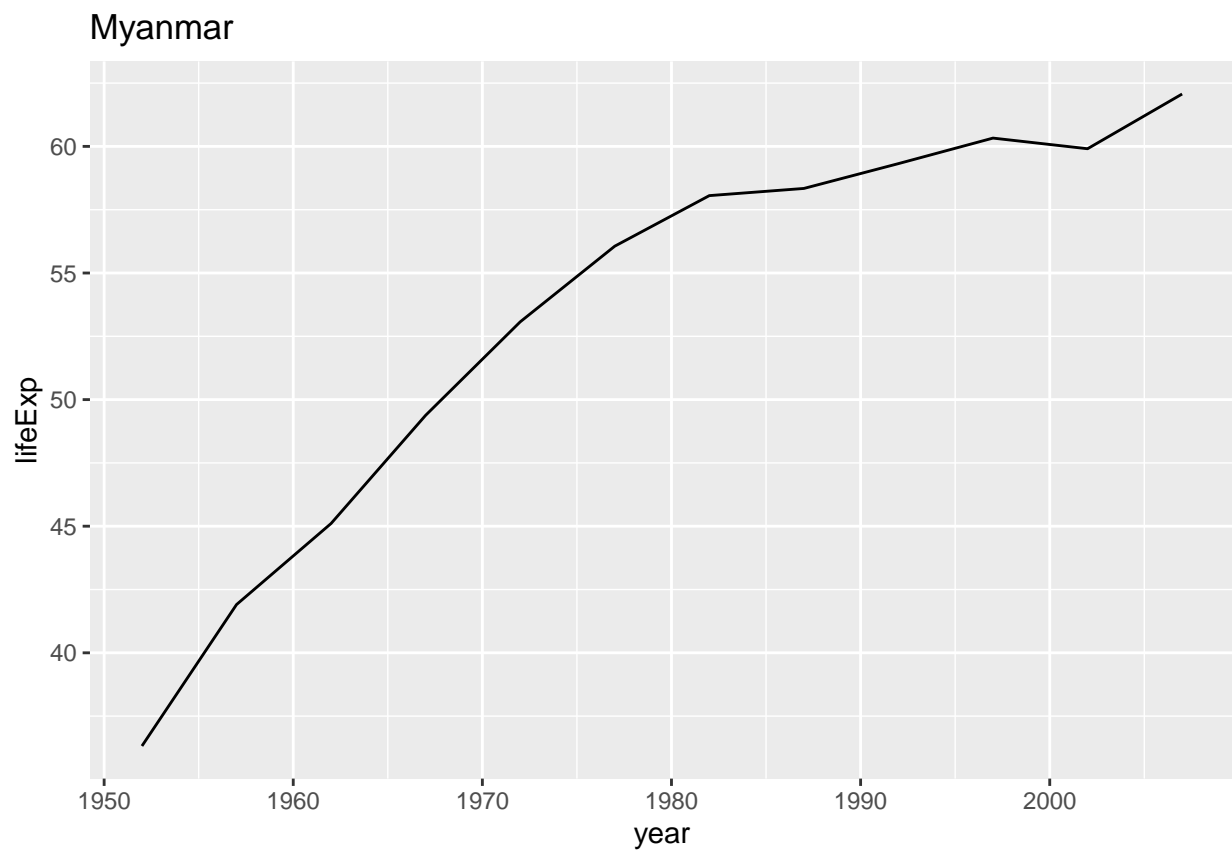
\$Morocco



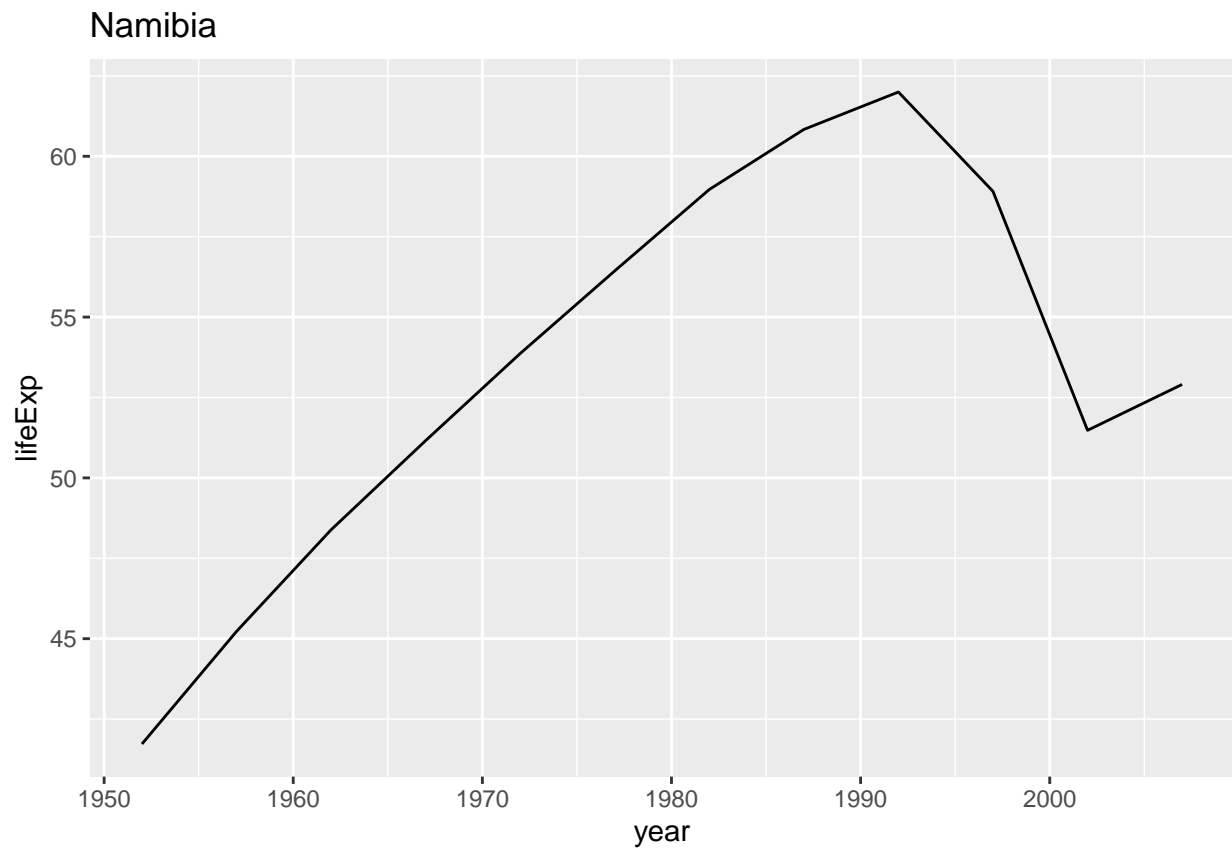
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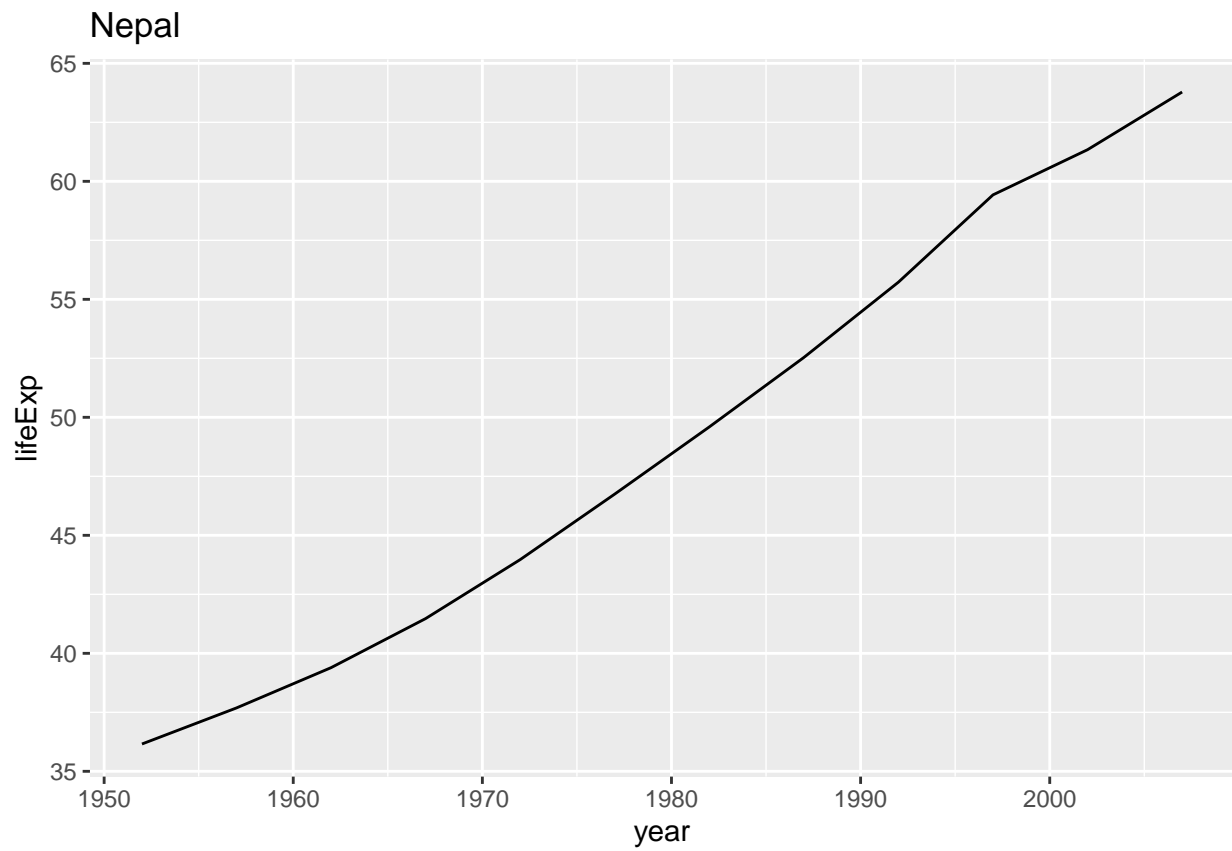
\$Myanmar



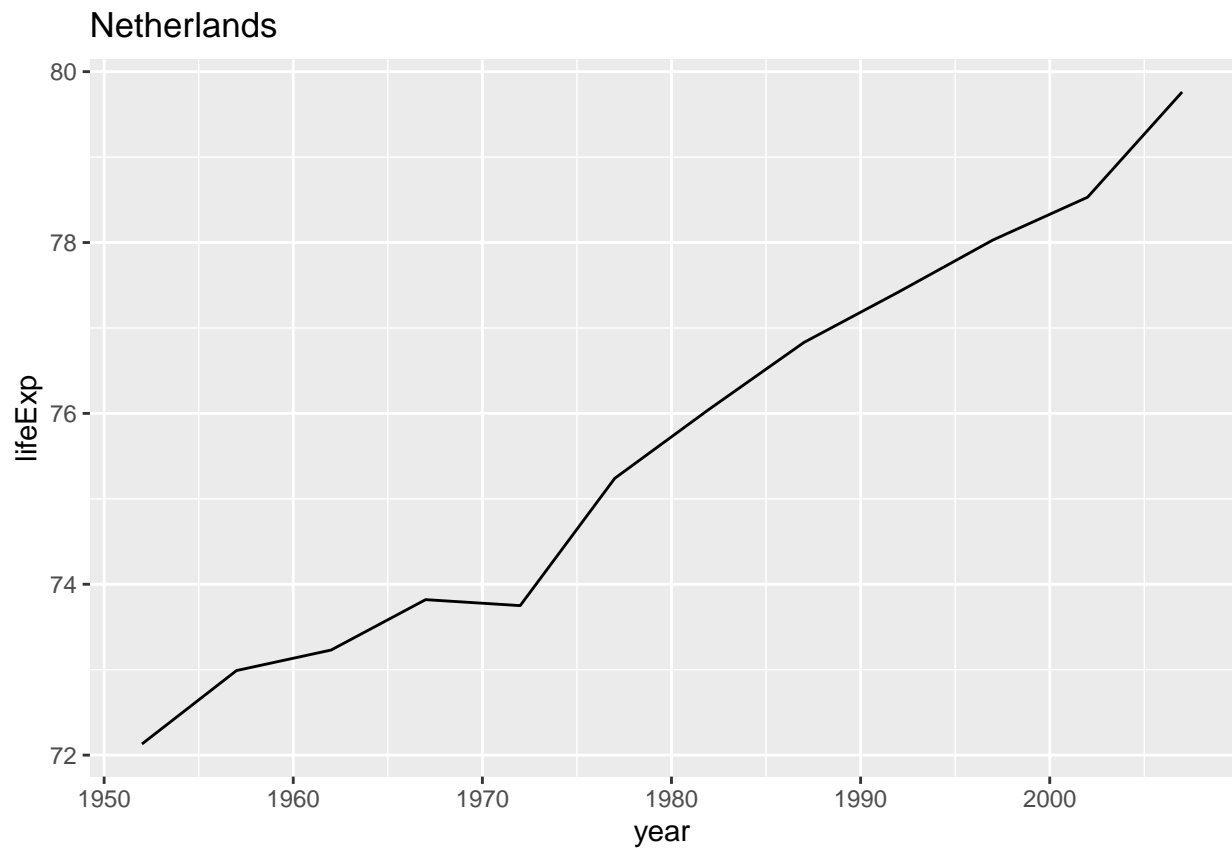
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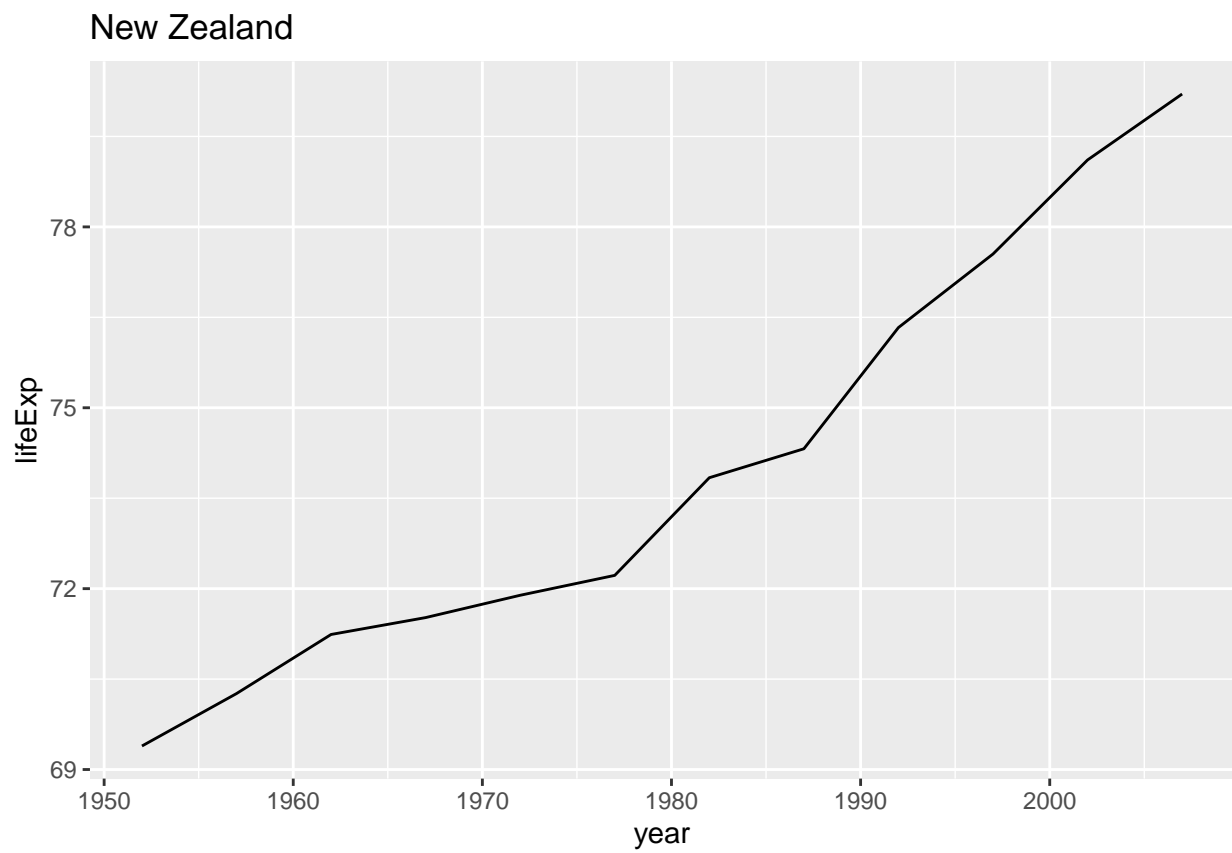
\$Nepal



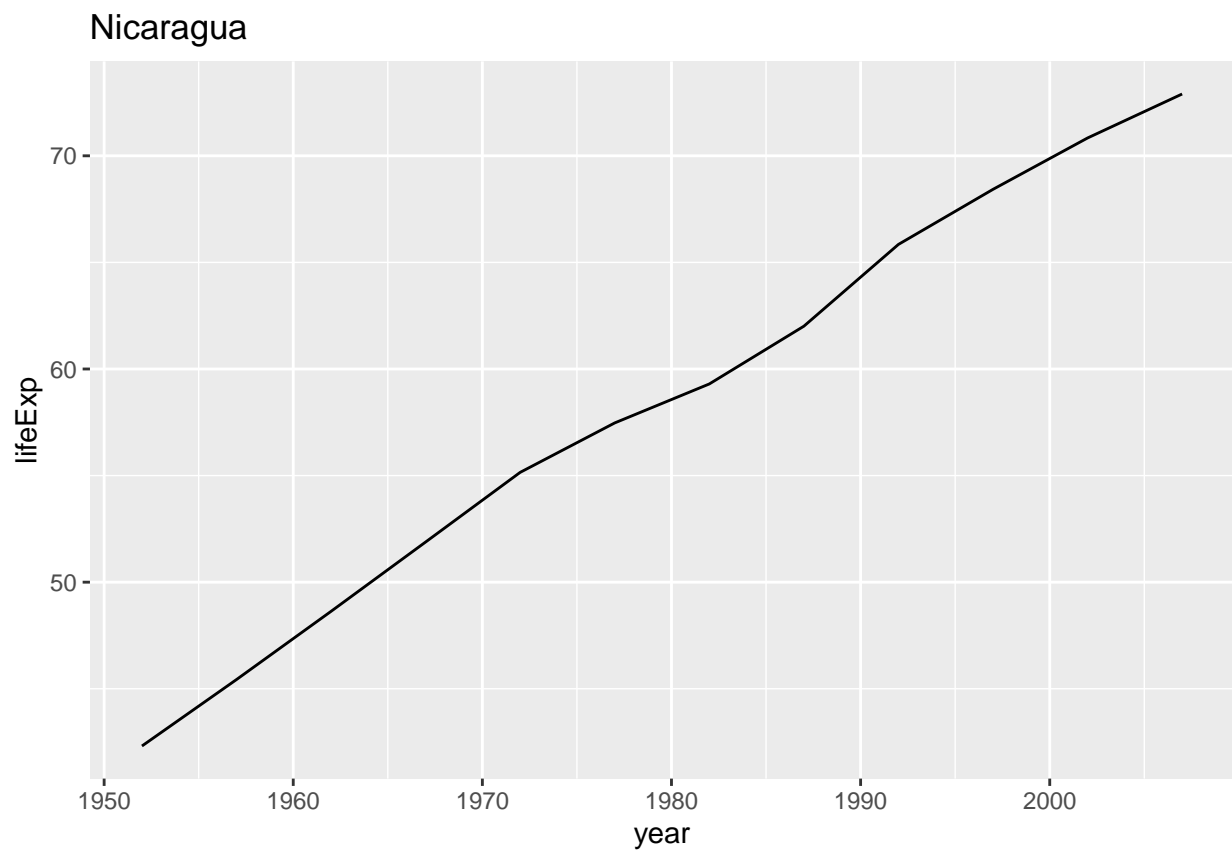
\$Netherlands



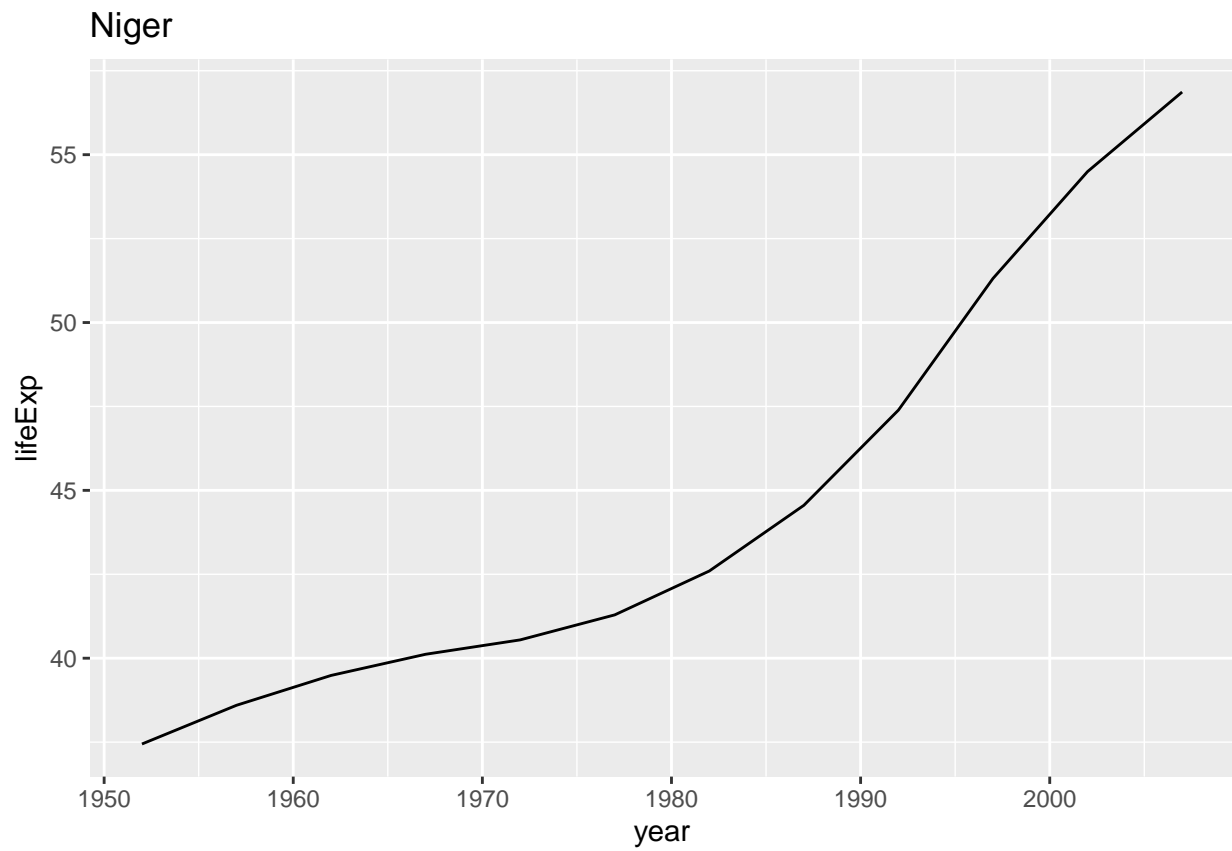
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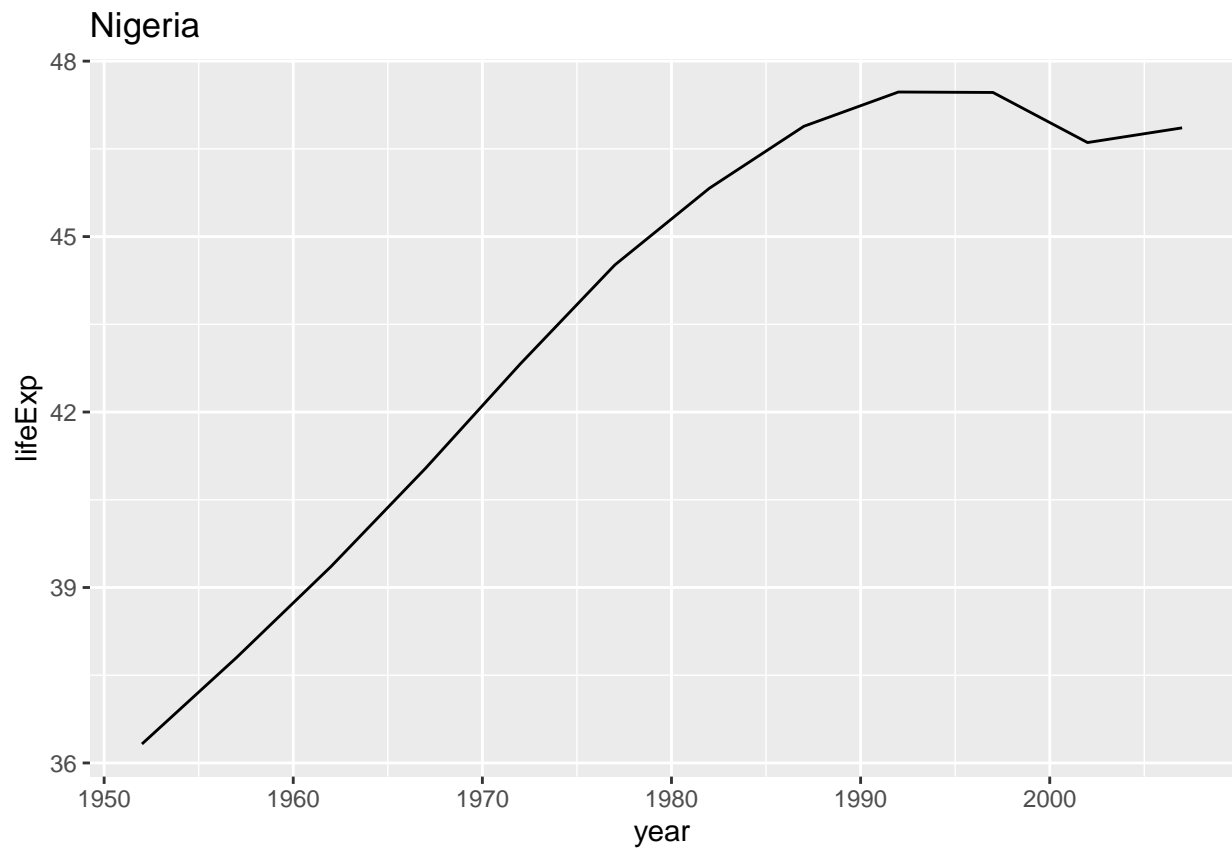
\$Nicaragua



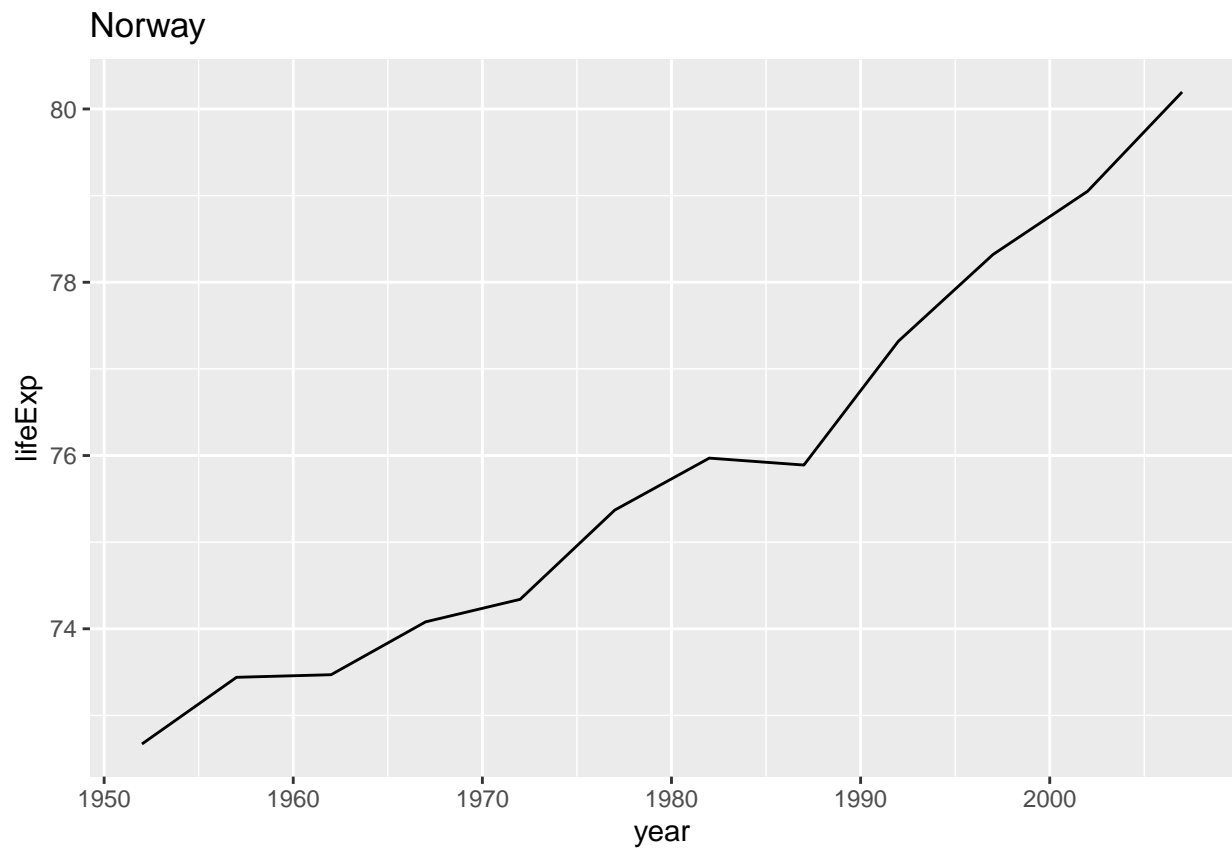
\$Niger



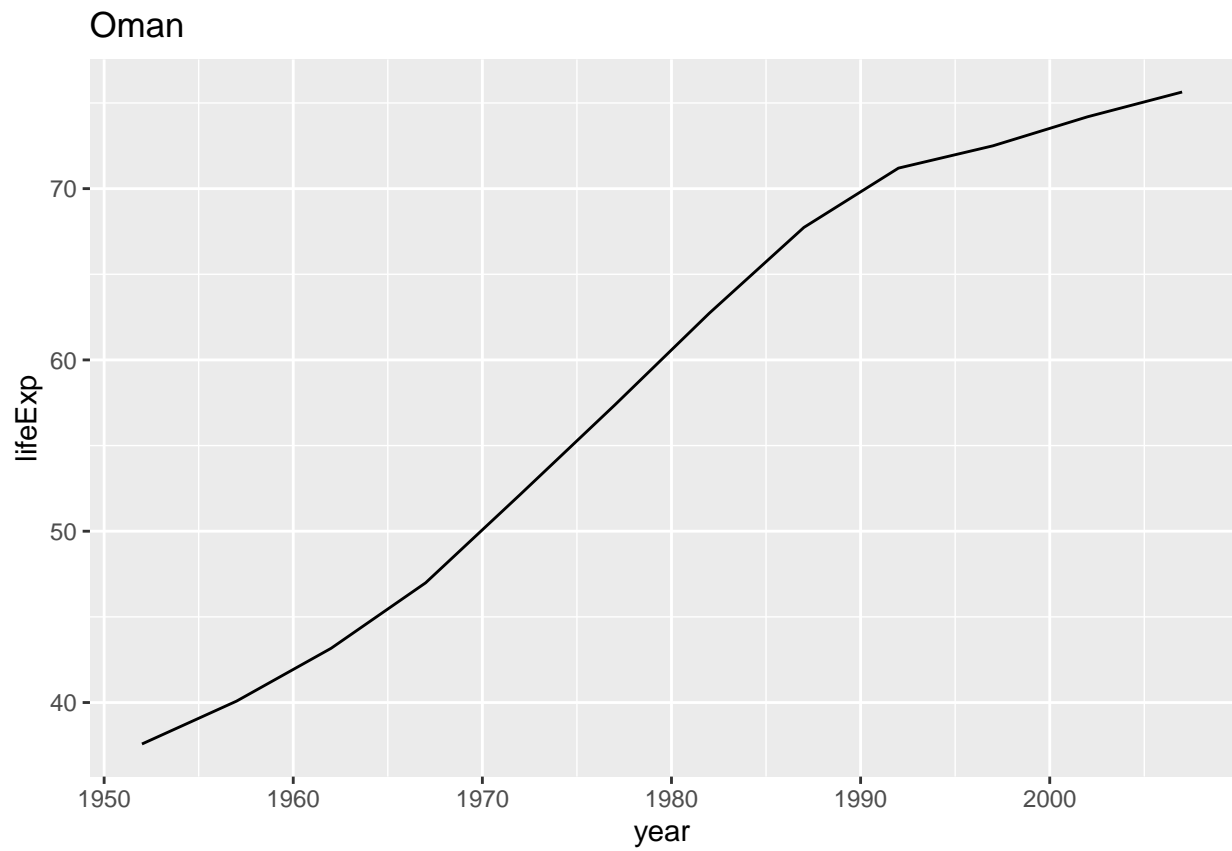
\$Nigeria



\$Norway

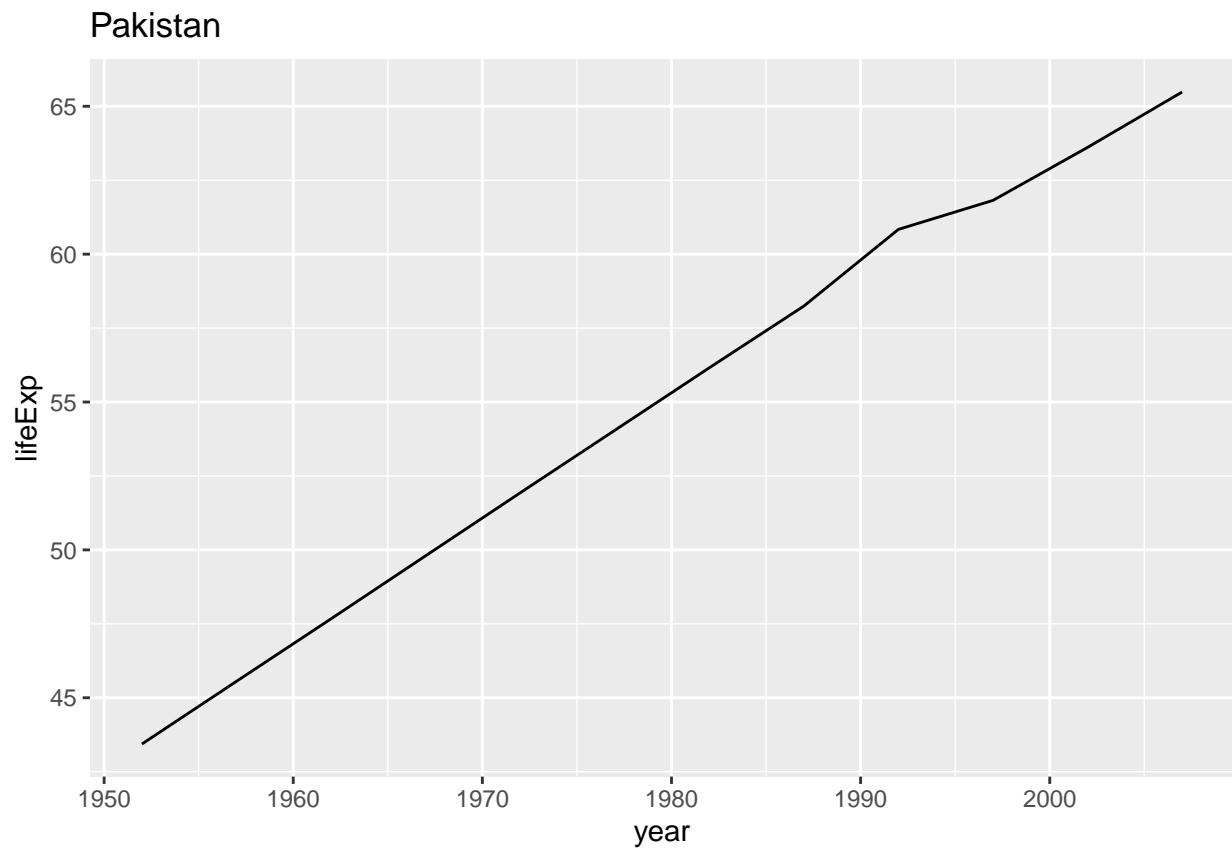


Oman



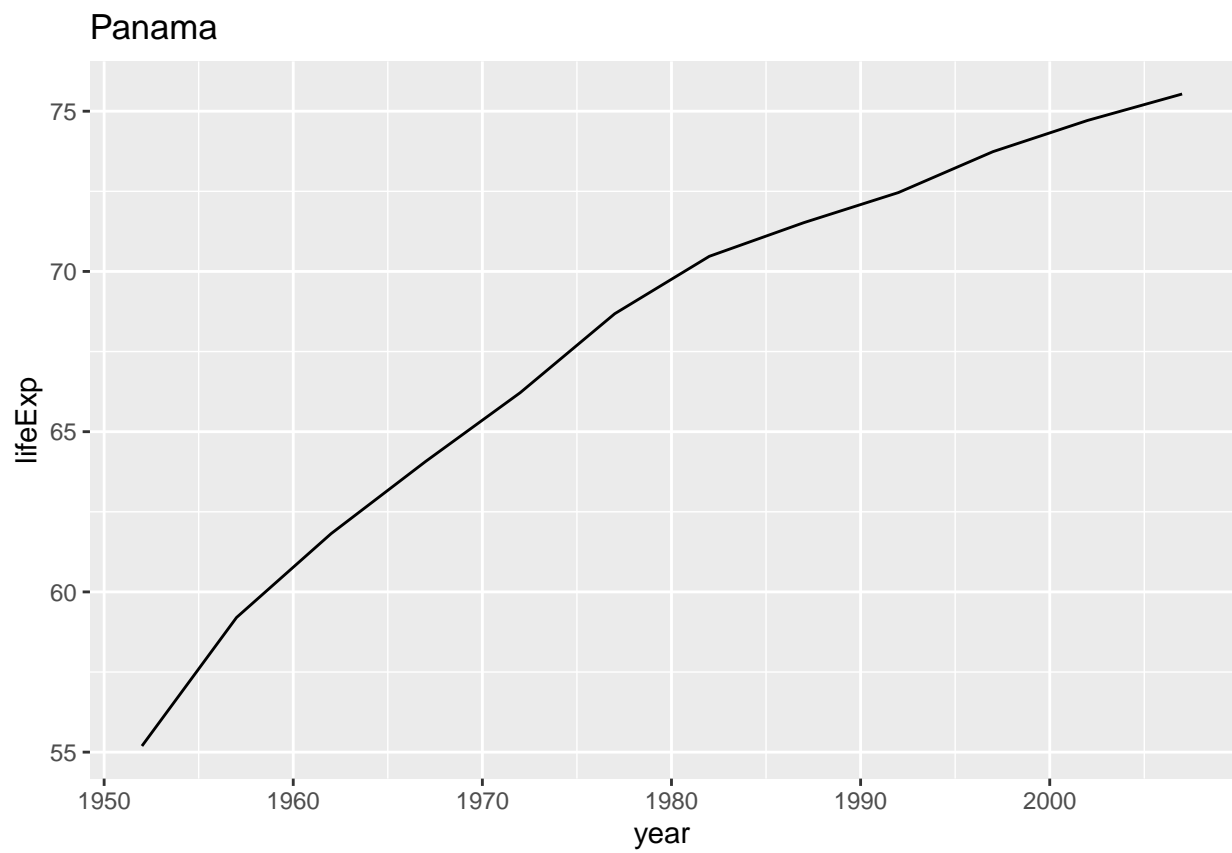
##

\$Pakistan

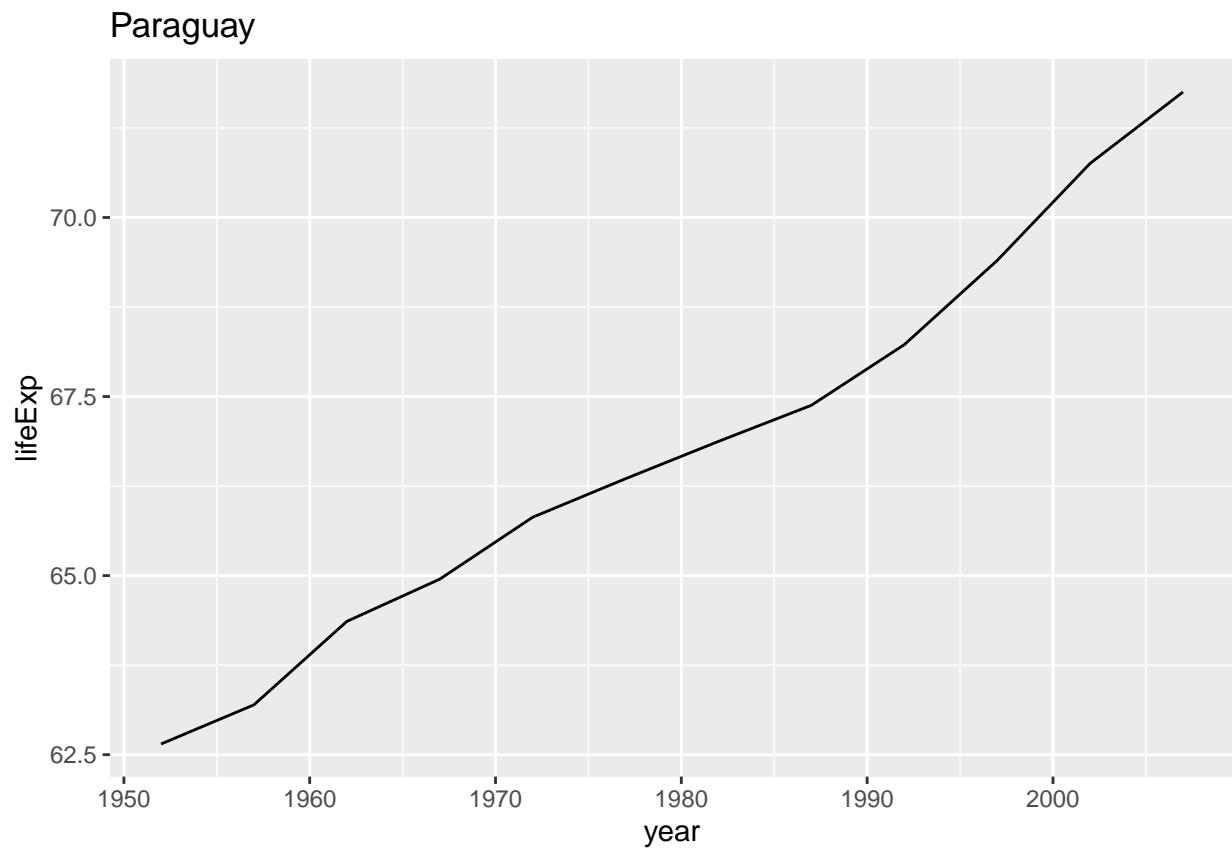


##

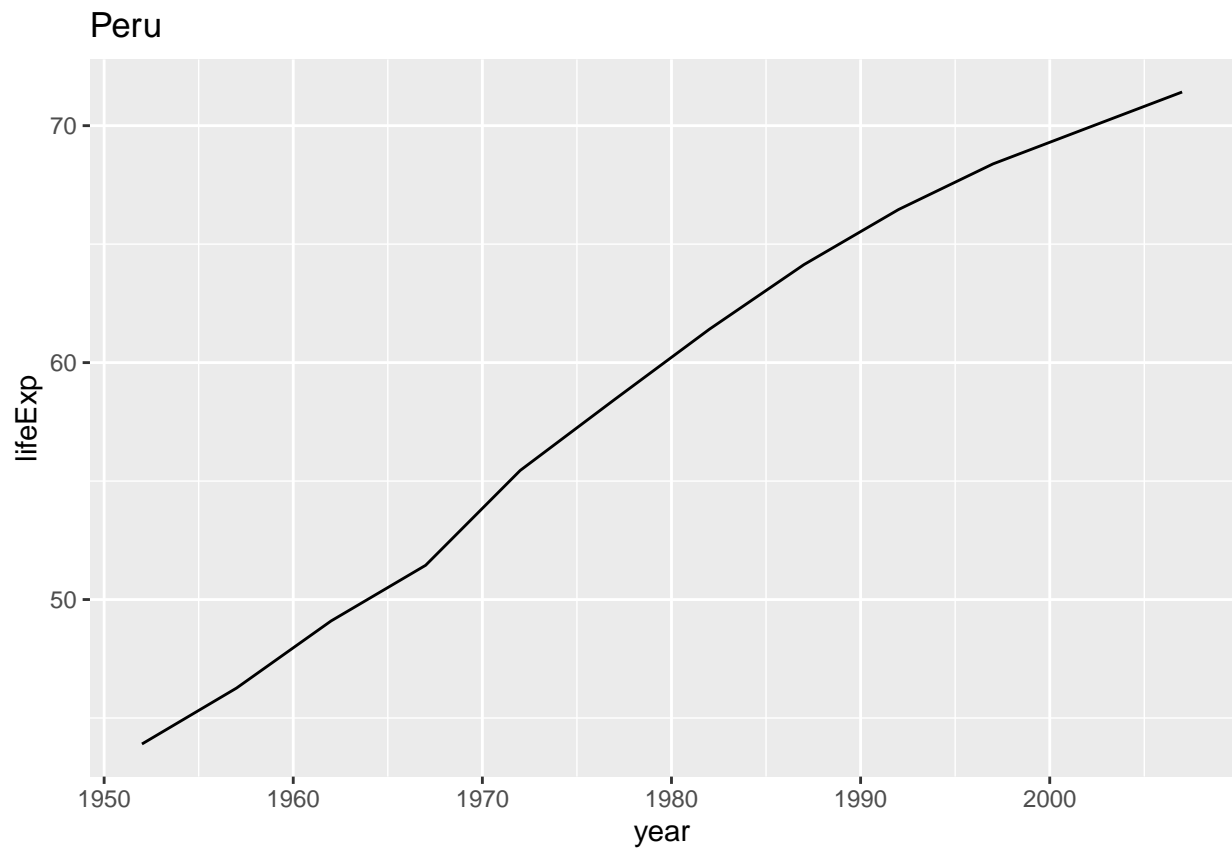
\$Panama



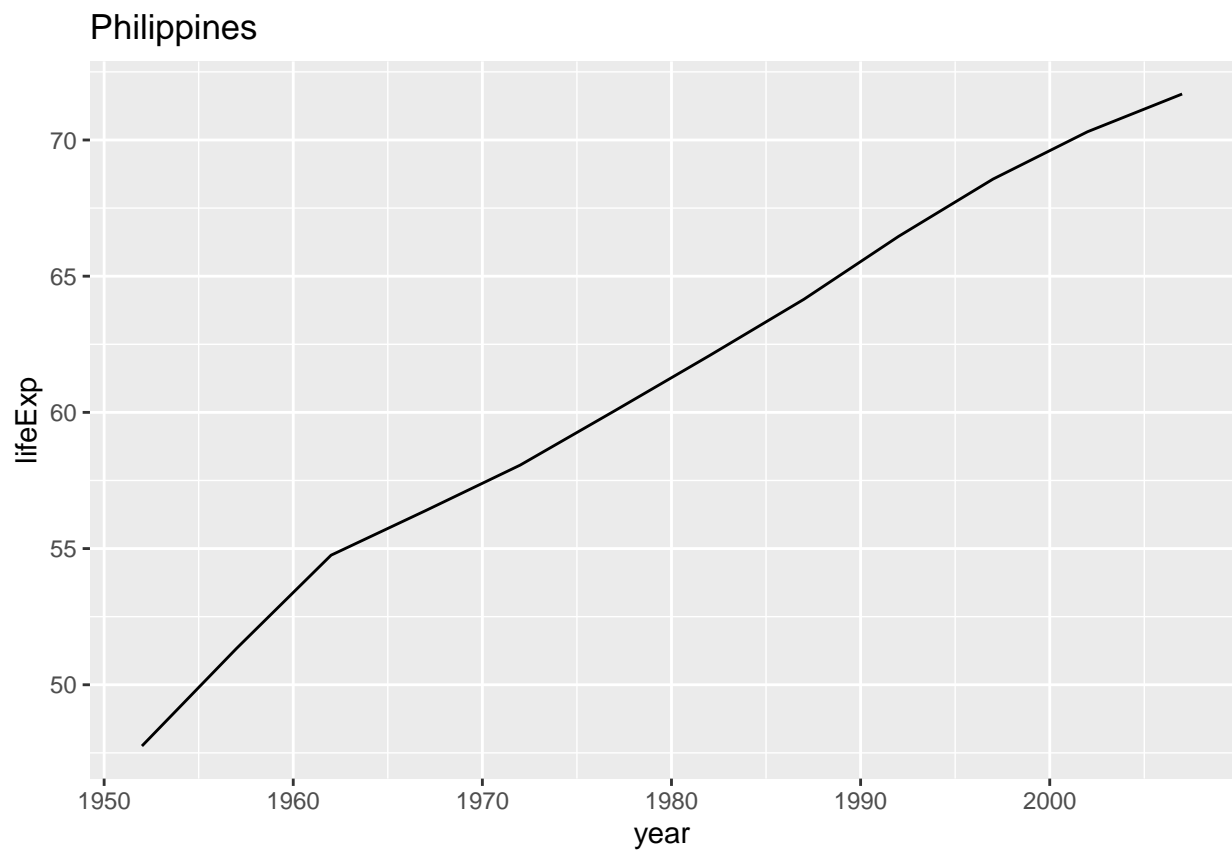
\$Paraguay



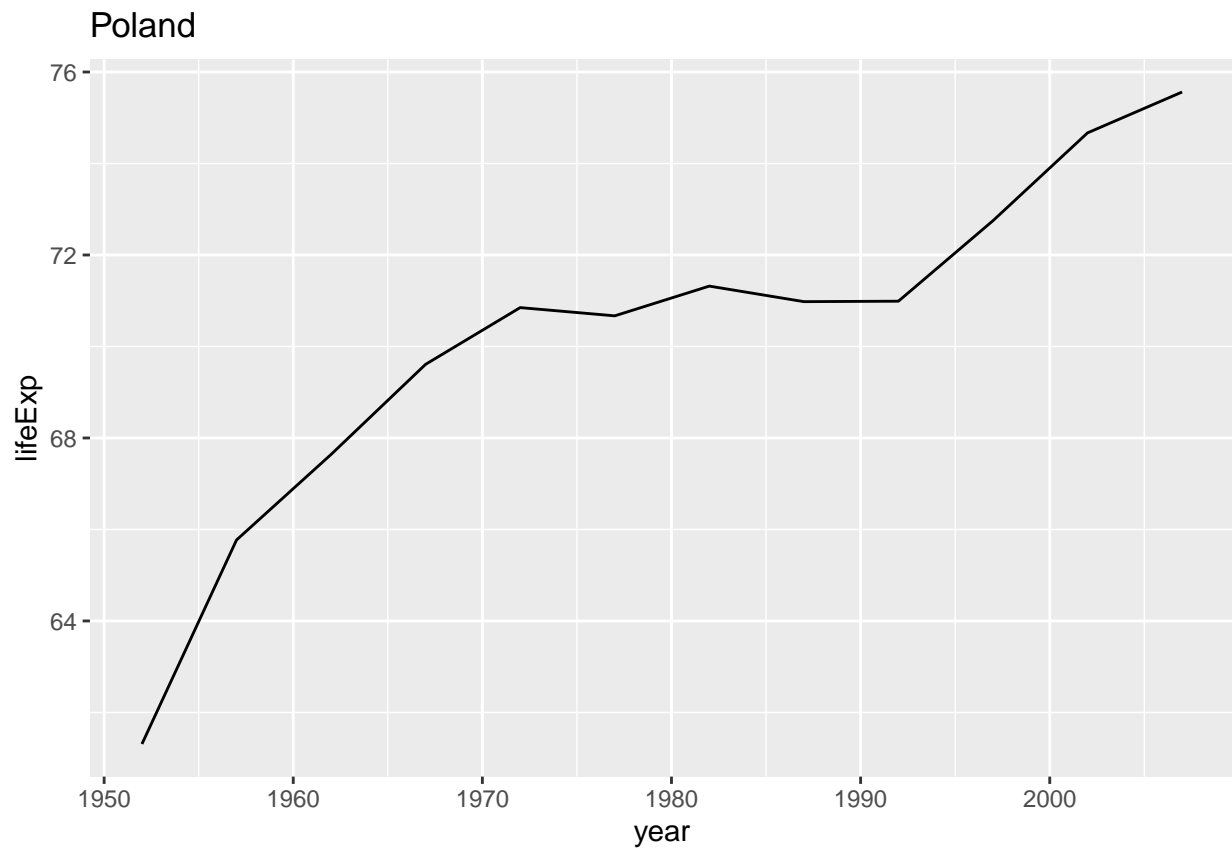
\$Peru



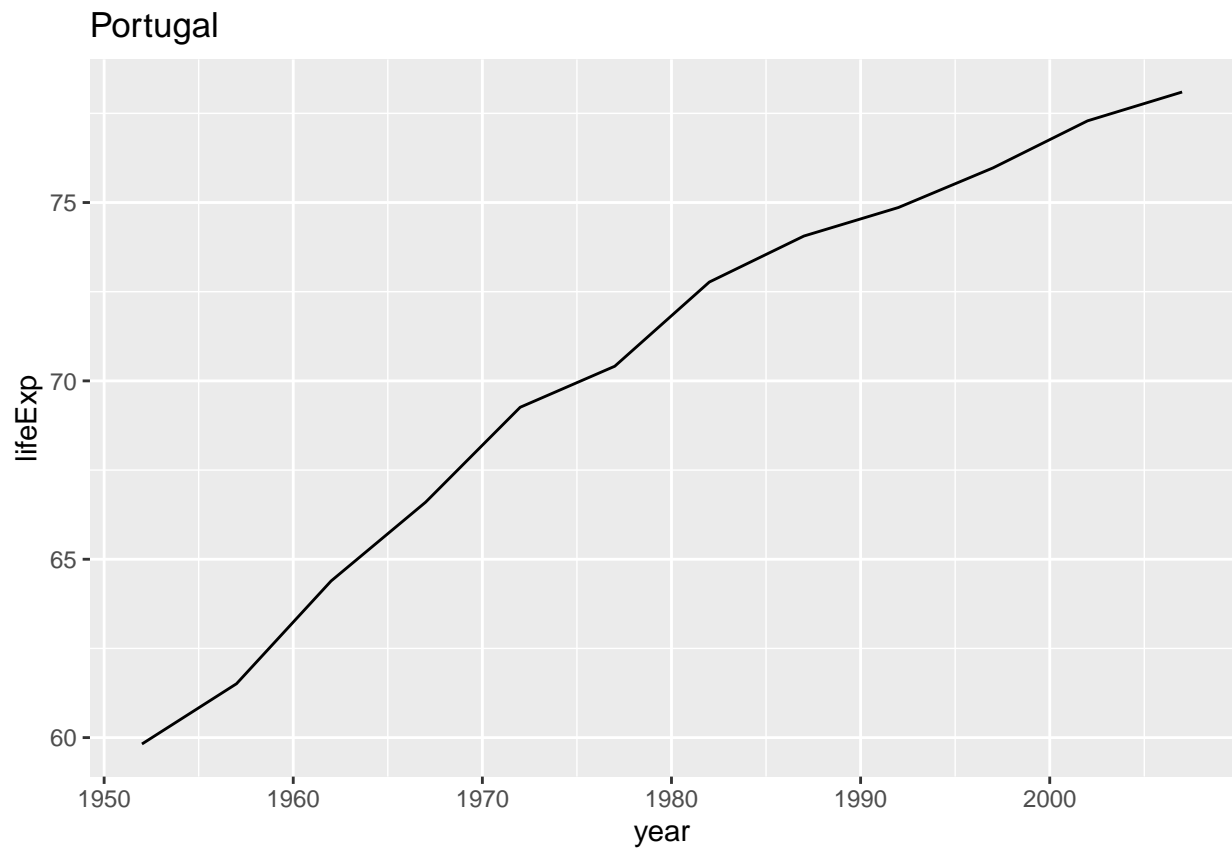
\$Philippines



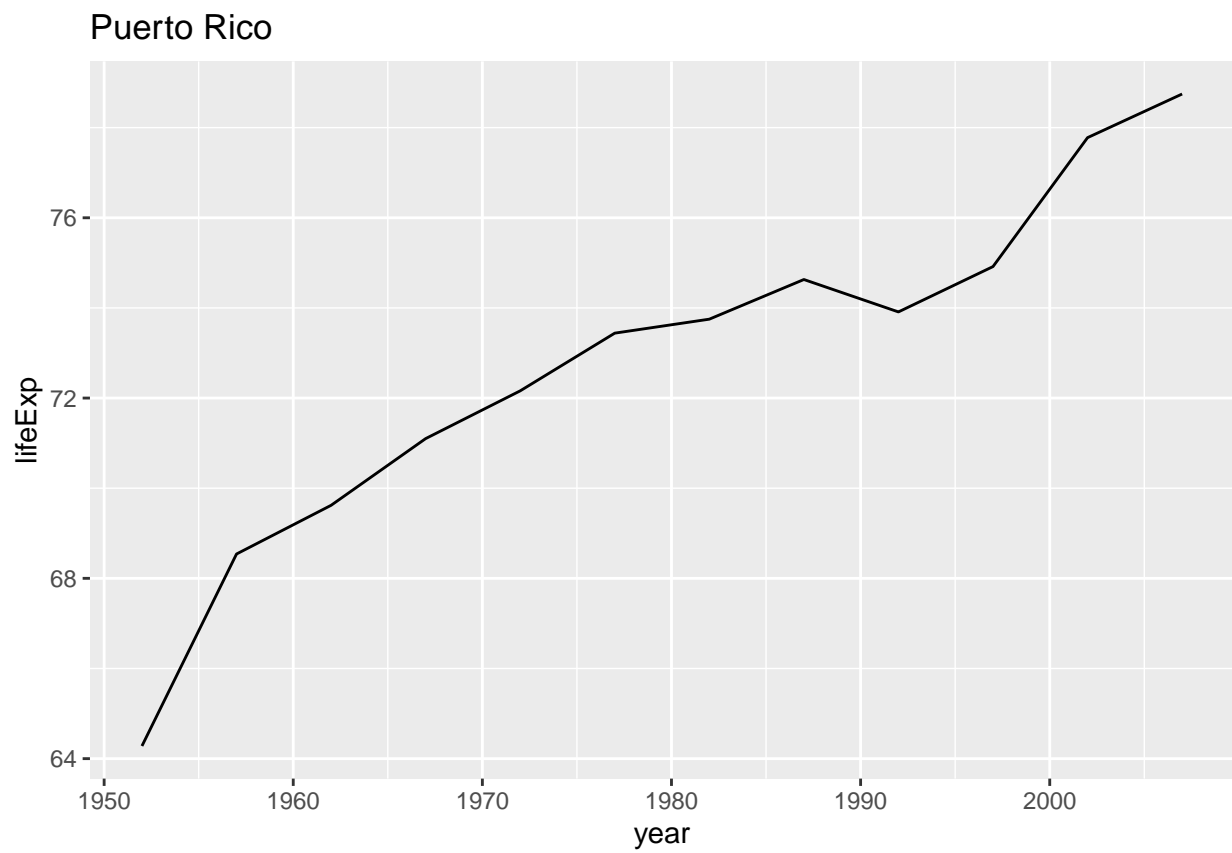
\$Poland



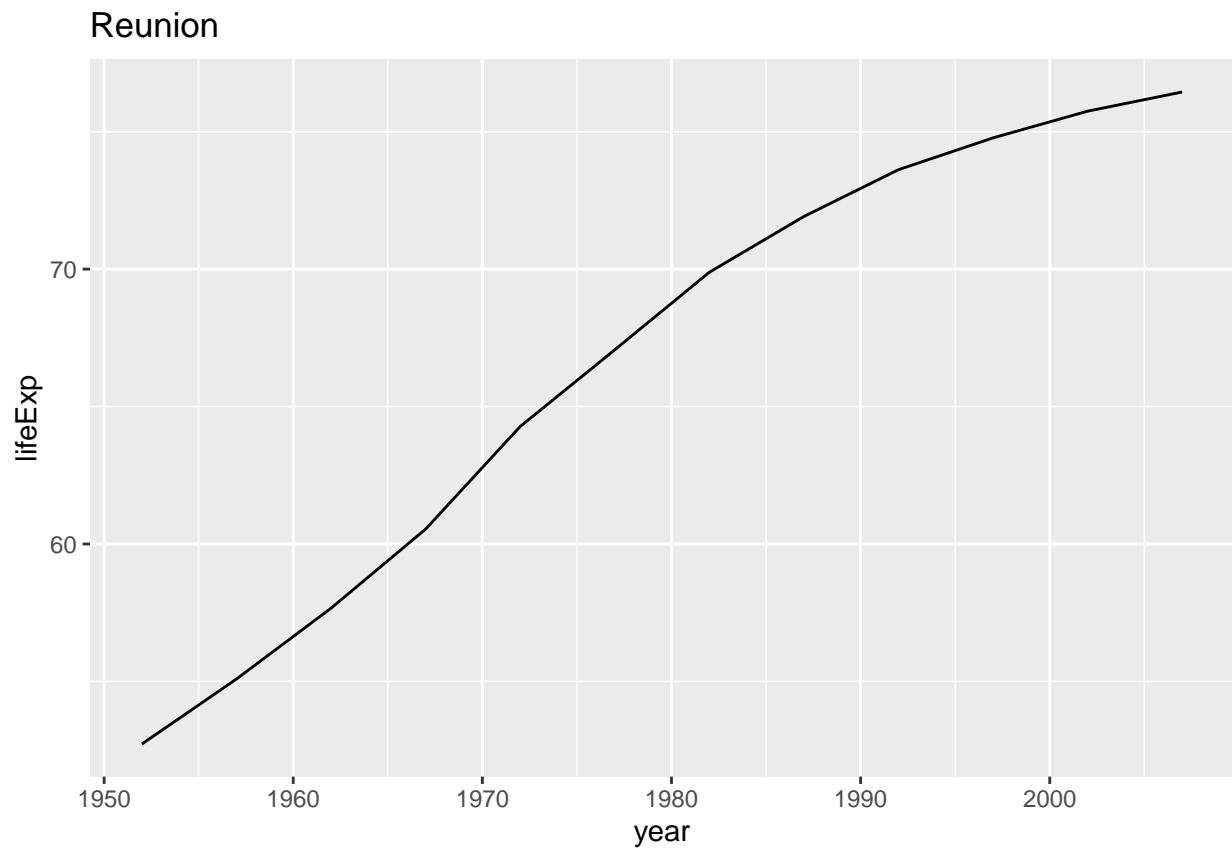
\$Portugal



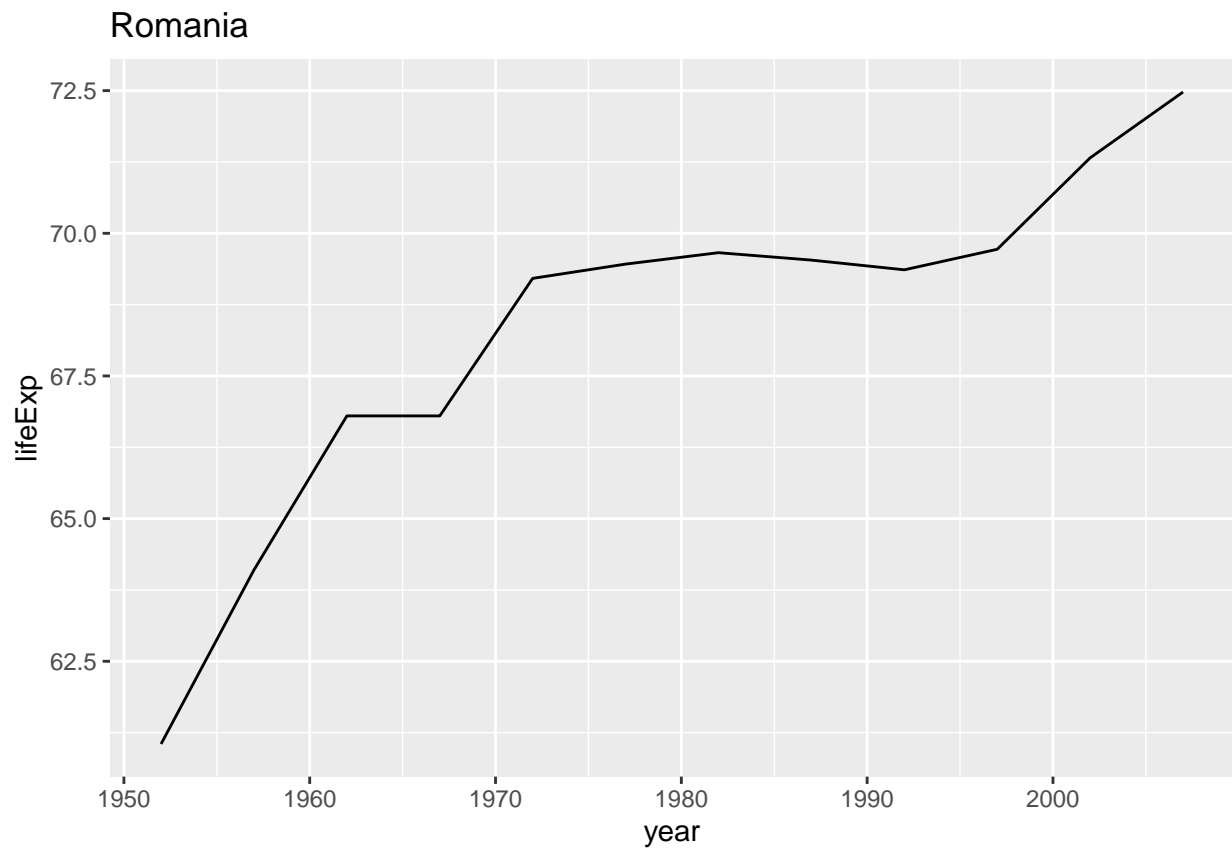
```
##  
## $`Puerto Rico`
```



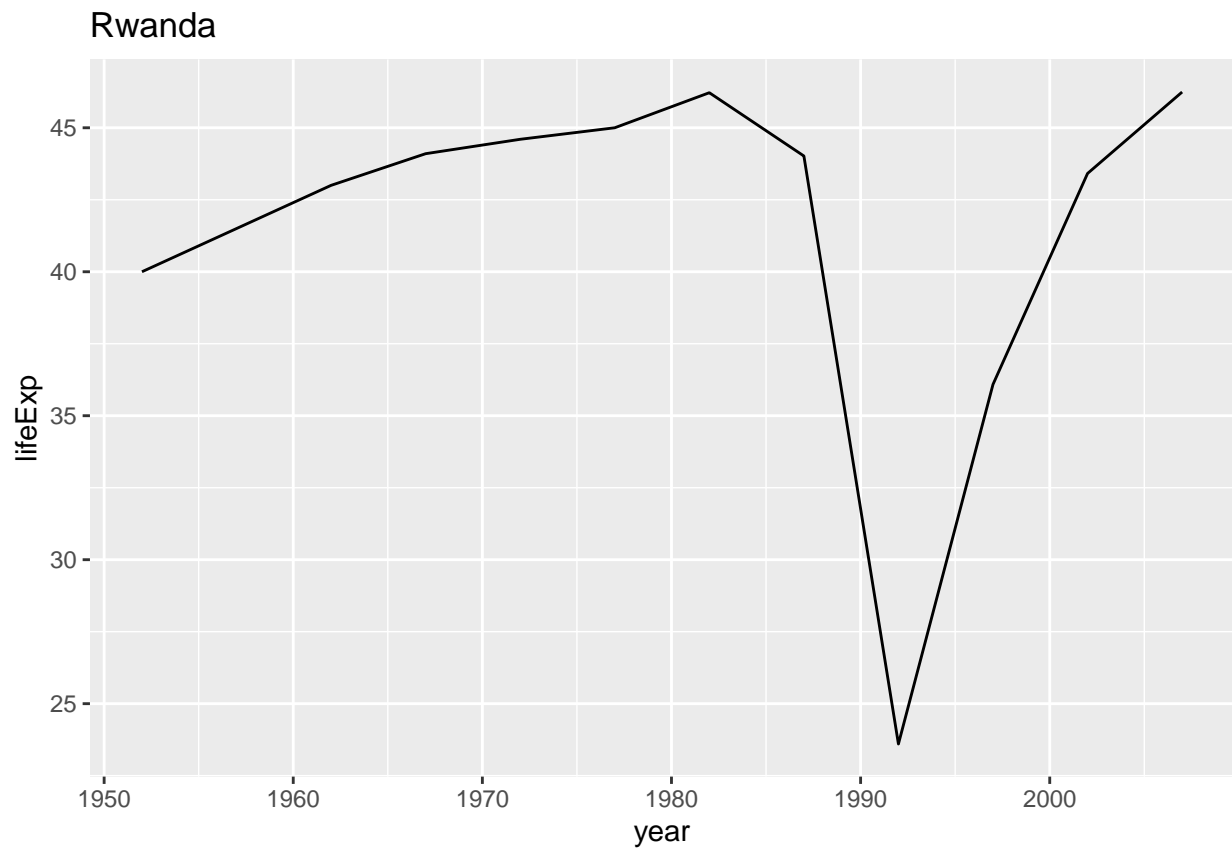
\$Reunion



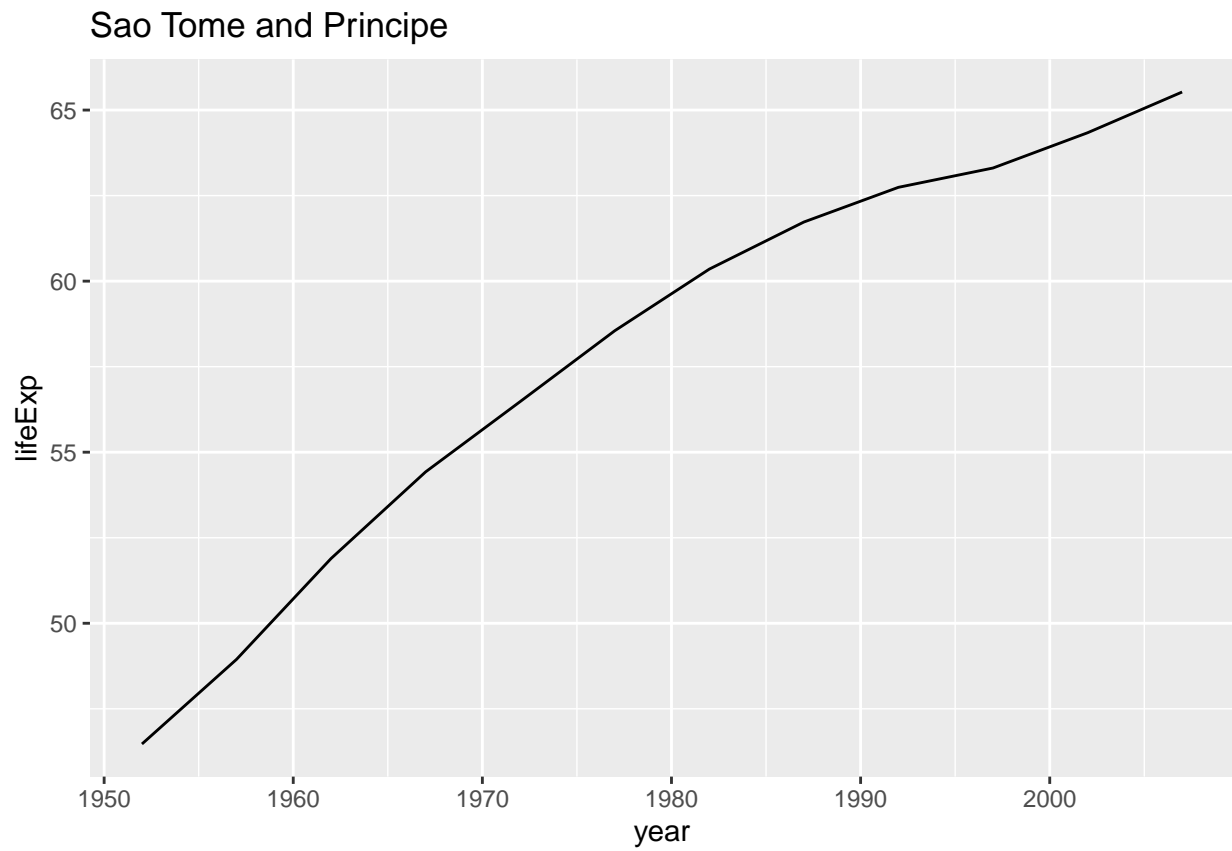
```
##  
## $Romania
```



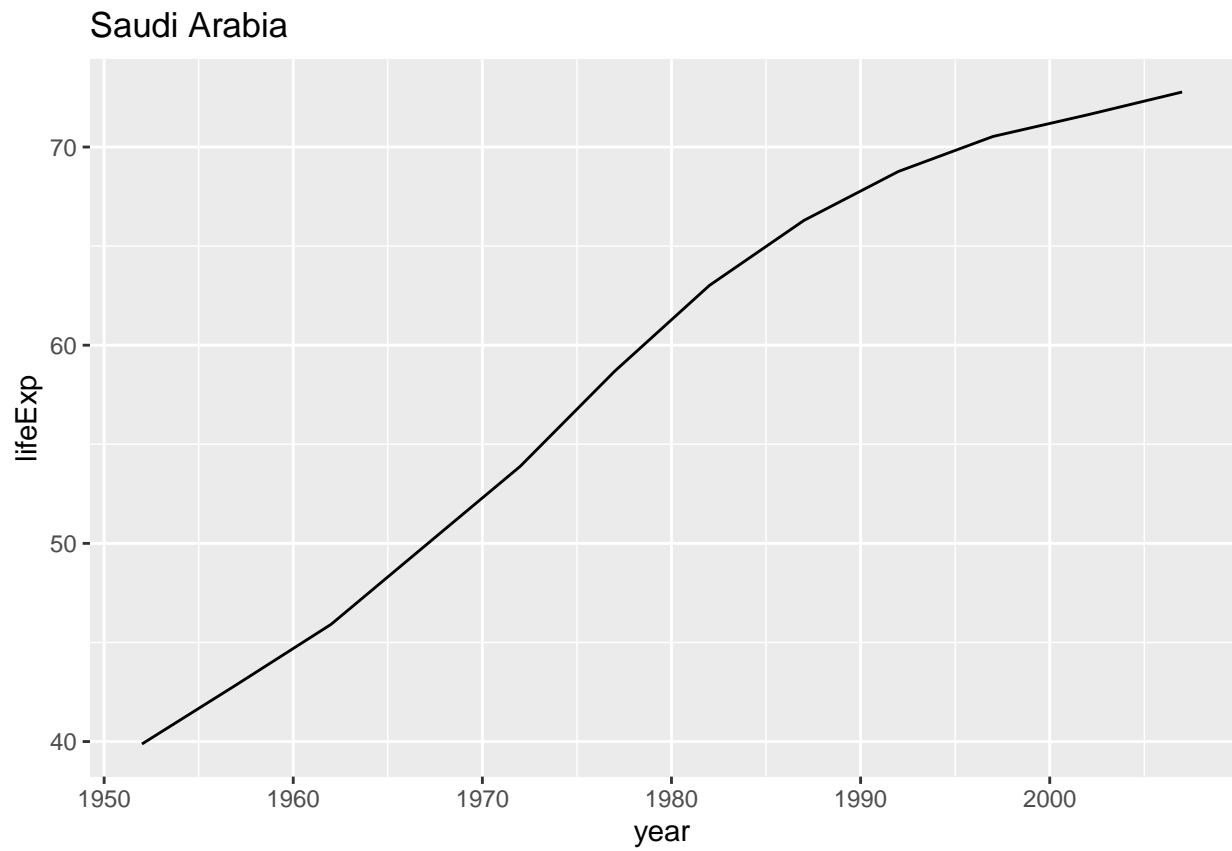
\$Rwanda



```
##  
## $`Sao Tome and Principe`
```

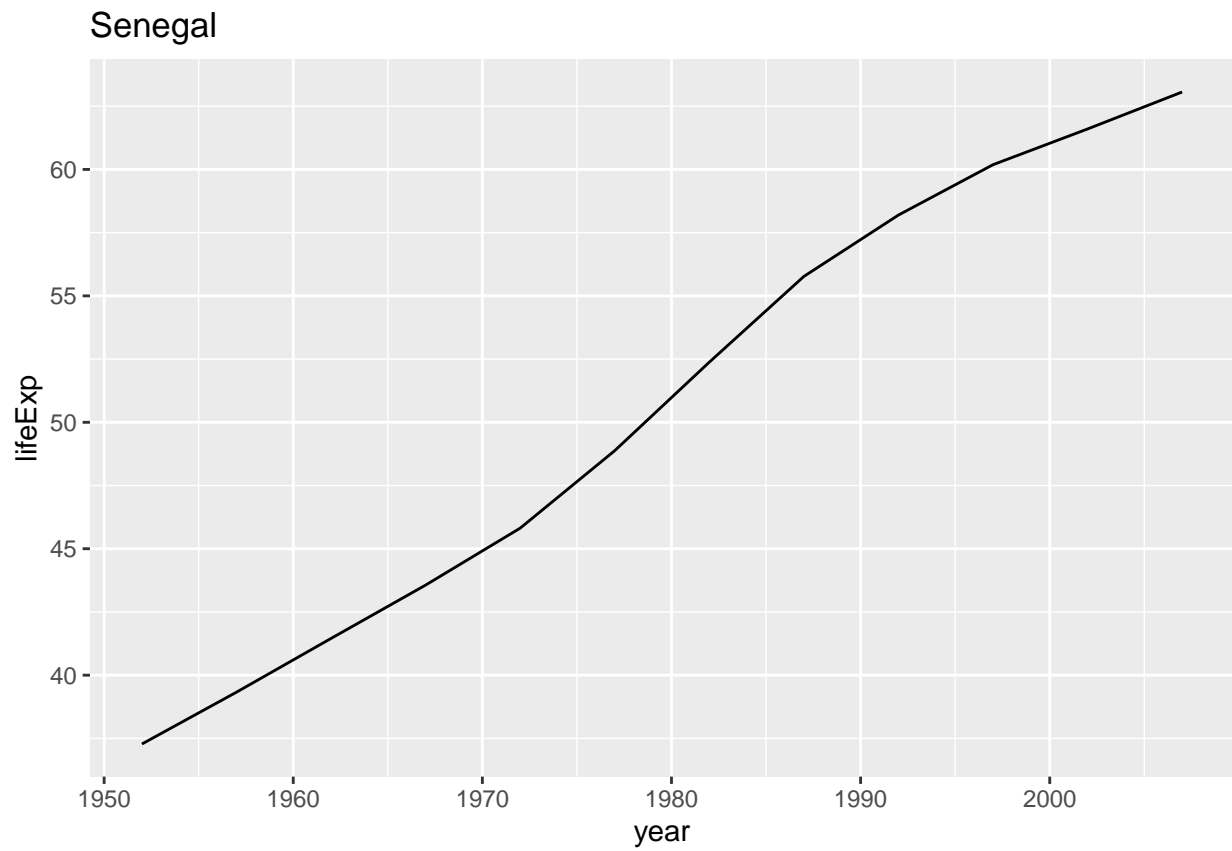


```
##  
## $`Saudi Arabia`
```

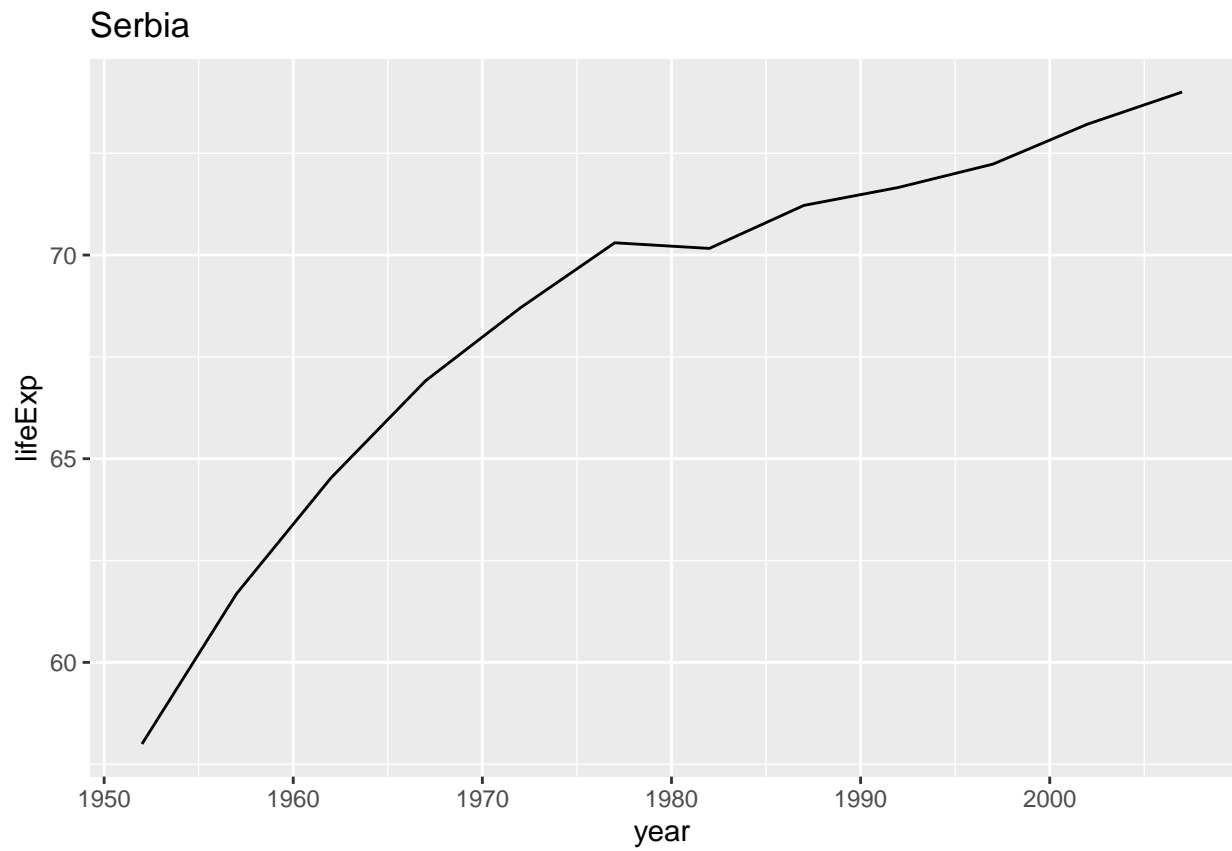


##

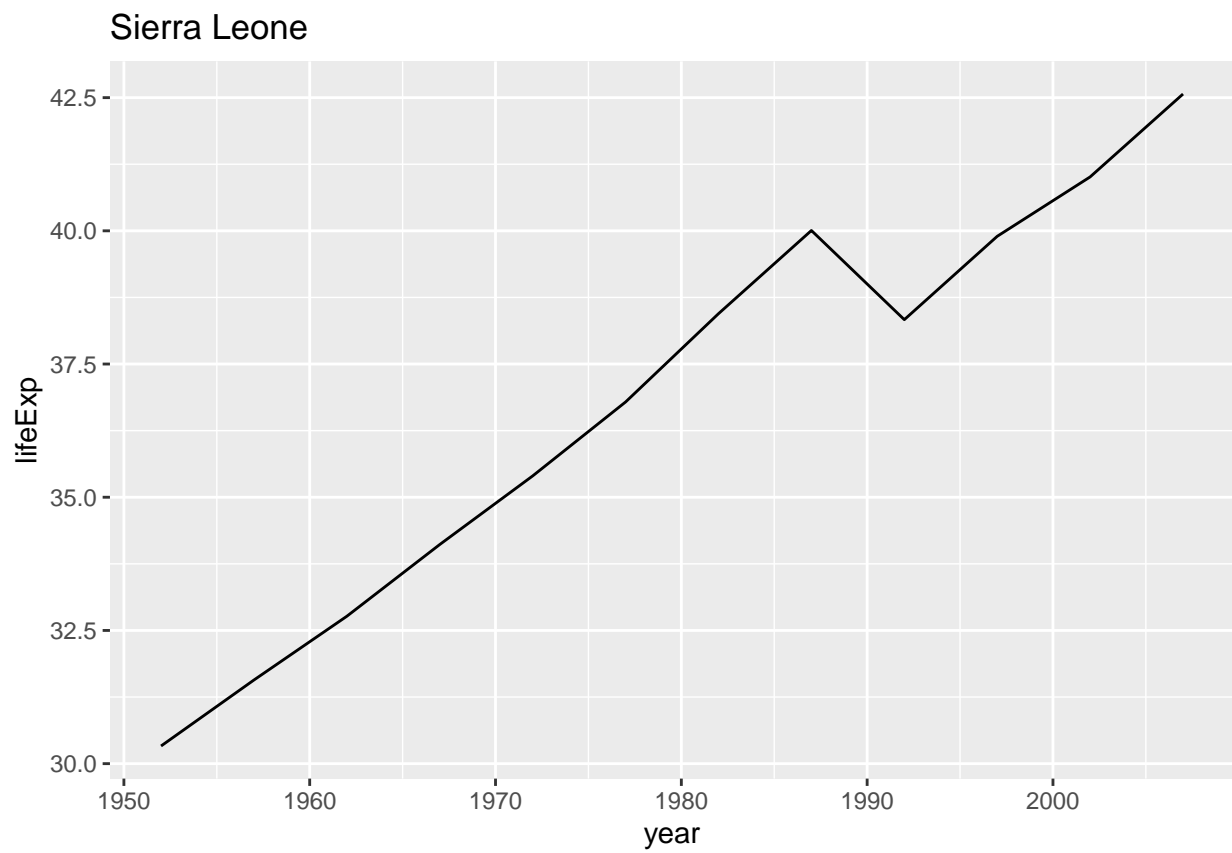
\$Senegal



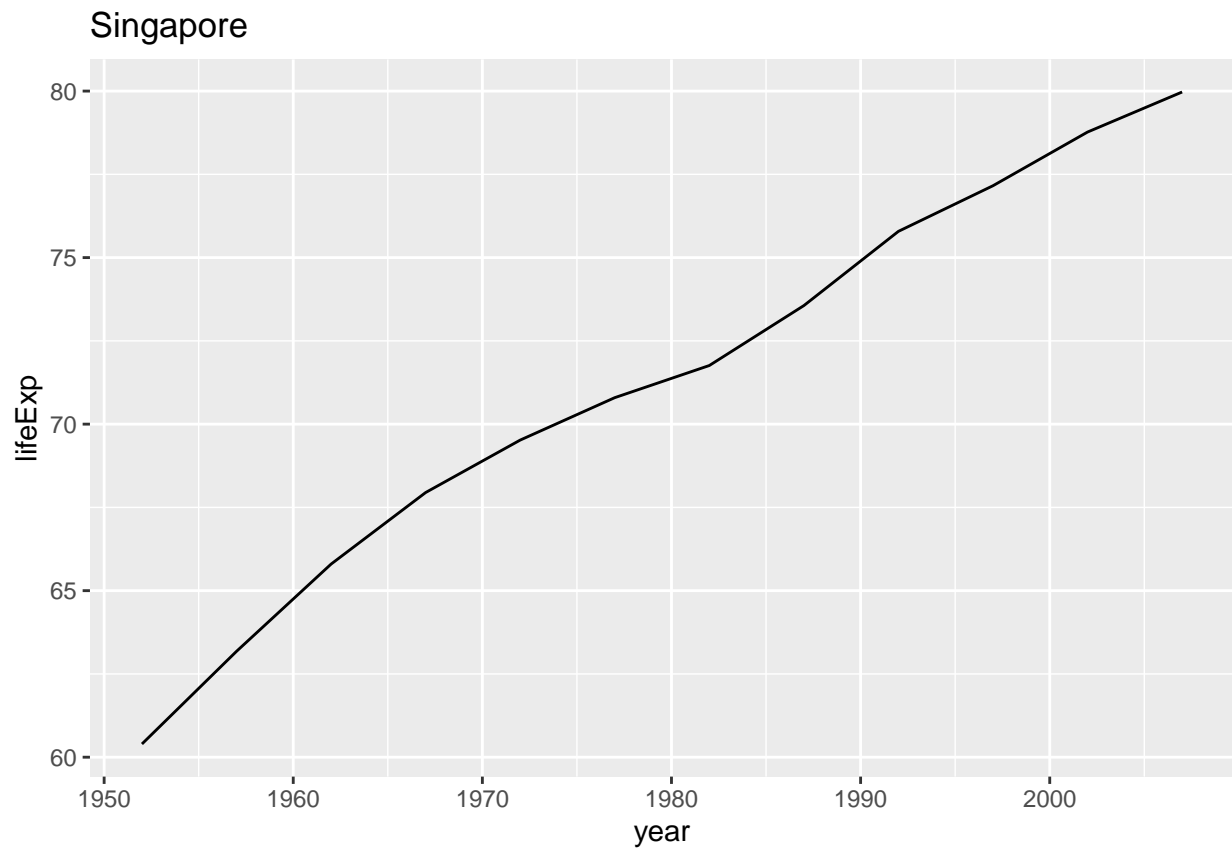
\$Serbia



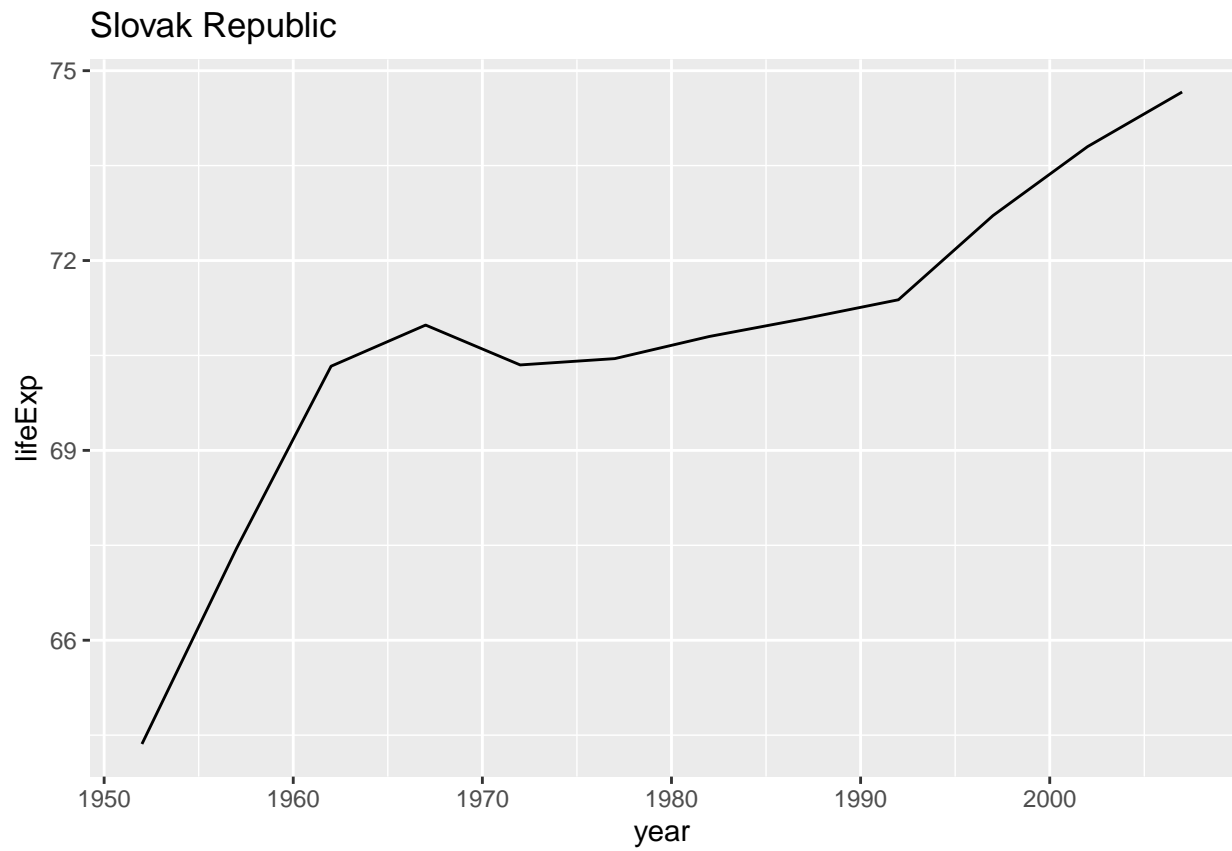
```
##  
## $`Sierra Leone`
```



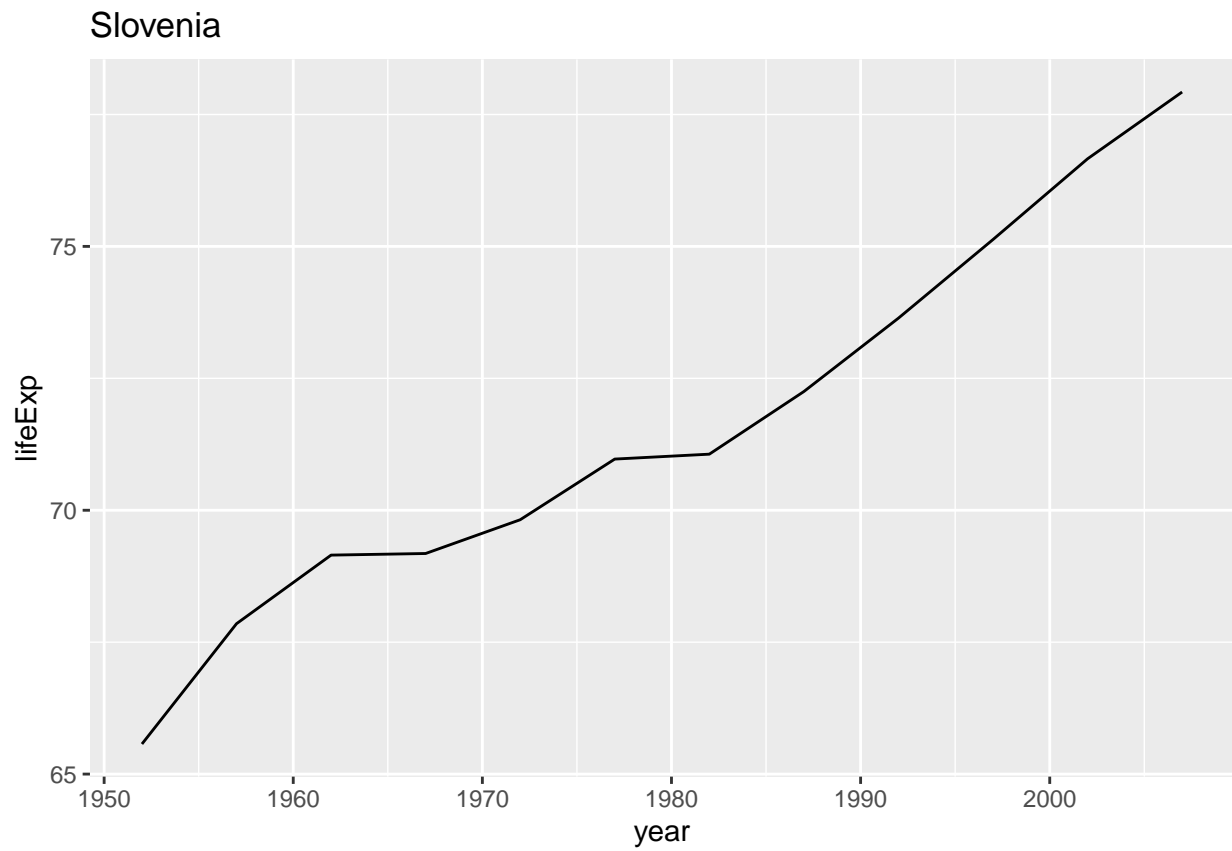
\$Singapore



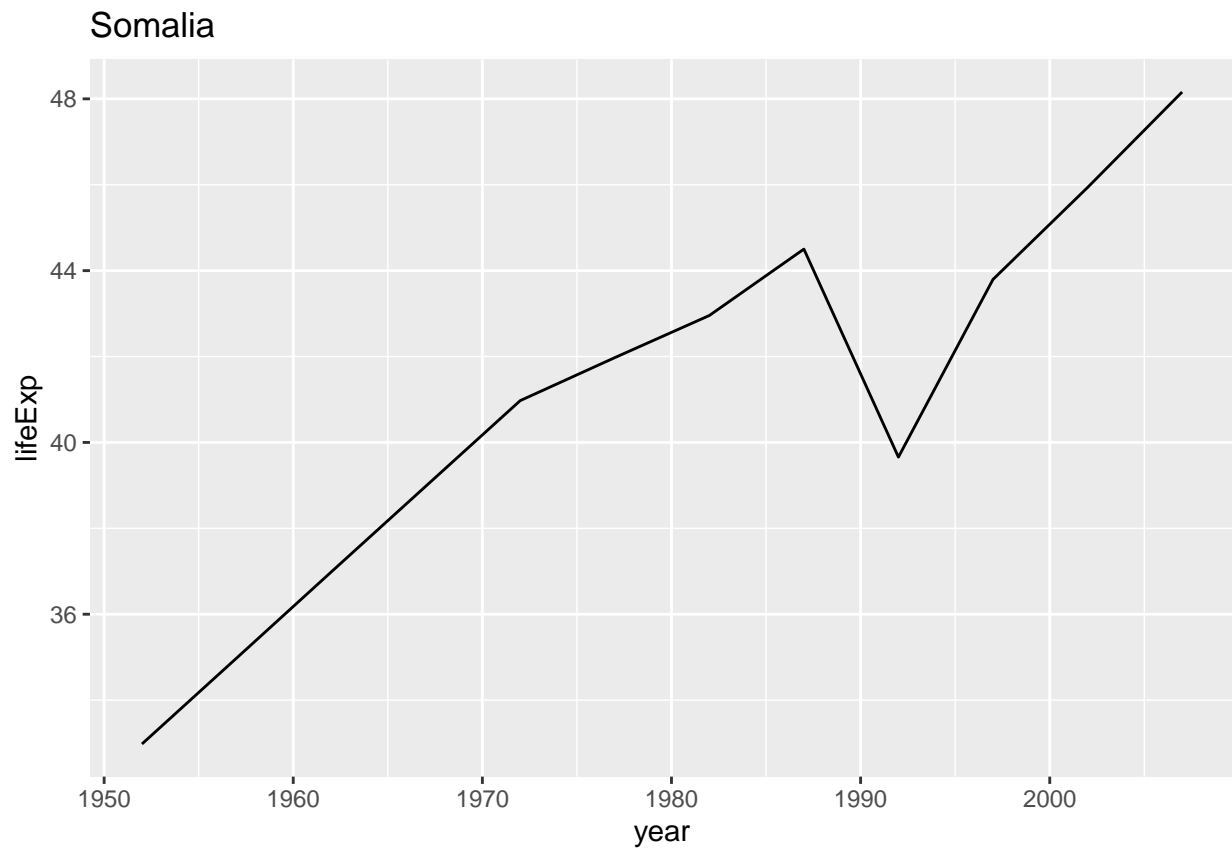
```
##  
## $`Slovak Republic`
```



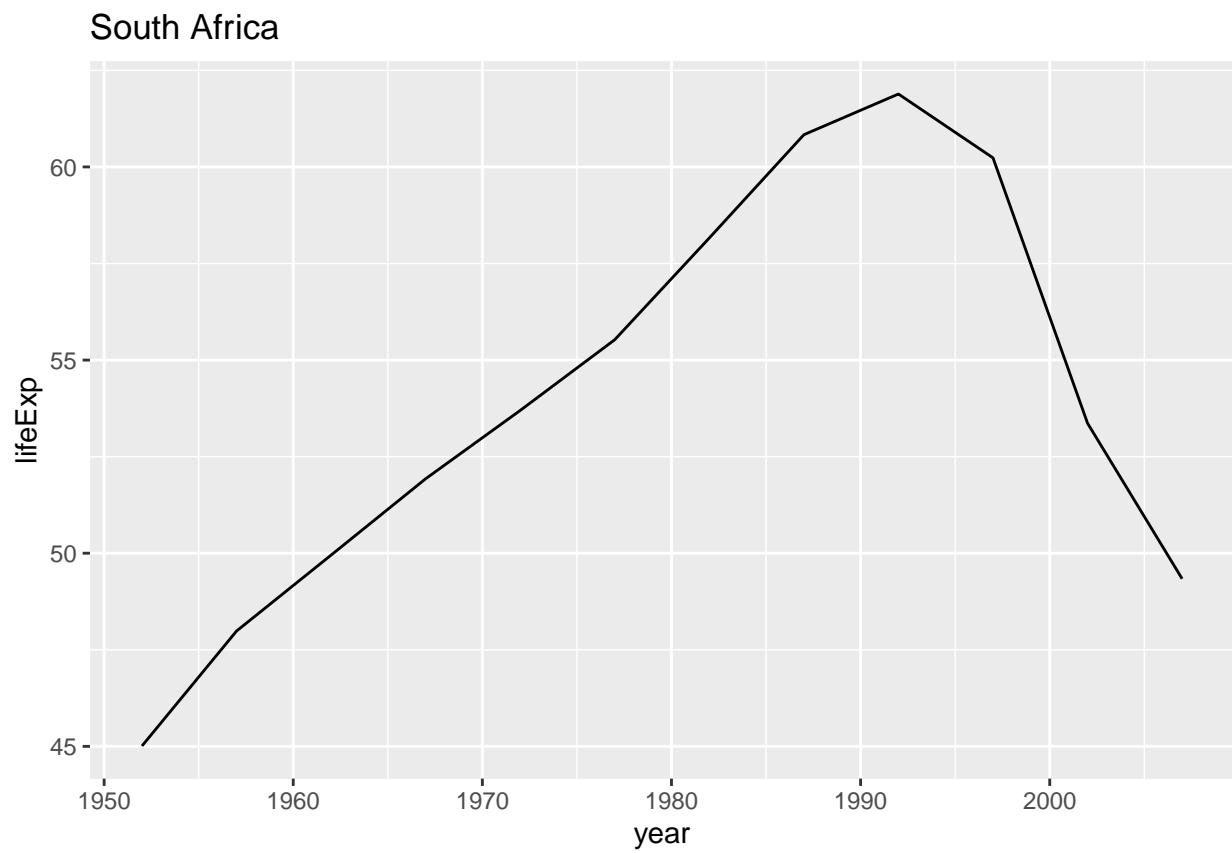
\$Slovenia



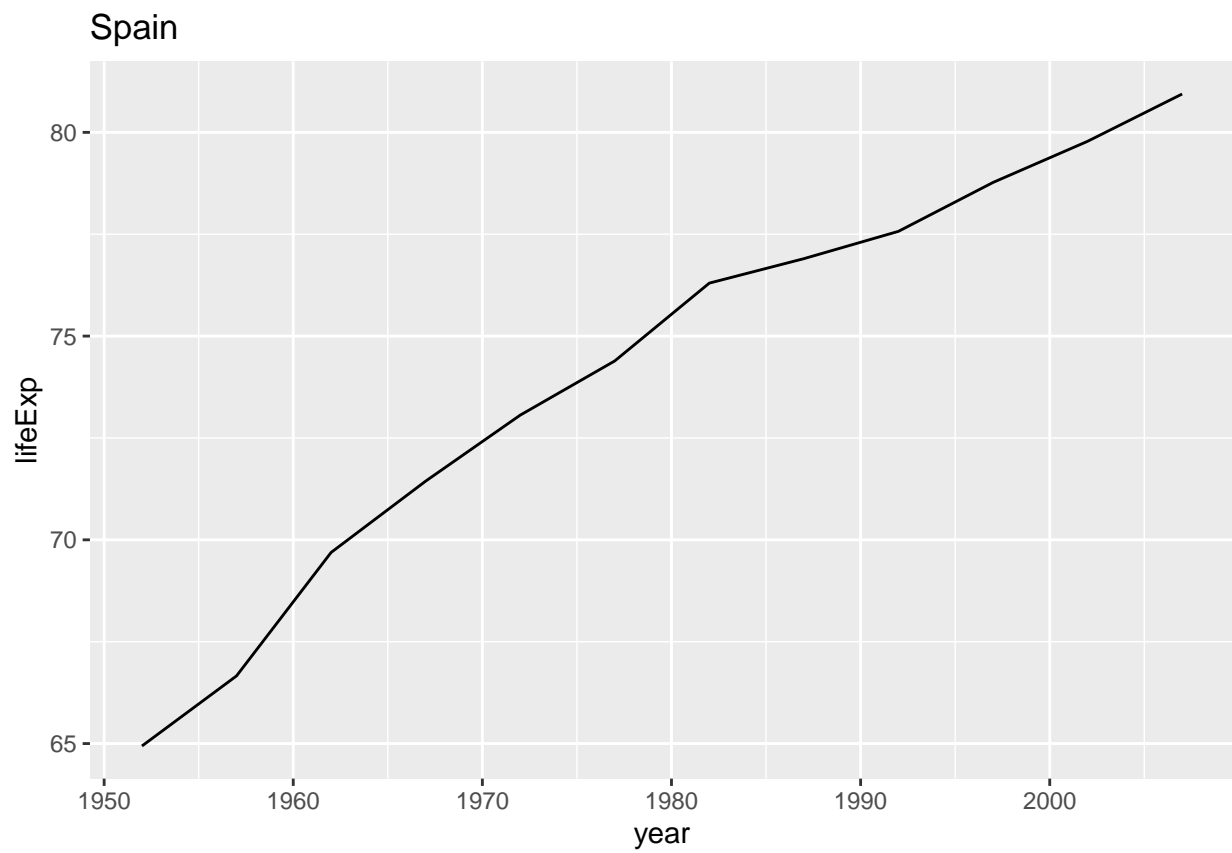
```
##  
## $Somalia
```



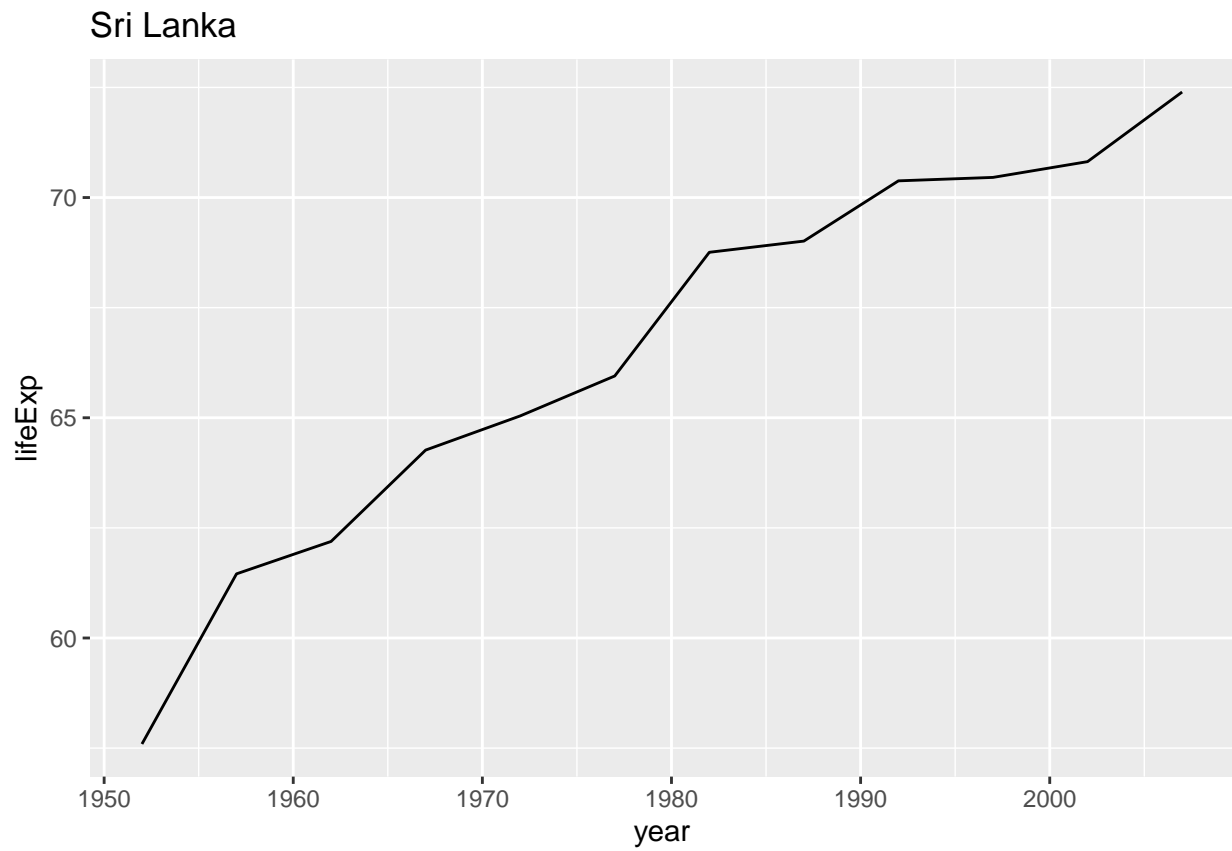
```
##  
## $`South Africa`
```



\$Spain

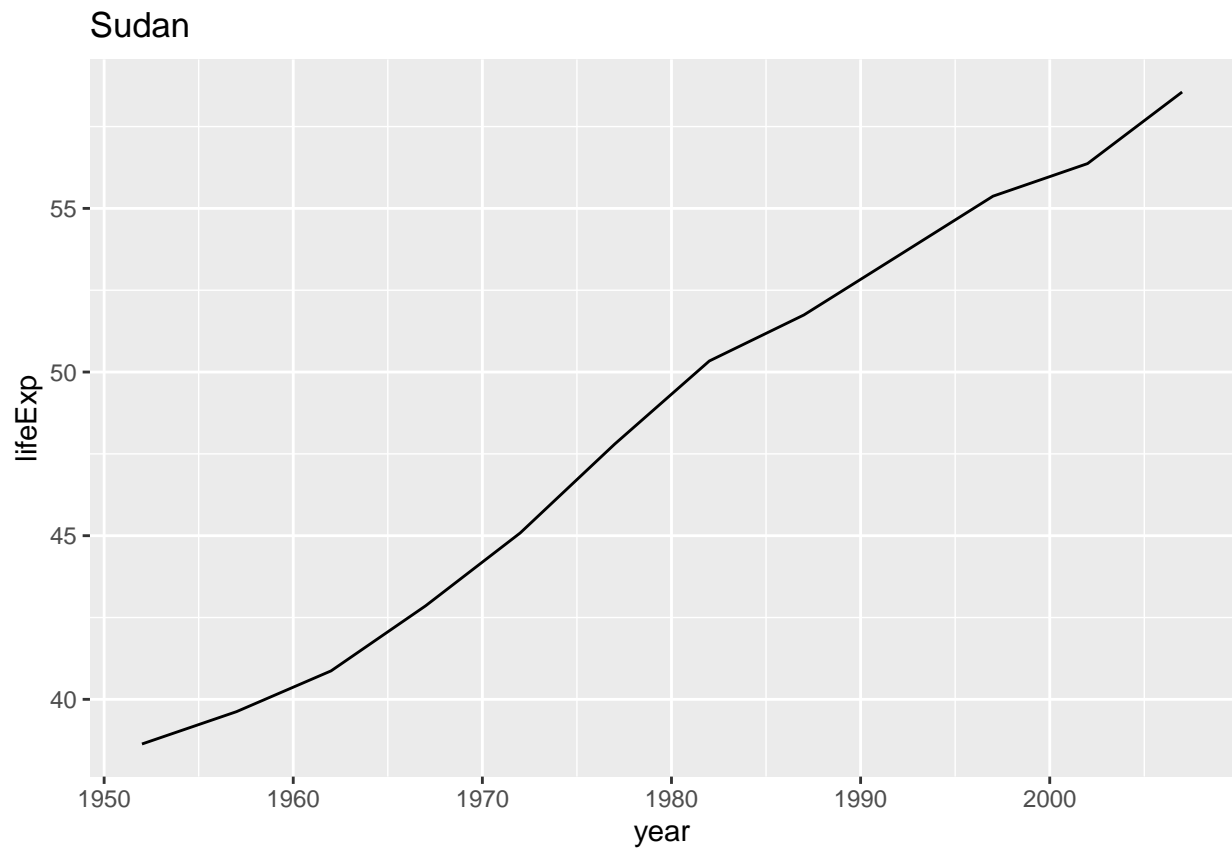


\$`Sri Lanka`

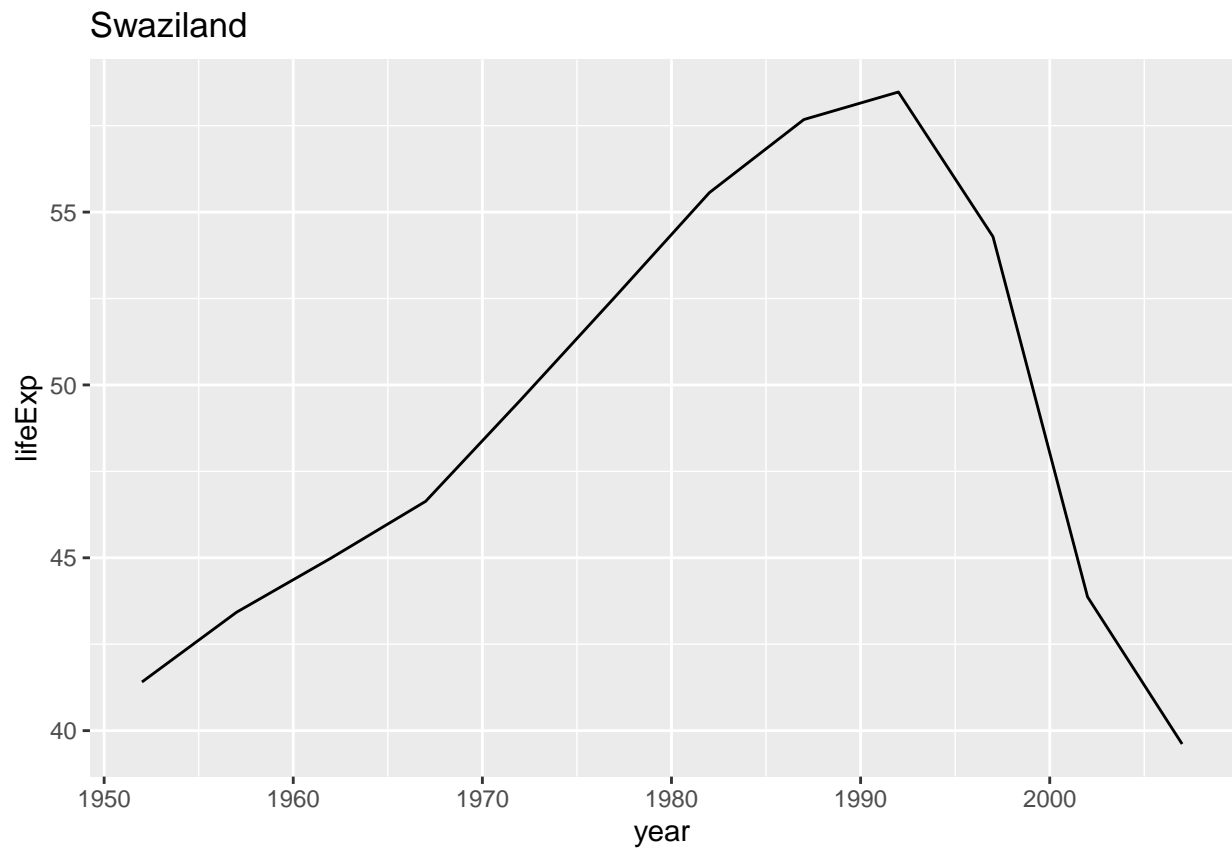


##

\$Sudan

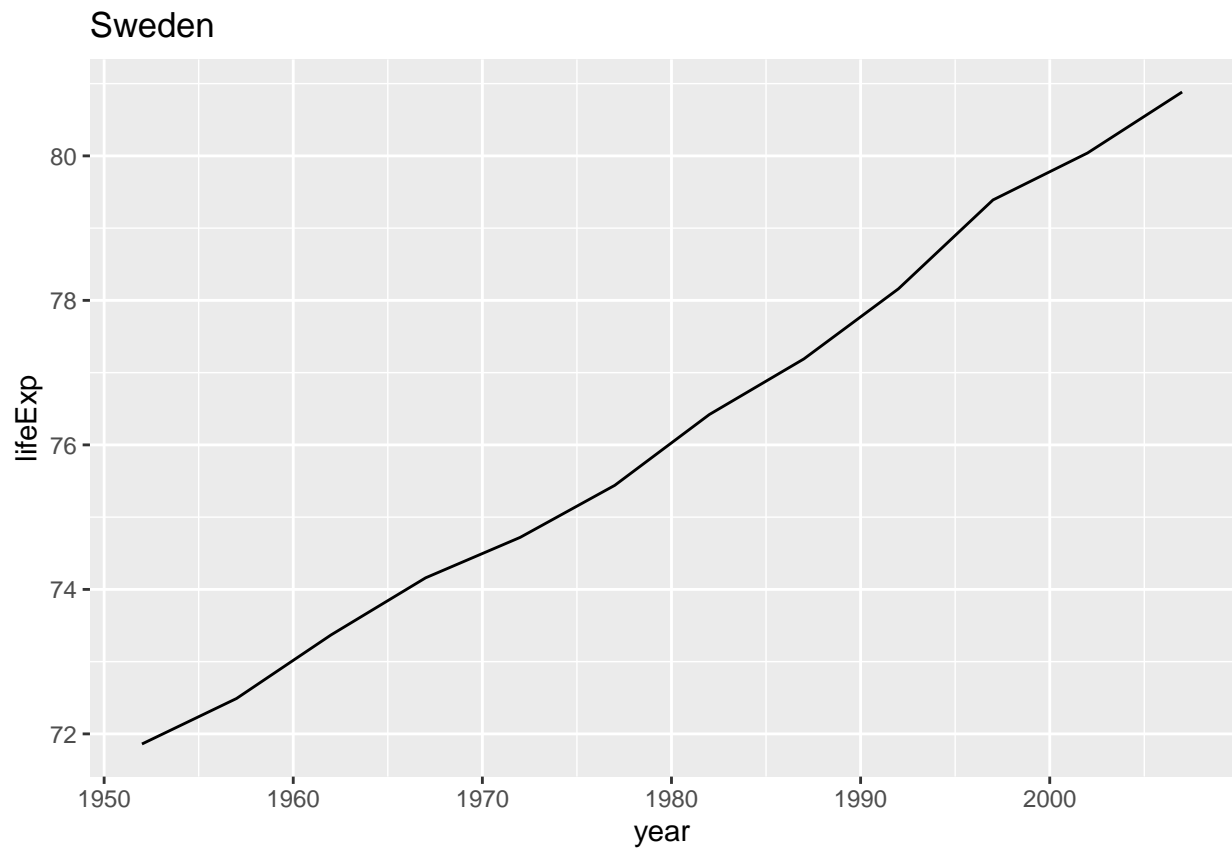


\$Swaziland

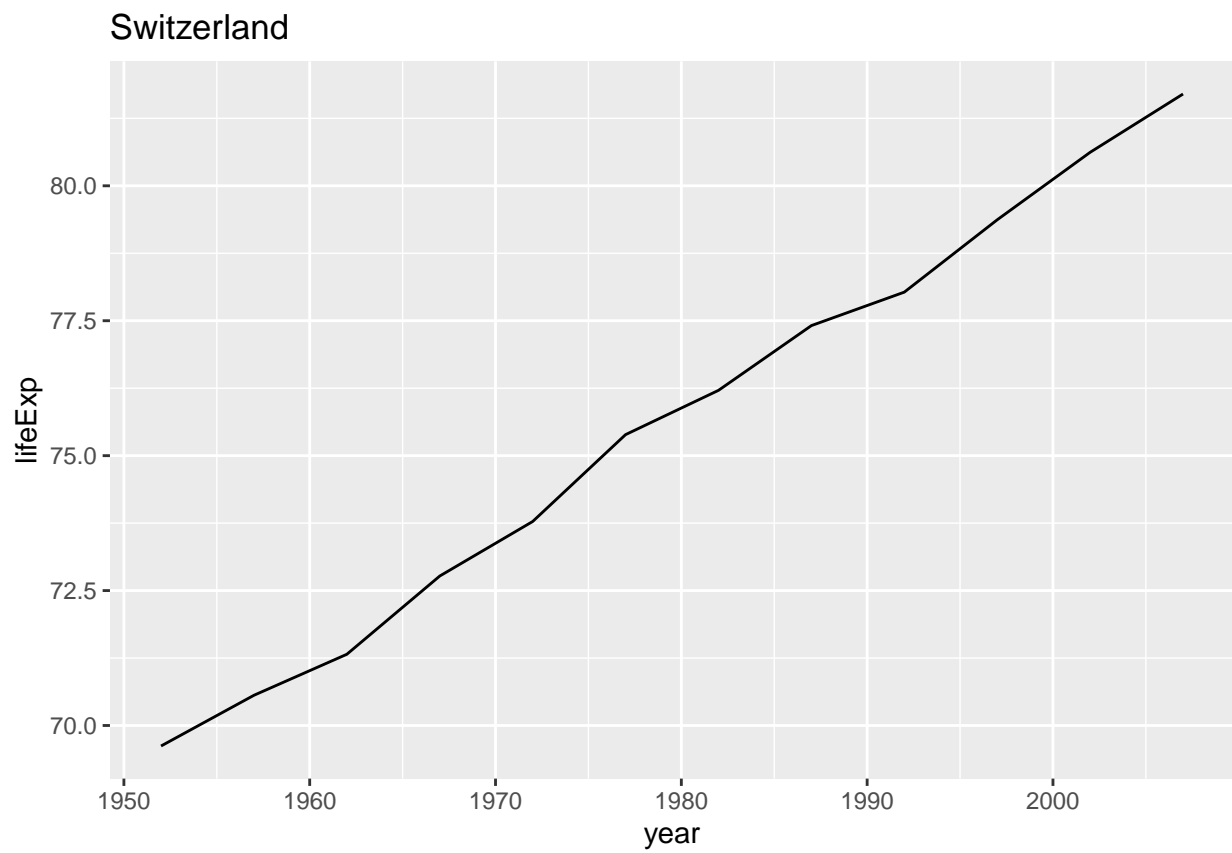


##

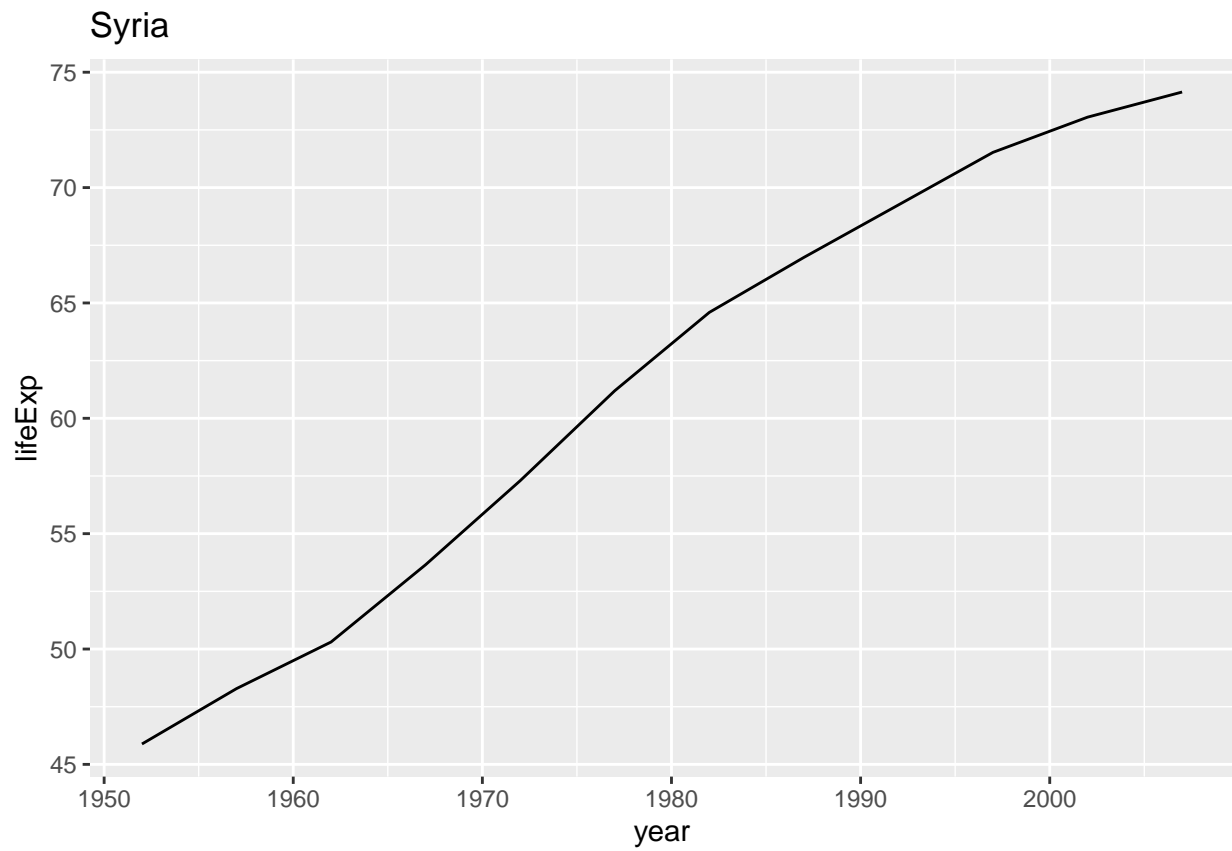
\$Sweden



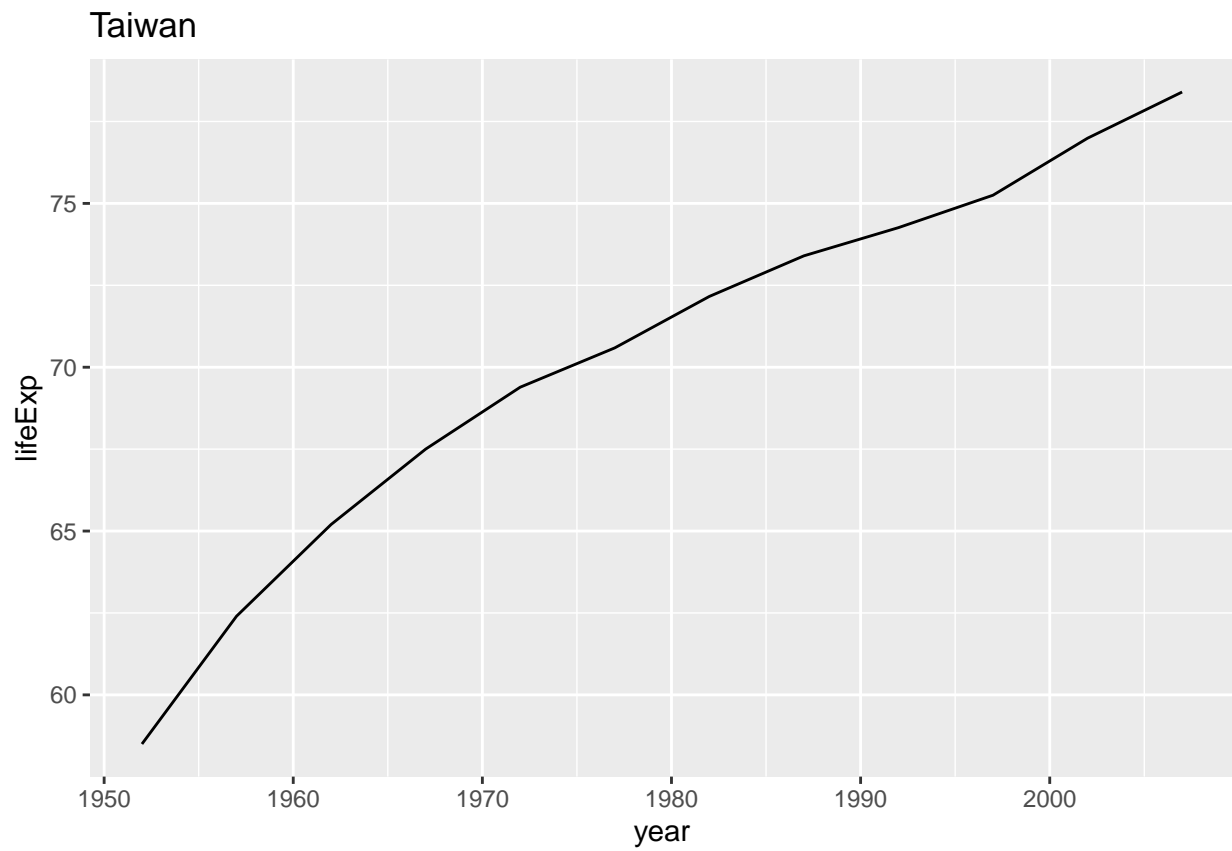
\$Switzerland



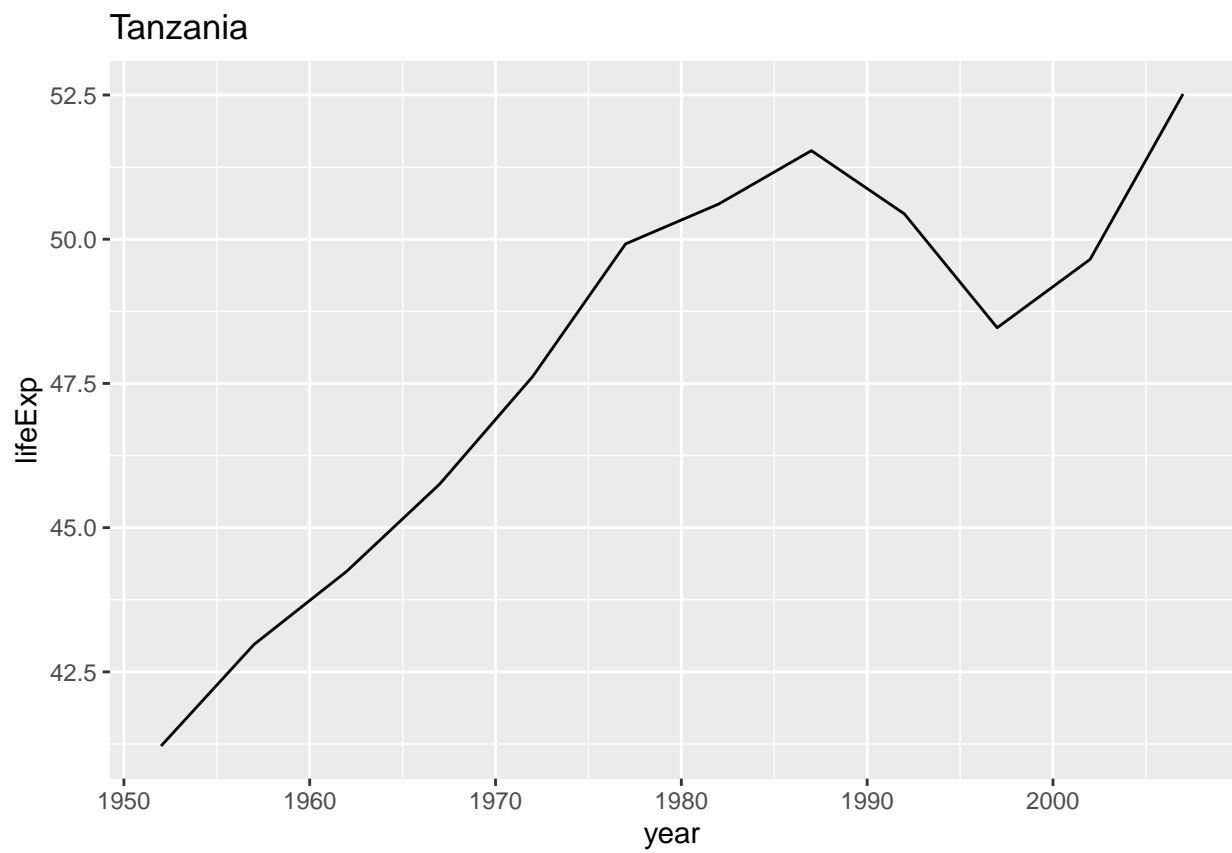
\$Syria



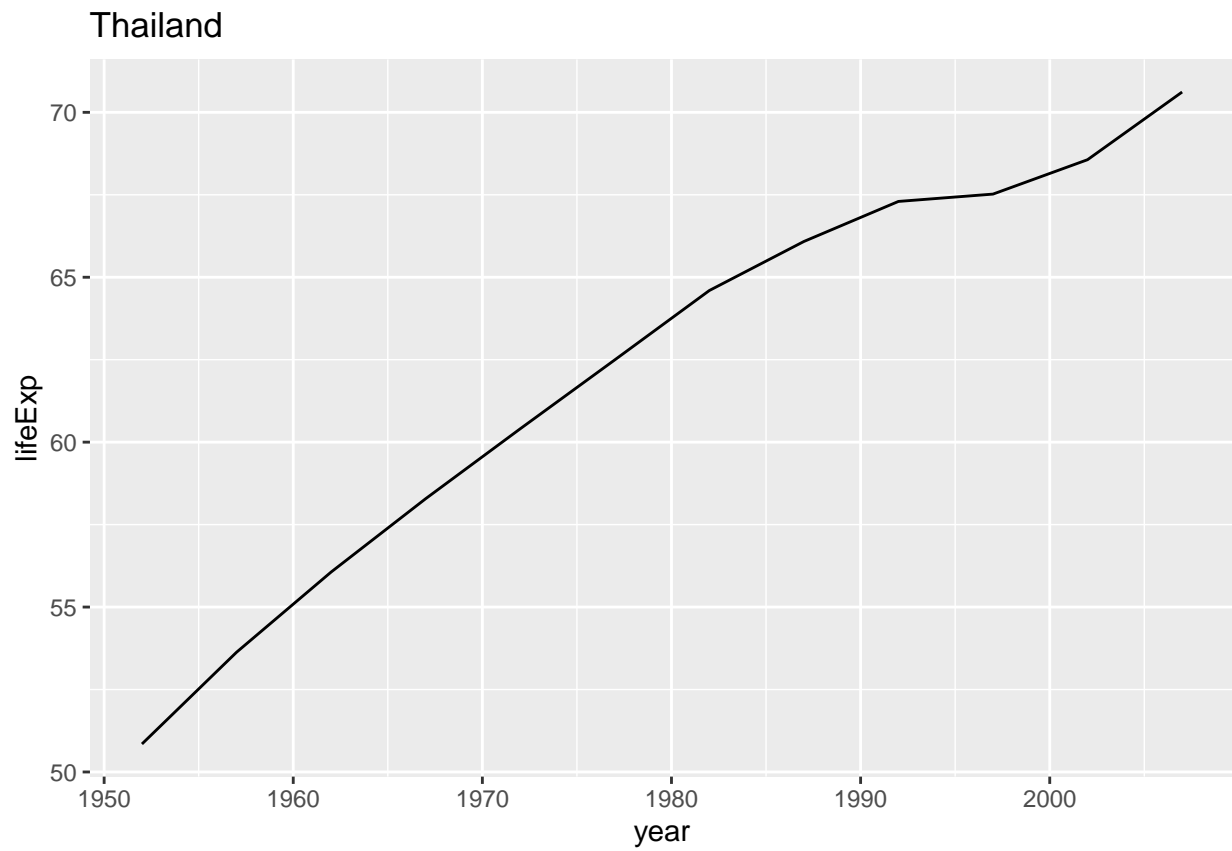
\$Taiwan



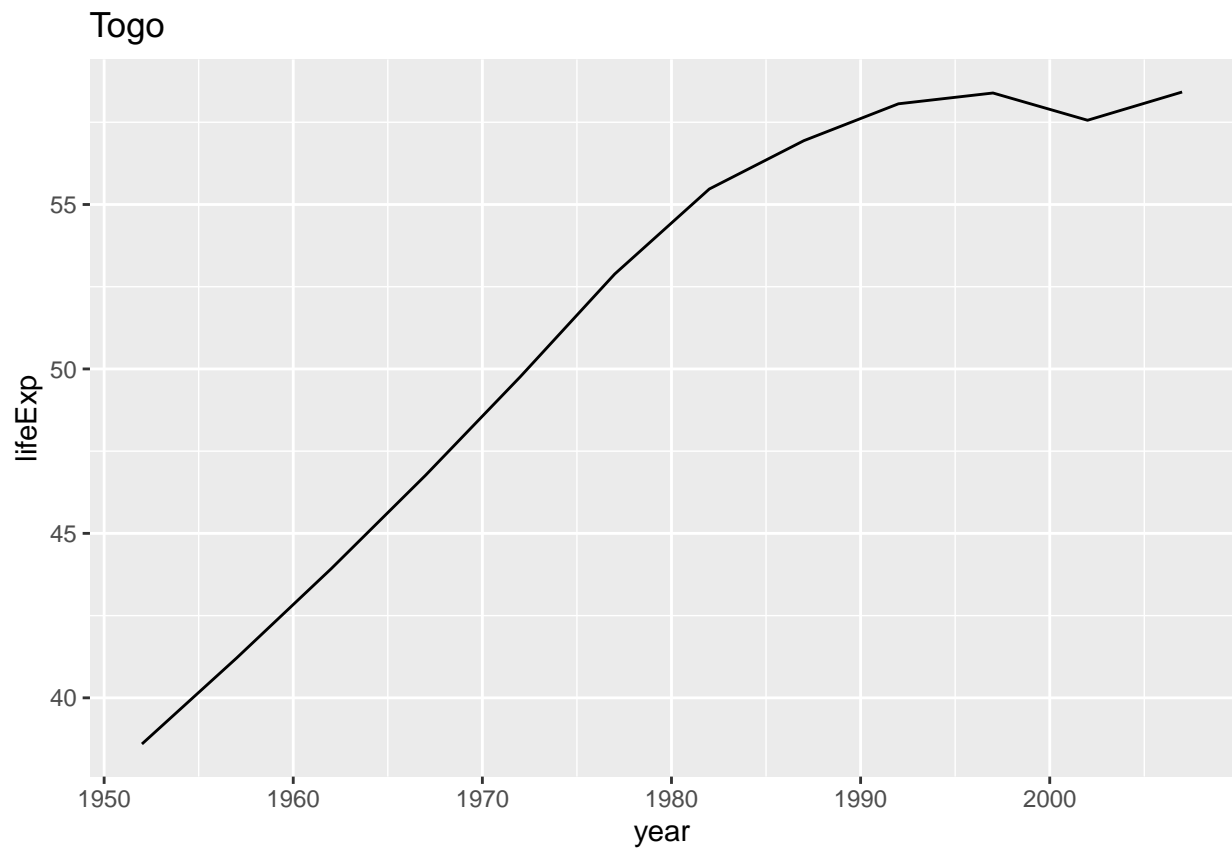
\$Tanzania



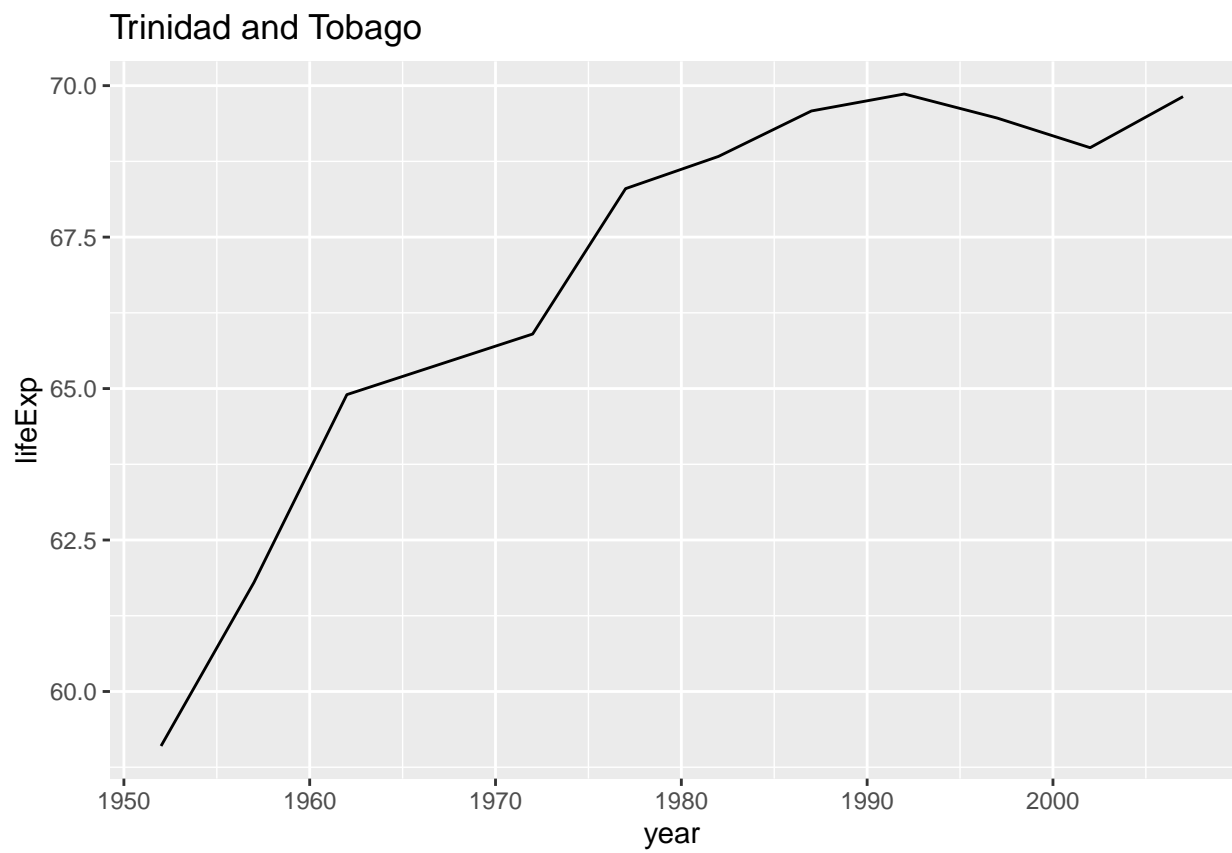
\$Thailand



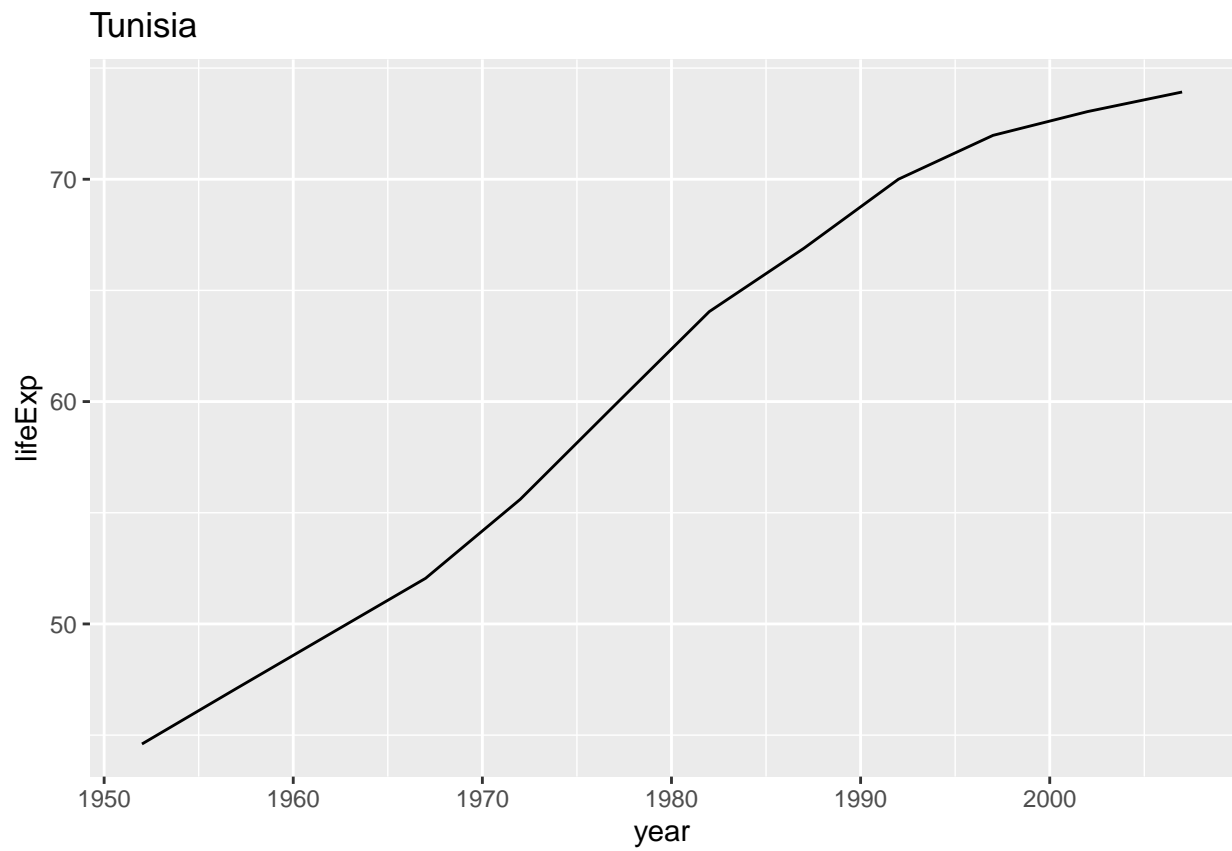
\$Togo



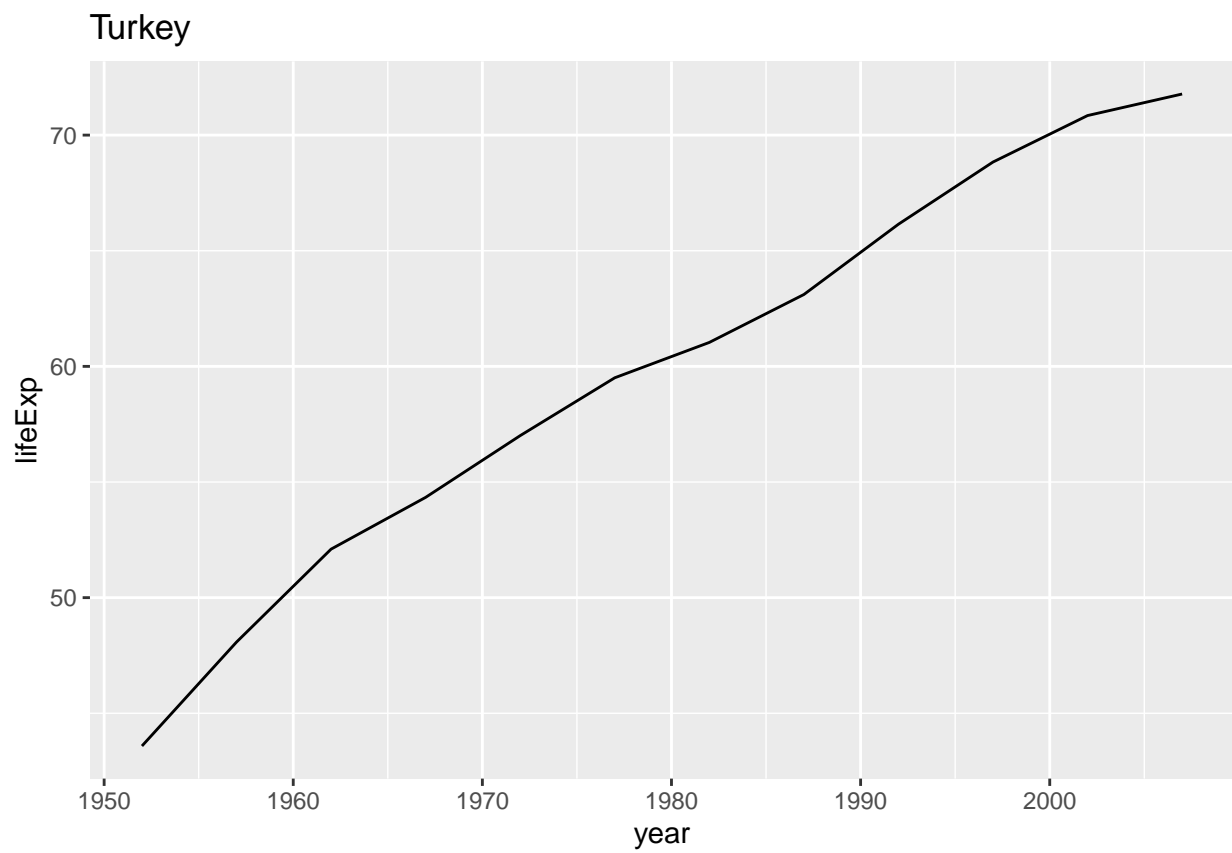
```
##  
## $`Trinidad and Tobago`
```



\$Tunisia

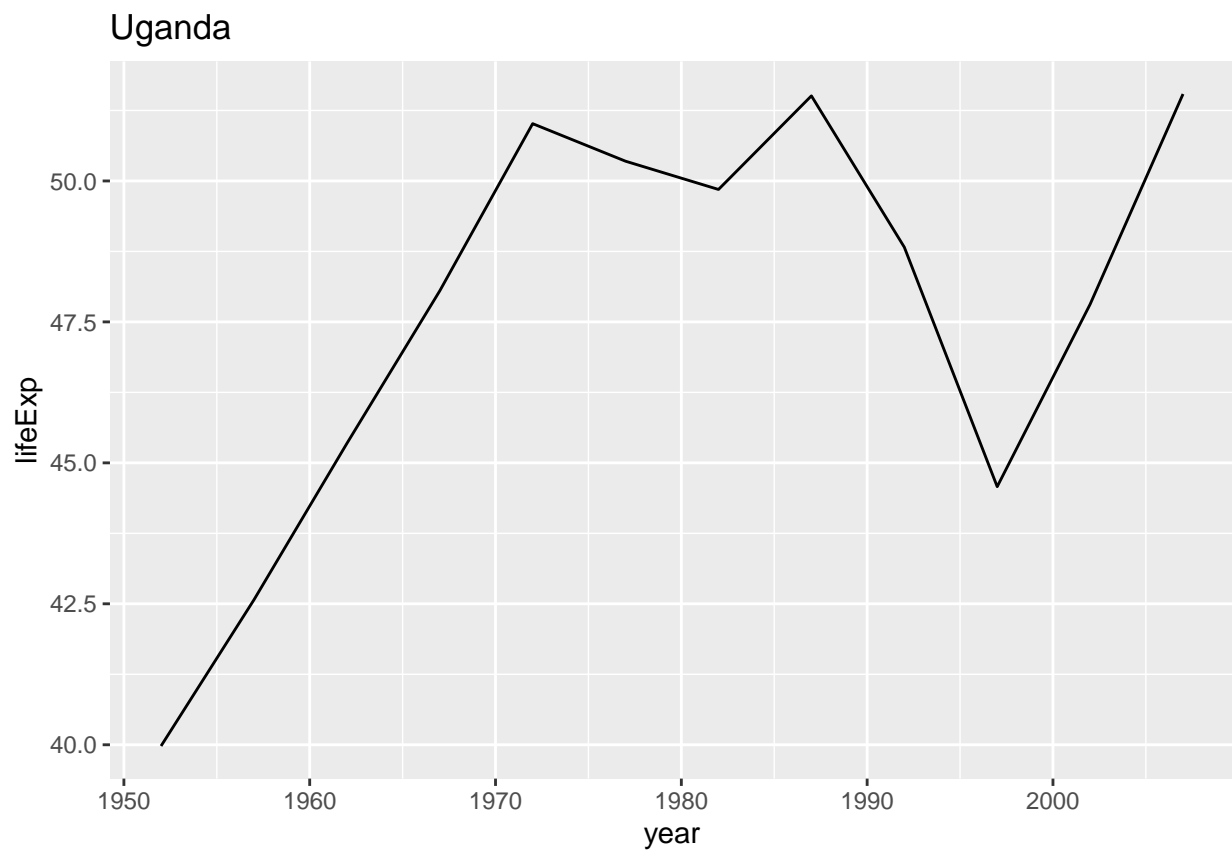


\$Turkey

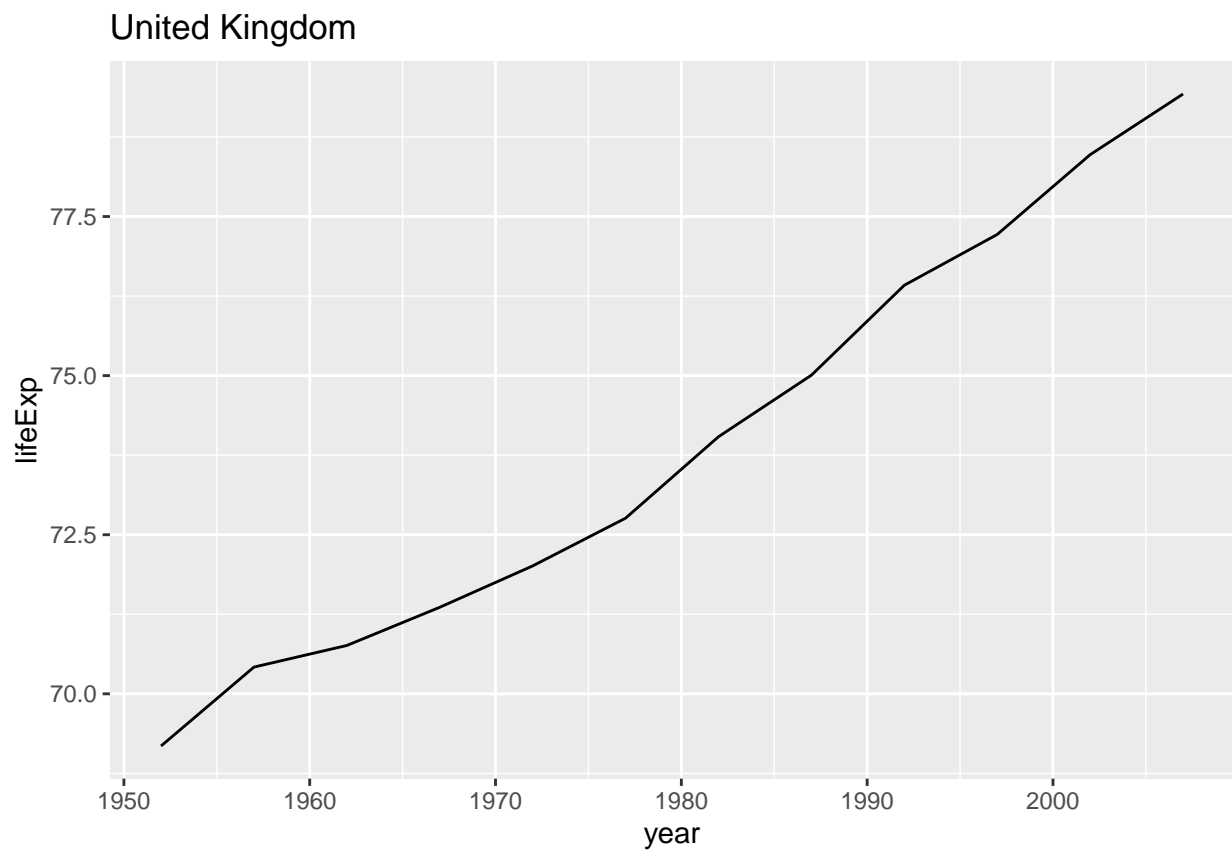


##

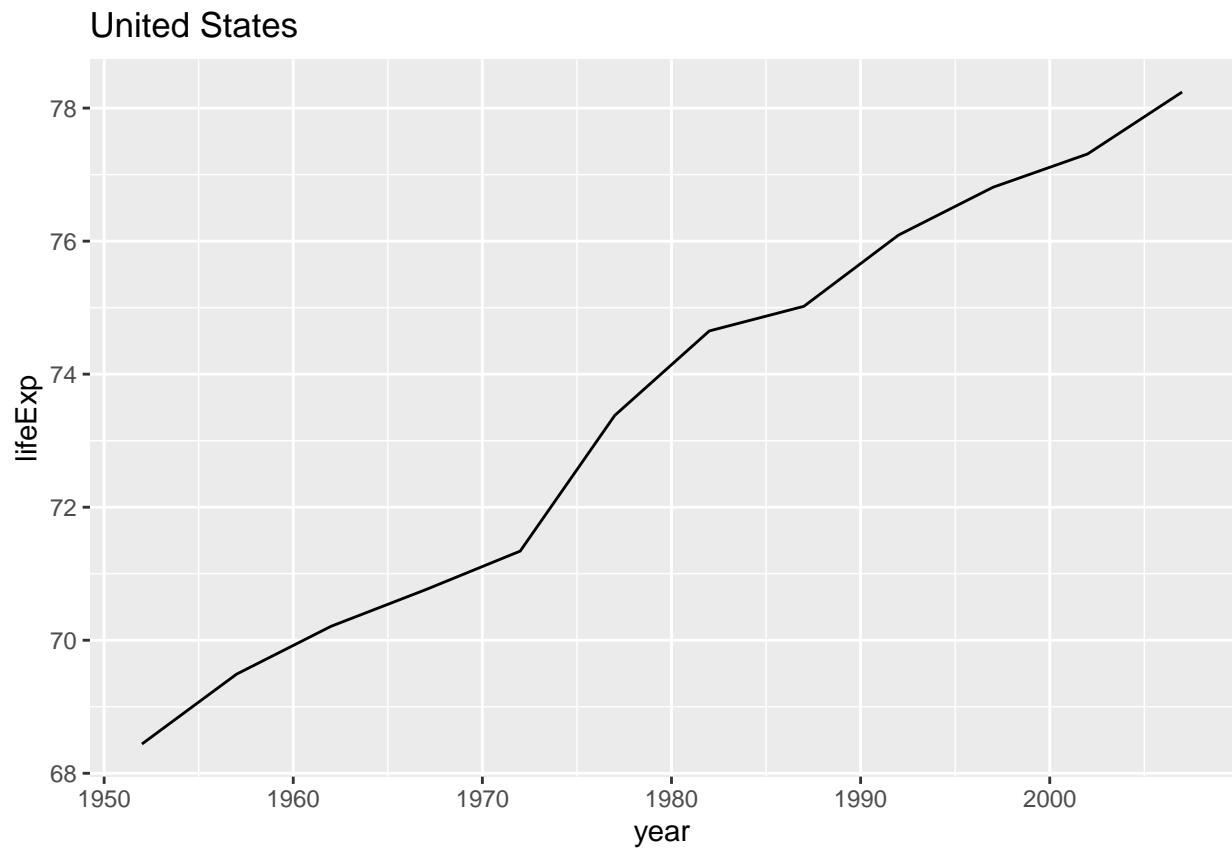
\$Uganda



```
##  
## $`United Kingdom`
```

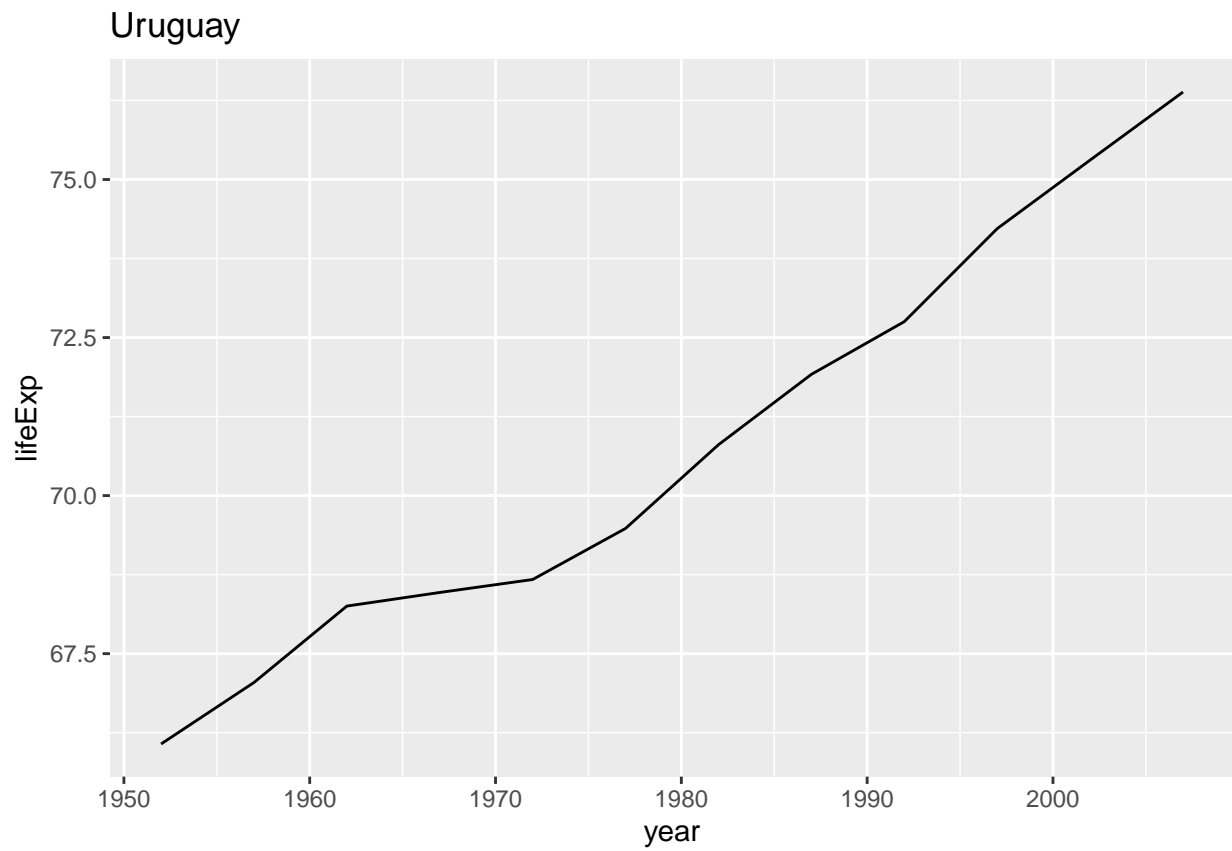


```
##  
## $`United States`
```

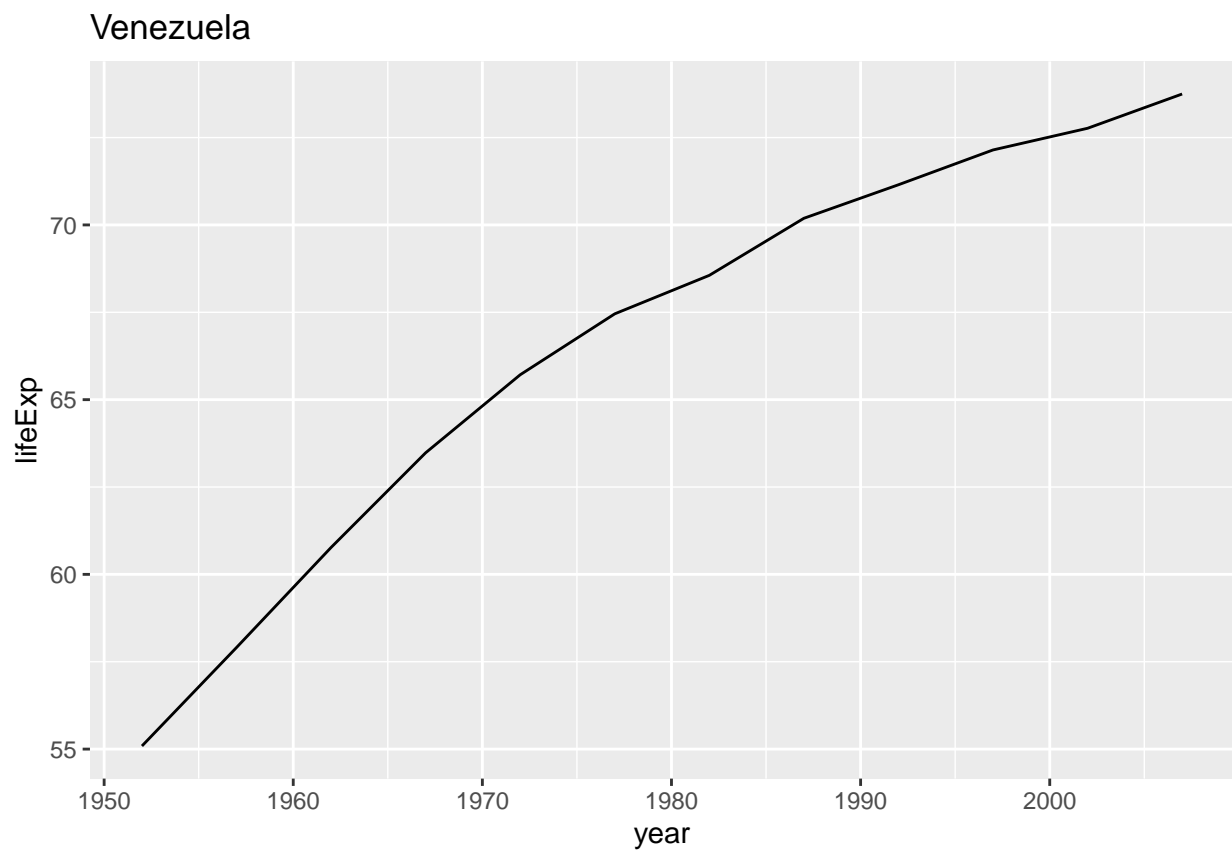



##

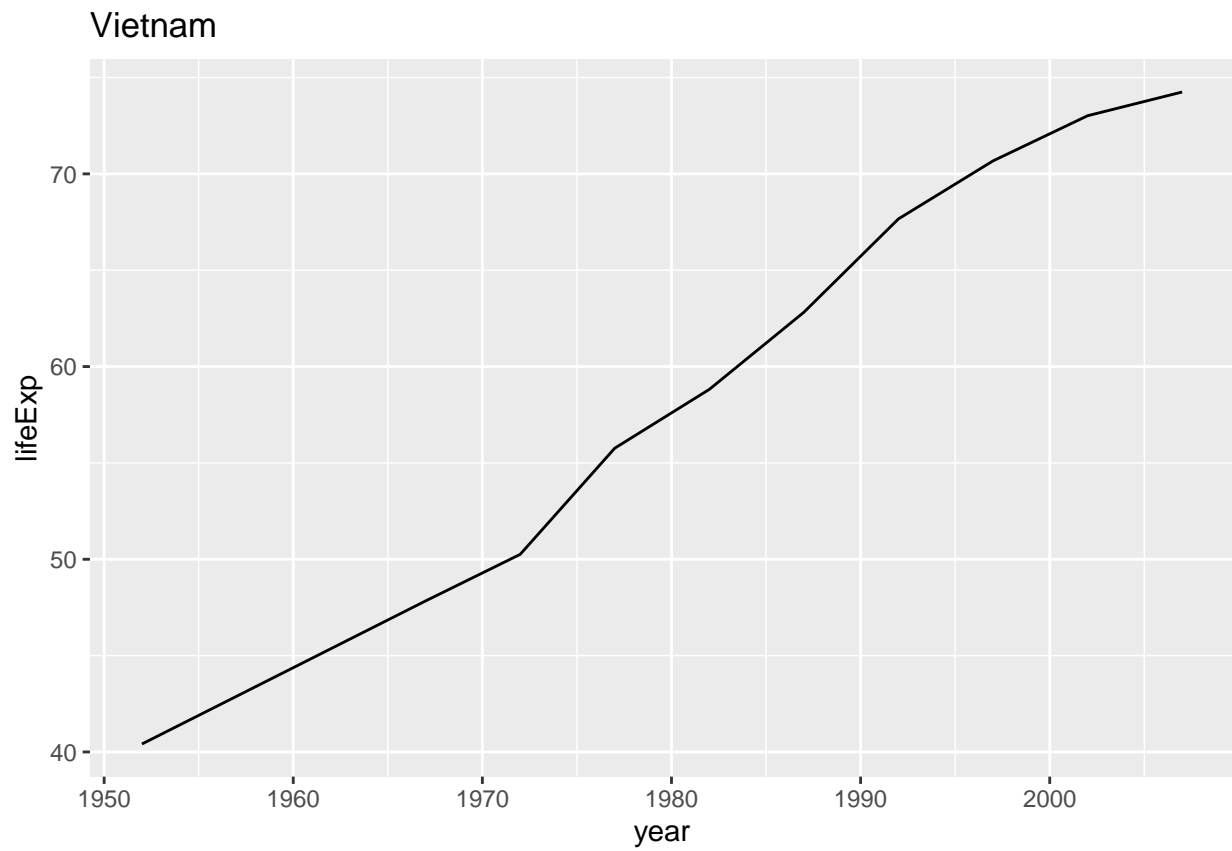
\$Uruguay



\$Venezuela

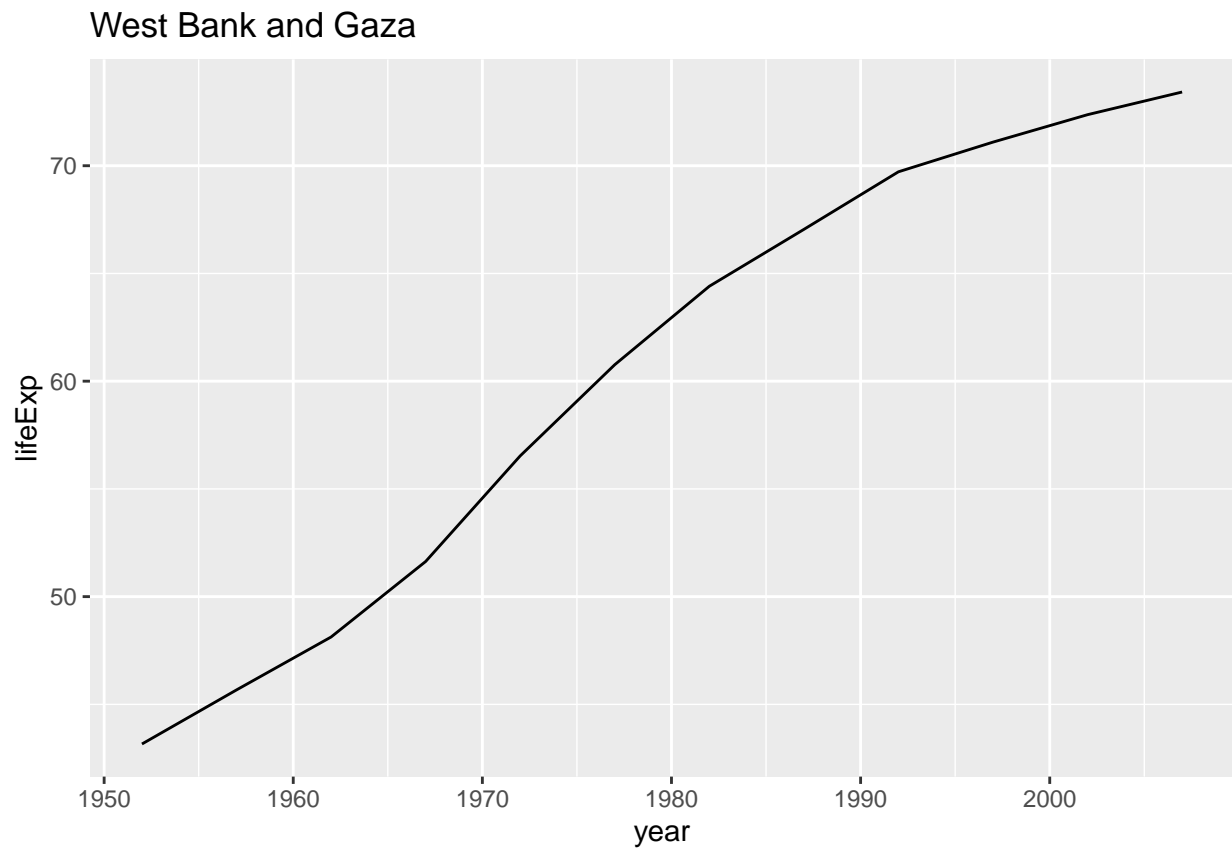


\$Vietnam



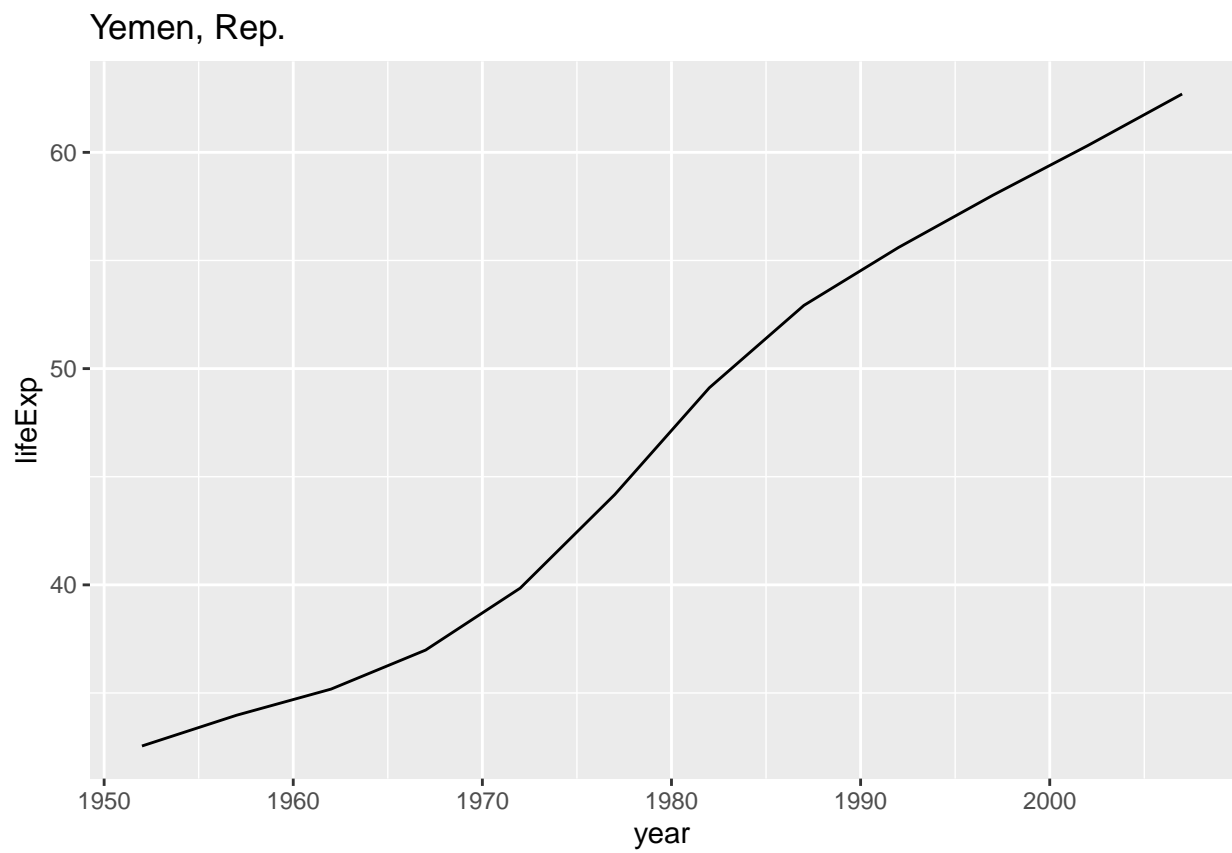
##

\$`West Bank and Gaza`

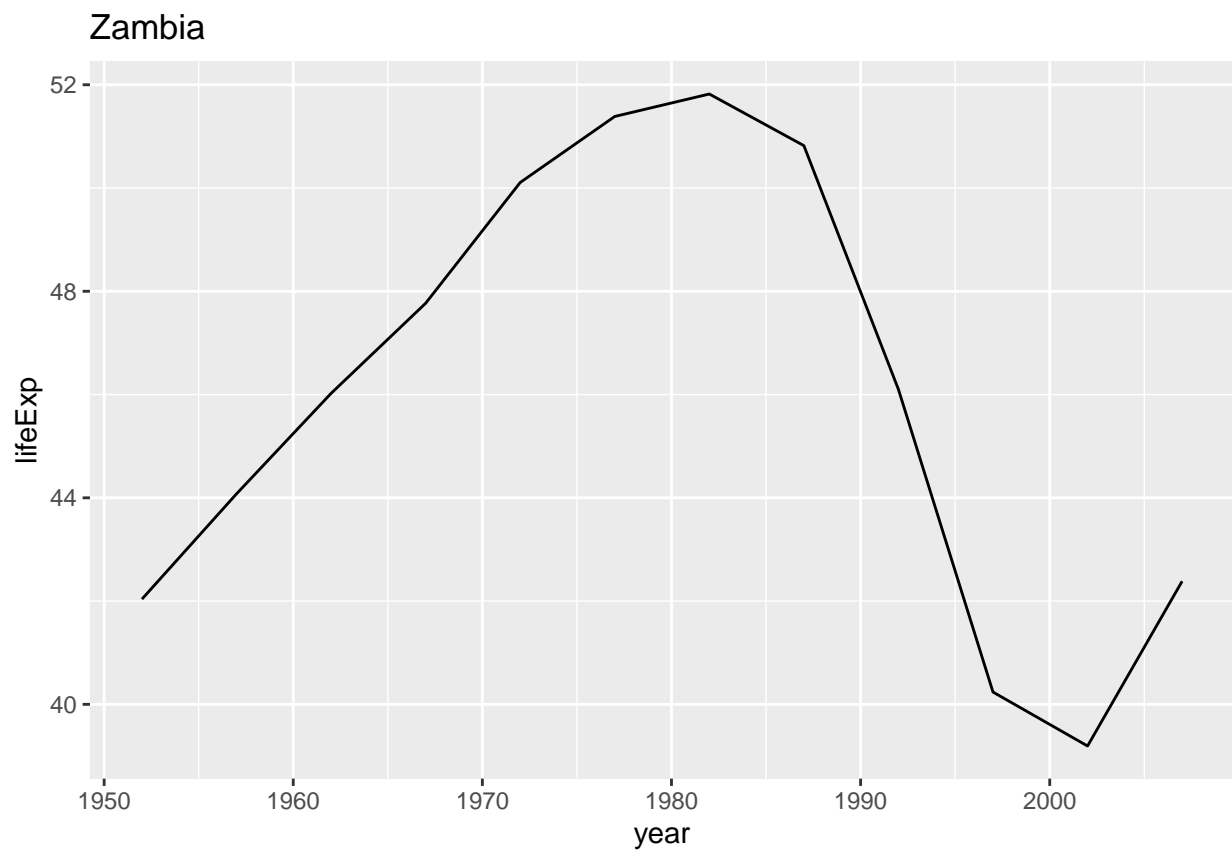


##

\$`Yemen, Rep.`

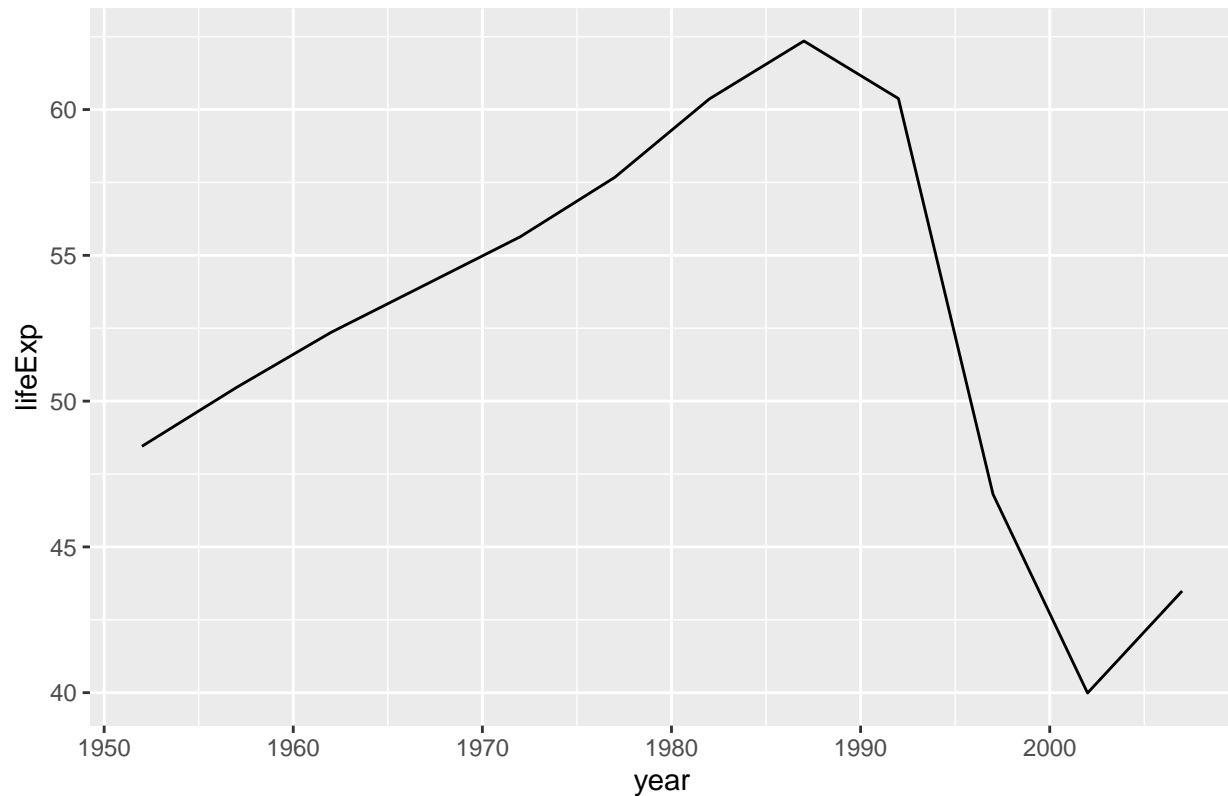


\$Zambia



\$Zimbabwe

Zimbabwe



```
dir_create("plots")

walk2(.x = plots, .y = countries,
      ~ ggsave(filename = glue("plots/{.y}.pdf"), plot = .x))
```

[illegible]

[illegible]

[illegible]

```
file_delete(glue("plots/{countries}.pdf"))

walk2(.x = plots, .y = countries,
  ~ ggsave(filename = paste0("plots/", .y, ".pdf"), plot = .x))
```

[illegible]

[illegible]

```
file.remove(paste0("plots/",countries, ".pdf"))
```

```
##      [1] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
```

```
## [16] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [31] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [46] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [61] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [76] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [91] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [106] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [121] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [136] TRUE TRUE TRUE TRUE TRUE TRUE TRUE
```

Chapter 5 from mdsr

What is tidy data?

The babynames data has been updated.

```
babynames %>% group_by(sex, name) %>%
  summarise( total_births = sum(n)) %>%
  arrange(desc(total_births))
```

`summarise()` regrouping output by 'sex' (override with `.groups` argument)

```
## # A tibble: 107,973 x 3
## # Groups:   sex [2]
##   sex  name    total_births
##   <chr> <chr>         <int>
## 1 M    James     5150472
## 2 M    John       5115466
## 3 M    Robert     4814815
## 4 M    Michael    4350824
## 5 F    Mary       4123200
## 6 M    William    4102604
## 7 M    David      3611329
## 8 M    Joseph     2603445
## 9 M    Richard    2563082
## 10 M   Charles    2386048
## # ... with 107,963 more rows
```

```
babynames %>% filter(name == "Sue") %>%
  group_by(sex, name) %>%
  summarise( total = sum(n))
```

`summarise()` regrouping output by 'sex' (override with `.groups` argument)

```
## # A tibble: 2 x 3
## # Groups:   sex [2]
##   sex  name    total
##   <chr> <chr>         <int>
## 1 F    Sue     144465
## 2 M    Sue        519
```

```
babynames %>% filter(name == "Robin") %>%
  group_by(sex, name) %>%
  summarise( total = sum(n))
```

`summarise()` regrouping output by 'sex' (override with `.groups` argument)

```
## # A tibble: 2 x 3
## # Groups:   sex [2]
##   sex  name  total
##   <chr> <chr> <int>
## 1 F    Robin 289395
## 2 M    Robin 44616

babynames %>% filter(name %in% c("Sue", "Robin", "Leslie")) %>%
  group_by(sex, name) %>%
  summarise( total = sum(n)) %>%
  pivot_wider(names_from = "sex", values_from = "total")

## `summarise()` regrouping output by 'sex' (override with `.groups` argument)

## # A tibble: 3 x 3
##   name      F      M
##   <chr>   <int> <int>
## 1 Leslie 266474 112689
## 2 Robin  289395 44616
## 3 Sue    144465   519

BabyWide <- babynames %>%
  group_by(sex, name) %>%
  summarise( total = sum(n)) %>%
  pivot_wider(names_from = sex, values_from = total)

## `summarise()` regrouping output by 'sex' (override with `.groups` argument)

head(BabyWide, 10)

## # A tibble: 10 x 3
##   name      F      M
##   <chr>   <int> <int>
## 1 Aabha      35    NA
## 2 Aabriella  32    NA
## 3 Aada        5    NA
## 4 Aaden       5  4653
## 5 Aadhira    77    NA
## 6 Aadhvika    9    NA
## 7 Aadhya   1478    NA
## 8 Aadi       16   811
## 9 Aadilynn    5    NA
## 10 Aadison   11    NA

BabyWide %>% filter( M > 50000, F > 50000) %>%
  mutate( ratio = pmin(M/F, F/M) ) %>%
  arrange(desc(ratio))

## # A tibble: 20 x 4
##   name      F      M ratio
##   <chr>   <int> <int> <dbl>
## 1 Riley  100881  92789 0.920
## 2 Jackie  90604  78405 0.865
## 3 Casey   76020 110165 0.690
## 4 Jessie 167010 110027 0.659
## 5 Avery  117789  53519 0.454
## 6 Leslie 266474 112689 0.423
```

```
## 7 Angel 94837 226719 0.418
## 8 Marion 188255 71994 0.382
## 9 Jordan 130158 369745 0.352
## 10 Taylor 317936 109852 0.346
## 11 Willie 146148 448702 0.326
## 12 Jamie 267599 85299 0.319
## 13 Lynn 181834 52250 0.287
## 14 Dana 191498 53064 0.277
## 15 Lee 62115 230776 0.269
## 16 Tracy 250772 61164 0.244
## 17 Terry 96883 422580 0.229
## 18 Alexis 336623 62928 0.187
## 19 Shannon 294878 51926 0.176
## 20 Kelly 471024 81550 0.173
```

Automation and iteration

The Lahman data has been updated.

```
names(Teams)
```

```
## [1] "yearID"      "lgID"         "teamID"       "franchID"
## [5] "divID"       "Rank"         "G"            "Ghome"
## [9] "W"           "L"            "DivWin"       "WCWin"
## [13] "LgWin"       "WSWin"        "R"            "AB"
## [17] "H"           "X2B"          "X3B"          "HR"
## [21] "BB"          "SO"           "SB"           "CS"
## [25] "HBP"         "SF"           "RA"           "ER"
## [29] "ERA"         "CG"           "SHO"          "SV"
## [33] "IPouts"      "HA"           "HRA"          "BBA"
## [37] "SOA"         "E"            "DP"           "FP"
## [41] "name"        "park"         "attendance"   "BPF"
## [45] "PPF"         "teamIDBR"     "teamIDlahman45" "teamIDretro"
```

Replace the apply() function with map()

```
Teams %>% select(15:40) %>%
  map_df(mean, na.rm = TRUE)
```

```
## # A tibble: 1 x 26
##       R      AB      H      X2B      X3B      HR      BB      SO      SB      CS      HBP      SF      RA
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1  685.  5159. 1348.  230.  46.3  105.  476.  758.  111.  47.4  45.7  44.9  685.
## # ... with 13 more variables: ER <dbl>, ERA <dbl>, CG <dbl>, SHO <dbl>,
## #   SV <dbl>, IPouts <dbl>, HA <dbl>, HRA <dbl>, BBA <dbl>, SOA <dbl>, E <dbl>,
## #   DP <dbl>, FP <dbl>
```

```
angles <- Teams %>% filter(franchID == "ANA") %>%
  group_by(teamID, name) %>%
  summarize( began = first(yearID), end = last(yearID) ) %>%
  arrange(began)
```

```
## `summarise()` regrouping output by 'teamID' (override with `.groups` argument)
```



```

angles

## # A tibble: 4 x 4
## # Groups:   teamID [3]
##   teamID name          began   end
##   <fct> <chr>          <int> <int>
## 1 LAA    Los Angeles Angels    1961  1964
## 2 CAL    California Angels     1965  1996
## 3 ANA    Anaheim Angels        1997  2004
## 4 LAA    Los Angeles Angels of Anaheim 2005  2019

angles_names <- angles$name

angles_names

## [1] "Los Angeles Angels"          "California Angels"
## [3] "Anaheim Angels"             "Los Angeles Angels of Anaheim"

nchar(angles_names[1])

## [1] 18

nchar(angles_names[2])

## [1] 17

nchar(angles_names[3])

## [1] 14

nchar(angles_names[4])

## [1] 29

angles_names %>% map(nchar)

## [[1]]
## [1] 18
##
## [[2]]
## [1] 17
##
## [[3]]
## [1] 14
##
## [[4]]
## [1] 29

top5 <- function(x, teamname){
  x %>%
    filter(name == teamname) %>%
    select(teamID, yearID, W, L, name) %>%
    arrange(desc(W)) %>%
    head(5)
}

top5(Teams, angles_names[1])

##   teamID yearID W  L      name

```

```
## 1    LAA    1962 86 76 Los Angeles Angels
## 2    LAA    1964 82 80 Los Angeles Angels
## 3    LAA    1961 70 91 Los Angeles Angels
## 4    LAA    1963 70 91 Los Angeles Angels
```

```
top5(Teams, angles_names[2])
```

```
##   teamID yearID  W  L           name
## 1    CAL   1982 93 69 California Angels
## 2    CAL   1986 92 70 California Angels
## 3    CAL   1989 91 71 California Angels
## 4    CAL   1985 90 72 California Angels
## 5    CAL   1979 88 74 California Angels
```

```
top5(Teams, angles_names[3])
```

```
##   teamID yearID  W  L           name
## 1    ANA   2002 99 63 Anaheim Angels
## 2    ANA   2004 92 70 Anaheim Angels
## 3    ANA   1998 85 77 Anaheim Angels
## 4    ANA   1997 84 78 Anaheim Angels
## 5    ANA   2000 82 80 Anaheim Angels
```

```
top5(Teams, angles_names[4])
```

```
##   teamID yearID  W  L           name
## 1    LAA   2008 100 62 Los Angeles Angels of Anaheim
## 2    LAA   2014  98 64 Los Angeles Angels of Anaheim
## 3    LAA   2009  97 65 Los Angeles Angels of Anaheim
## 4    LAA   2005  95 67 Los Angeles Angels of Anaheim
## 5    LAA   2007  94 68 Los Angeles Angels of Anaheim
```

Compare lapply and map

```
angles_list <- lapply(angles_names, FUN = top5, x = Teams)
angles_list
```

```
## [[1]]
##   teamID yearID  W  L           name
## 1    LAA   1962 86 76 Los Angeles Angels
## 2    LAA   1964 82 80 Los Angeles Angels
## 3    LAA   1961 70 91 Los Angeles Angels
## 4    LAA   1963 70 91 Los Angeles Angels
##
## [[2]]
##   teamID yearID  W  L           name
## 1    CAL   1982 93 69 California Angels
## 2    CAL   1986 92 70 California Angels
## 3    CAL   1989 91 71 California Angels
## 4    CAL   1985 90 72 California Angels
## 5    CAL   1979 88 74 California Angels
##
## [[3]]
##   teamID yearID  W  L           name
## 1    ANA   2002 99 63 Anaheim Angels
## 2    ANA   2004 92 70 Anaheim Angels
## 3    ANA   1998 85 77 Anaheim Angels
```

```
## 4    ANA    1997 84 78 Anaheim Angels
## 5    ANA    2000 82 80 Anaheim Angels
##
## [[4]]
##   teamID yearID   W   L                      name
## 1    LAA    2008 100 62 Los Angeles Angels of Anaheim
## 2    LAA    2014  98 64 Los Angeles Angels of Anaheim
## 3    LAA    2009  97 65 Los Angeles Angels of Anaheim
## 4    LAA    2005  95 67 Los Angeles Angels of Anaheim
## 5    LAA    2007  94 68 Los Angeles Angels of Anaheim
```

```
angles_list2 <- angles_names %>% map(~ top5(Teams, .x))
angles_list2
```

```
## [[1]]
##   teamID yearID   W   L                      name
## 1    LAA    1962 86 76 Los Angeles Angels
## 2    LAA    1964 82 80 Los Angeles Angels
## 3    LAA    1961 70 91 Los Angeles Angels
## 4    LAA    1963 70 91 Los Angeles Angels
##
```

```
## [[2]]
##   teamID yearID   W   L                      name
## 1    CAL    1982 93 69 California Angels
## 2    CAL    1986 92 70 California Angels
## 3    CAL    1989 91 71 California Angels
## 4    CAL    1985 90 72 California Angels
## 5    CAL    1979 88 74 California Angels
##
```

```
## [[3]]
##   teamID yearID   W   L                      name
## 1    ANA    2002 99 63 Anaheim Angels
## 2    ANA    2004 92 70 Anaheim Angels
## 3    ANA    1998 85 77 Anaheim Angels
## 4    ANA    1997 84 78 Anaheim Angels
## 5    ANA    2000 82 80 Anaheim Angels
##
```

```
## [[4]]
##   teamID yearID   W   L                      name
## 1    LAA    2008 100 62 Los Angeles Angels of Anaheim
## 2    LAA    2014  98 64 Los Angeles Angels of Anaheim
## 3    LAA    2009  97 65 Los Angeles Angels of Anaheim
## 4    LAA    2005  95 67 Los Angeles Angels of Anaheim
## 5    LAA    2007  94 68 Los Angeles Angels of Anaheim
```

```
angles_df2 <- angles_names %>% map_df(~ top5(Teams, .x))
angles_df2
```

```
##   teamID yearID   W   L                      name
## 1    LAA    1962 86 76                      Los Angeles Angels
## 2    LAA    1964 82 80                      Los Angeles Angels
## 3    LAA    1961 70 91                      Los Angeles Angels
## 4    LAA    1963 70 91                      Los Angeles Angels
## 5    CAL    1982 93 69                      California Angels
## 6    CAL    1986 92 70                      California Angels
```

```
## 7    CAL    1989  91 71           California Angels
## 8    CAL    1985  90 72           California Angels
## 9    CAL    1979  88 74           California Angels
## 10   ANA    2002  99 63           Anaheim Angels
## 11   ANA    2004  92 70           Anaheim Angels
## 12   ANA    1998  85 77           Anaheim Angels
## 13   ANA    1997  84 78           Anaheim Angels
## 14   ANA    2000  82 80           Anaheim Angels
## 15   LAA    2008 100 62 Los Angeles Angels of Anaheim
## 16   LAA    2014  98 64 Los Angeles Angels of Anaheim
## 17   LAA    2009  97 65 Los Angeles Angels of Anaheim
## 18   LAA    2005  95 67 Los Angeles Angels of Anaheim
## 19   LAA    2007  94 68 Los Angeles Angels of Anaheim
```

```
angles_df2 %>% group_by(teamID, name) %>%
  summarise(N = n(), mean_wins = mean(W)) %>%
  arrange(desc(mean_wins))
```

```
## `summarise()` regrouping output by 'teamID' (override with ` .groups ` argument)
```

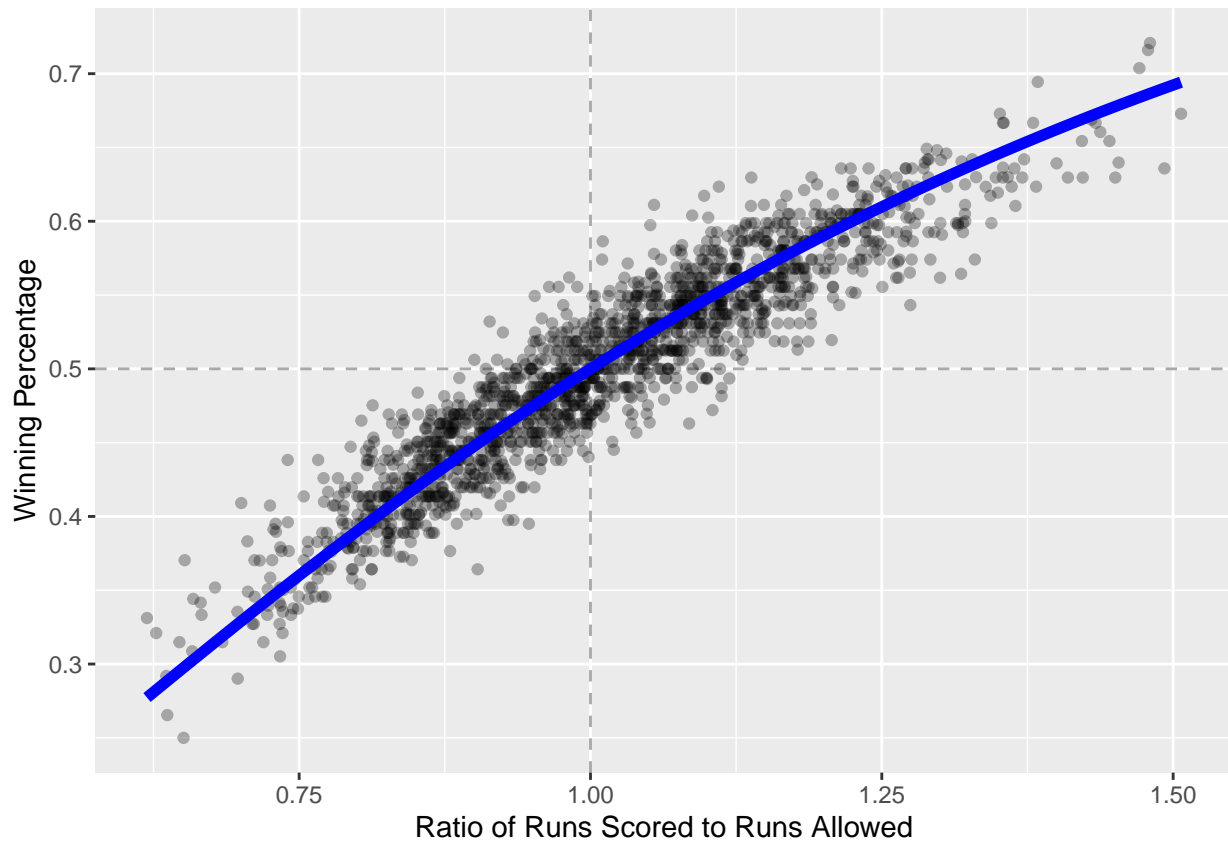
```
## # A tibble: 4 x 4
## # Groups:   teamID [3]
##   teamID name                N mean_wins
##   <fct> <chr>                <int>     <dbl>
## 1 LAA    Los Angeles Angels of Anaheim    5      96.8
## 2 CAL    California Angels                5      90.8
## 3 ANA    Anaheim Angels                    5      88.4
## 4 LAA    Los Angeles Angels                4       77
```

Iteration over subgroups, update with map

```
exp_wpct <- function(x){
  return( 1 / (1 + (1/x)^2))
}
```

```
TeamRuns <- Teams %>%
  filter(yearID >= 1954) %>%
  rename(RS = R) %>%
  mutate(WPct = W / (W+L), run_ratio = RS/RA) %>%
  select(yearID, teamID, lgID, WPct, run_ratio)
```

```
TeamRuns %>% ggplot(aes(x = run_ratio, y = WPct)) +
  geom_vline(xintercept = 1, color = "darkgrey", linetype = 2) +
  geom_hline(yintercept = 0.5, color = "darkgrey", linetype = 2) +
  geom_point(alpha = 0.3) +
  stat_function(fun = exp_wpct, size = 2, color = "blue") +
  xlab("Ratio of Runs Scored to Runs Allowed") +
  ylab("Winning Percentage")
```



```
library(mosaic)

## Loading required package: lattice
## Loading required package: ggformula
## Loading required package: ggstance
##
## Attaching package: 'ggstance'
##
## The following objects are masked from 'package:ggplot2':
##
##   geom_errorbarh, GeomErrorbarh
##
## New to ggformula? Try the tutorials:
##   learnr::run_tutorial("introduction", package = "ggformula")
##   learnr::run_tutorial("refining", package = "ggformula")
## Loading required package: mosaicData
## Loading required package: Matrix
##
## Attaching package: 'Matrix'
##
## The following objects are masked from 'package:tidyr':
##
##   expand, pack, unpack
## Registered S3 method overwritten by 'mosaic':
```

```

##      method                                from
##      fortify.SpatialPolygonsDataFrame ggplot2

##
## The 'mosaic' package masks several functions from core packages in order to add
## additional features. The original behavior of these functions should not be affected by this.
##
## Note: If you use the Matrix package, be sure to load it BEFORE loading mosaic.
##
## Have you tried the ggformula package for your plots?
##
## Attaching package: 'mosaic'

## The following object is masked from 'package:Matrix':
##
##      mean

## The following objects are masked from 'package:infer':
##
##      prop_test, t_test

## The following object is masked from 'package:scales':
##
##      rescale

## The following objects are masked from 'package:dplyr':
##
##      count, do, tally

## The following object is masked from 'package:purrr':
##
##      cross

## The following object is masked from 'package:ggplot2':
##
##      stat

## The following objects are masked from 'package:stats':
##
##      binom.test, cor, cor.test, cov, fivenum, IQR, median, prop.test,
##      quantile, sd, t.test, var

## The following objects are masked from 'package:base':
##
##      max, mean, min, prod, range, sample, sum
exWpct <- fitModel( WPct ~ 1/(1 + (1/run_ratio)^k), data = TeamRuns)
coef(exWpct)

##      k
## 1.836508

exWpct <- nls( WPct ~ 1/(1 + (1/run_ratio)^k), data = TeamRuns)

## Warning in nls(WPct ~ 1/(1 + (1/run_ratio)^k), data = TeamRuns): No starting values specified for some
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model
coef(exWpct)

```

```
##          k
## 1.836508
```

```
fit_k <- function(x){
  mod <- nls( formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x )
  return(data.frame(k = coef(mod)))
}
```

```
fit_k(TeamRuns)
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model
```

```
##          k
## k 1.836508
```

```
TeamRuns2 <- TeamRuns %>%
  mutate(decade = yearID %/% 10 * 10)
TeamRuns2
```

	yearID	teamID	lgID	WPct	run_ratio	decade
## 1	1954	BAL	AL	0.3506494	0.7230539	1950
## 2	1954	BOS	AL	0.4480519	0.9615385	1950
## 3	1954	BRO	NL	0.5974026	1.0513514	1950
## 4	1954	CHA	AL	0.6103896	1.3646833	1950
## 5	1954	CHN	NL	0.4155844	0.9138381	1950
## 6	1954	CIN	NL	0.4805195	0.9554391	1950
## 7	1954	CLE	AL	0.7207792	1.4801587	1950
## 8	1954	DET	AL	0.4415584	0.8795181	1950
## 9	1954	ML1	NL	0.5779221	1.2050360	1950
## 10	1954	NY1	NL	0.6298701	1.3309091	1950
## 11	1954	NYA	AL	0.6688312	1.4298401	1950
## 12	1954	PHA	AL	0.3311688	0.6194286	1950
## 13	1954	PHI	NL	0.4870130	1.0732899	1950
## 14	1954	PIT	NL	0.3441558	0.6591716	1950
## 15	1954	SLN	NL	0.4675325	1.0113924	1950
## 16	1954	WS1	AL	0.4285714	0.9294118	1950
## 17	1955	BAL	AL	0.3701299	0.7161804	1950
## 18	1955	BOS	AL	0.5454545	1.1579755	1950
## 19	1955	BRO	NL	0.6405229	1.3184615	1950
## 20	1955	CHA	AL	0.5909091	1.3016158	1950
## 21	1955	CHN	NL	0.4705882	0.8779804	1950
## 22	1955	CIN	NL	0.4870130	1.1125731	1950
## 23	1955	CLE	AL	0.6038961	1.1613977	1950
## 24	1955	DET	AL	0.5129870	1.1778116	1950
## 25	1955	KC1	AL	0.4090909	0.7003293	1950
## 26	1955	ML1	NL	0.5519481	1.1122754	1950
## 27	1955	NY1	NL	0.5194805	1.0430906	1950
## 28	1955	NYA	AL	0.6233766	1.3391916	1950
## 29	1955	PHI	NL	0.5000000	1.0135135	1950
## 30	1955	PIT	NL	0.3896104	0.7301173	1950
## 31	1955	SLN	NL	0.4415584	0.8639366	1950
## 32	1955	WS1	AL	0.3441558	0.7579214	1950
## 33	1956	BAL	AL	0.4480519	0.8099291	1950
## 34	1956	BOS	AL	0.5454545	1.0386152	1950

## 35	1956	BRO	NL	0.6038961	1.1980033	1950
## 36	1956	CHA	AL	0.5519481	1.2239748	1950
## 37	1956	CHN	NL	0.3896104	0.8432203	1950
## 38	1956	CIN	NL	0.5909091	1.1778116	1950
## 39	1956	CLE	AL	0.5714286	1.2254733	1950
## 40	1956	DET	AL	0.5324675	1.1287554	1950
## 41	1956	KC1	AL	0.3376623	0.7448857	1950
## 42	1956	ML1	NL	0.5974026	1.2460457	1950
## 43	1956	NY1	NL	0.4350649	0.8307692	1950
## 44	1956	NYA	AL	0.6298701	1.3581616	1950
## 45	1956	PHI	NL	0.4610390	0.9051491	1950
## 46	1956	PIT	NL	0.4285714	0.9004594	1950
## 47	1956	SLN	NL	0.4935065	0.9713467	1950
## 48	1956	WS1	AL	0.3831169	0.7056277	1950
## 49	1957	BAL	AL	0.5000000	1.0153061	1950
## 50	1957	BOS	AL	0.5324675	1.0793413	1950
## 51	1957	BRO	NL	0.5454545	1.1675127	1950
## 52	1957	CHA	AL	0.5844156	1.2491166	1950
## 53	1957	CHN	NL	0.4025974	0.8698061	1950
## 54	1957	CIN	NL	0.5194805	0.9564661	1950
## 55	1957	CLE	AL	0.4967320	0.9445983	1950
## 56	1957	DET	AL	0.5064935	1.0000000	1950
## 57	1957	KC1	AL	0.3856209	0.7929577	1950
## 58	1957	ML1	NL	0.6168831	1.2593801	1950
## 59	1957	NY1	NL	0.4480519	0.9172611	1950
## 60	1957	NYA	AL	0.6363636	1.3539326	1950
## 61	1957	PHI	NL	0.5000000	0.9496951	1950
## 62	1957	PIT	NL	0.4025974	0.8419540	1950
## 63	1957	SLN	NL	0.5649351	1.1066066	1950
## 64	1957	WS1	AL	0.3571429	0.7462871	1950
## 65	1958	BAL	AL	0.4836601	0.9060870	1950
## 66	1958	BOS	AL	0.5129870	1.0086831	1950
## 67	1958	CHA	AL	0.5324675	1.0308943	1950
## 68	1958	CHN	NL	0.4675325	0.9779310	1950
## 69	1958	CIN	NL	0.4935065	1.1191626	1950
## 70	1958	CLE	AL	0.5032680	1.0929134	1950
## 71	1958	DET	AL	0.5000000	1.0874587	1950
## 72	1958	KC1	AL	0.4740260	0.9004208	1950
## 73	1958	LAN	NL	0.4610390	0.8777924	1950
## 74	1958	ML1	NL	0.5974026	1.2476895	1950
## 75	1958	NYA	AL	0.5974026	1.3154246	1950
## 76	1958	PHI	NL	0.4480519	0.8713911	1950
## 77	1958	PIT	NL	0.5454545	1.0906096	1950
## 78	1958	SFN	NL	0.5194805	1.0415473	1950
## 79	1958	SLN	NL	0.4675325	0.8792614	1950
## 80	1958	WS1	AL	0.3961039	0.7402945	1950
## 81	1959	BAL	AL	0.4805195	0.8872786	1950
## 82	1959	BOS	AL	0.4870130	1.0431034	1950
## 83	1959	CHA	AL	0.6103896	1.1377551	1950
## 84	1959	CHN	NL	0.4805195	0.9781977	1950
## 85	1959	CIN	NL	0.4805195	1.0352304	1950
## 86	1959	CLE	AL	0.5779221	1.1532508	1950
## 87	1959	DET	AL	0.4935065	0.9740437	1950
## 88	1959	KC1	AL	0.4285714	0.8960526	1950

## 89	1959	LAN	NL	0.5641026	1.0522388	1950
## 90	1959	ML1	NL	0.5512821	1.1621188	1950
## 91	1959	NYA	AL	0.5129870	1.0618238	1950
## 92	1959	PHI	NL	0.4155844	0.8262069	1950
## 93	1959	PIT	NL	0.5064935	0.9573529	1950
## 94	1959	SFN	NL	0.5389610	1.1500816	1950
## 95	1959	SLN	NL	0.4610390	0.8841379	1950
## 96	1959	WS1	AL	0.4090909	0.8830243	1950
## 97	1960	BAL	AL	0.5779221	1.1254125	1960
## 98	1960	BOS	AL	0.4220779	0.8490323	1960
## 99	1960	CHA	AL	0.5649351	1.2009724	1960
## 100	1960	CHN	NL	0.3896104	0.8170103	1960
## 101	1960	CIN	NL	0.4350649	0.9248555	1960
## 102	1960	CLE	AL	0.4935065	0.9624820	1960
## 103	1960	DET	AL	0.4610390	0.9829193	1960
## 104	1960	KC1	AL	0.3766234	0.8134921	1960
## 105	1960	LAN	NL	0.5324675	1.1163575	1960
## 106	1960	ML1	NL	0.5714286	1.1003040	1960
## 107	1960	NYA	AL	0.6298701	1.1897927	1960
## 108	1960	PHI	NL	0.3831169	0.7901592	1960
## 109	1960	PIT	NL	0.6168831	1.2377740	1960
## 110	1960	SFN	NL	0.5129870	1.0633914	1960
## 111	1960	SLN	NL	0.5584416	1.0373377	1960
## 112	1960	WS1	AL	0.4740260	0.9655172	1960
## 113	1961	BAL	AL	0.5864198	1.1751701	1960
## 114	1961	BOS	AL	0.4691358	0.9204545	1960
## 115	1961	CHA	AL	0.5308642	1.0537190	1960
## 116	1961	CHN	NL	0.4155844	0.8612500	1960
## 117	1961	CIN	NL	0.6038961	1.0872894	1960
## 118	1961	CLE	AL	0.4844720	0.9800532	1960
## 119	1961	DET	AL	0.6234568	1.2533532	1960
## 120	1961	KC1	AL	0.3788820	0.7914253	1960
## 121	1961	LAA	AL	0.4347826	0.9489796	1960
## 122	1961	LAN	NL	0.5779221	1.0545194	1960
## 123	1961	MIN	AL	0.4375000	0.9087404	1960
## 124	1961	ML1	NL	0.5389610	1.0853659	1960
## 125	1961	NYA	AL	0.6728395	1.3513072	1960
## 126	1961	PHI	NL	0.3051948	0.7336683	1960
## 127	1961	PIT	NL	0.4870130	1.0281481	1960
## 128	1961	SFN	NL	0.5519481	1.1801527	1960
## 129	1961	SLN	NL	0.5194805	1.0523952	1960
## 130	1961	WS2	AL	0.3788820	0.7963918	1960
## 131	1962	BAL	AL	0.4753086	0.9588235	1960
## 132	1962	BOS	AL	0.4750000	0.9351852	1960
## 133	1962	CHA	AL	0.5246914	1.0744681	1960
## 134	1962	CHN	NL	0.3641975	0.7642080	1960
## 135	1962	CIN	NL	0.6049383	1.1708029	1960
## 136	1962	CLE	AL	0.4938272	0.9154362	1960
## 137	1962	DET	AL	0.5279503	1.0953757	1960
## 138	1962	HOU	NL	0.4000000	0.8256625	1960
## 139	1962	KC1	AL	0.4444444	0.8900836	1960
## 140	1962	LAA	AL	0.5308642	1.0169972	1960
## 141	1962	LAN	NL	0.6181818	1.2080344	1960
## 142	1962	MIN	AL	0.5617284	1.1192146	1960

## 143	1962	ML1	NL	0.5308642	1.0977444	1960
## 144	1962	NYA	AL	0.5925926	1.2014706	1960
## 145	1962	NYN	NL	0.2500000	0.6508439	1960
## 146	1962	PHI	NL	0.5031056	0.9288538	1960
## 147	1962	PIT	NL	0.5776398	1.1277955	1960
## 148	1962	SFN	NL	0.6242424	1.2724638	1960
## 149	1962	SLN	NL	0.5185185	1.1656627	1960
## 150	1962	WS2	AL	0.3726708	0.8365922	1960
## 151	1963	BAL	AL	0.5308642	1.0370370	1960
## 152	1963	BOS	AL	0.4720497	0.9460227	1960
## 153	1963	CHA	AL	0.5802469	1.2555147	1960
## 154	1963	CHN	NL	0.5061728	0.9861592	1960
## 155	1963	CIN	NL	0.5308642	1.0909091	1960
## 156	1963	CLE	AL	0.4876543	0.9045584	1960
## 157	1963	DET	AL	0.4876543	0.9957326	1960
## 158	1963	HOU	NL	0.4074074	0.7250000	1960
## 159	1963	KC1	AL	0.4506173	0.8735795	1960
## 160	1963	LAA	AL	0.4347826	0.9045455	1960
## 161	1963	LAN	NL	0.6111111	1.1636364	1960
## 162	1963	MIN	AL	0.5652174	1.2740864	1960
## 163	1963	ML1	NL	0.5185185	1.1227197	1960
## 164	1963	NYA	AL	0.6459627	1.3053016	1960
## 165	1963	NYN	NL	0.3148148	0.6472868	1960
## 166	1963	PHI	NL	0.5370370	1.1107266	1960
## 167	1963	PIT	NL	0.4567901	0.9529412	1960
## 168	1963	SFN	NL	0.5432099	1.1310452	1960
## 169	1963	SLN	NL	0.5740741	1.1894904	1960
## 170	1963	WS2	AL	0.3456790	0.7118227	1960
## 171	1964	BAL	AL	0.5987654	1.1975309	1960
## 172	1964	BOS	AL	0.4444444	0.8675914	1960
## 173	1964	CHA	AL	0.6049383	1.2814371	1960
## 174	1964	CHN	NL	0.4691358	0.8964088	1960
## 175	1964	CIN	NL	0.5679012	1.1660777	1960
## 176	1964	CLE	AL	0.4876543	0.9942280	1960
## 177	1964	DET	AL	0.5246914	1.0309735	1960
## 178	1964	HOU	NL	0.4074074	0.7882166	1960
## 179	1964	KC1	AL	0.3518519	0.7428230	1960
## 180	1964	LAA	AL	0.5061728	0.9872958	1960
## 181	1964	LAN	NL	0.4938272	1.0734266	1960
## 182	1964	MIN	AL	0.4876543	1.0870206	1960
## 183	1964	ML1	NL	0.5432099	1.0793011	1960
## 184	1964	NYA	AL	0.6111111	1.2651646	1960
## 185	1964	NYN	NL	0.3271605	0.7332474	1960
## 186	1964	PHI	NL	0.5679012	1.0965190	1960
## 187	1964	PIT	NL	0.4938272	1.0424528	1960
## 188	1964	SFN	NL	0.5555556	1.1175468	1960
## 189	1964	SLN	NL	0.5740741	1.0966258	1960
## 190	1964	WS2	AL	0.3827160	0.7885402	1960
## 191	1965	BAL	AL	0.5802469	1.1089965	1960
## 192	1965	BOS	AL	0.3827160	0.8457649	1960
## 193	1965	CAL	AL	0.4629630	0.9261863	1960
## 194	1965	CHA	AL	0.5864198	1.1657658	1960
## 195	1965	CHN	NL	0.4444444	0.8782849	1960
## 196	1965	CIN	NL	0.5493827	1.1718750	1960

## 197	1965	CLE	AL	0.5370370	1.0815661	1960
## 198	1965	DET	AL	0.5493827	1.1295681	1960
## 199	1965	HOU	NL	0.4012346	0.8002813	1960
## 200	1965	KC1	AL	0.3641975	0.7748344	1960
## 201	1965	LAN	NL	0.5987654	1.1669866	1960
## 202	1965	MIN	AL	0.6296296	1.2900000	1960
## 203	1965	ML1	NL	0.5308642	1.1184834	1960
## 204	1965	NYA	AL	0.4753086	1.0115894	1960
## 205	1965	NYN	NL	0.3086420	0.6582447	1960
## 206	1965	PHI	NL	0.5279503	0.9805097	1960
## 207	1965	PIT	NL	0.5555556	1.1637931	1960
## 208	1965	SFN	NL	0.5864198	1.1500843	1960
## 209	1965	SLN	NL	0.4968944	1.0489614	1960
## 210	1965	WS2	AL	0.4320988	0.8196949	1960
## 211	1966	ATL	NL	0.5246914	1.1449488	1960
## 212	1966	BAL	AL	0.6062500	1.2562396	1960
## 213	1966	BOS	AL	0.4444444	0.8960328	1960
## 214	1966	CAL	AL	0.4938272	0.9393468	1960
## 215	1966	CHA	AL	0.5123457	1.1102515	1960
## 216	1966	CHN	NL	0.3641975	0.7960445	1960
## 217	1966	CIN	NL	0.4750000	0.9857550	1960
## 218	1966	CLE	AL	0.5000000	0.9795222	1960
## 219	1966	DET	AL	0.5432099	1.0300860	1960
## 220	1966	HOU	NL	0.4444444	0.8805755	1960
## 221	1966	KC1	AL	0.4625000	0.8703704	1960
## 222	1966	LAN	NL	0.5864198	1.2367347	1960
## 223	1966	MIN	AL	0.5493827	1.1411360	1960
## 224	1966	NYA	AL	0.4402516	0.9983660	1960
## 225	1966	NYN	NL	0.4099379	0.7713535	1960
## 226	1966	PHI	NL	0.5370370	1.0875000	1960
## 227	1966	PIT	NL	0.5679012	1.1840874	1960
## 228	1966	SFN	NL	0.5776398	1.0782748	1960
## 229	1966	SLN	NL	0.5123457	0.9896014	1960
## 230	1966	WS2	AL	0.4465409	0.8452200	1960
## 231	1967	ATL	NL	0.4753086	0.9859375	1960
## 232	1967	BAL	AL	0.4720497	1.1047297	1960
## 233	1967	BOS	AL	0.5679012	1.1758958	1960
## 234	1967	CAL	AL	0.5217391	0.9659284	1960
## 235	1967	CHA	AL	0.5493827	1.0814664	1960
## 236	1967	CHN	NL	0.5403727	1.1250000	1960
## 237	1967	CIN	NL	0.5370370	1.0728242	1960
## 238	1967	CLE	AL	0.4629630	0.9119086	1960
## 239	1967	DET	AL	0.5617284	1.1635434	1960
## 240	1967	HOU	NL	0.4259259	0.8436658	1960
## 241	1967	KC1	AL	0.3850932	0.8075758	1960
## 242	1967	LAN	NL	0.4506173	0.8722689	1960
## 243	1967	MIN	AL	0.5617284	1.1372881	1960
## 244	1967	NYA	AL	0.4444444	0.8405797	1960
## 245	1967	NYN	NL	0.3765432	0.7410714	1960
## 246	1967	PHI	NL	0.5061728	1.0533563	1960
## 247	1967	PIT	NL	0.5000000	0.9797980	1960
## 248	1967	SFN	NL	0.5617284	1.1833031	1960
## 249	1967	SLN	NL	0.6273292	1.2477558	1960
## 250	1967	WS2	AL	0.4720497	0.8634223	1960

##	251	1968	ATL	NL	0.5000000	0.9362477	1960
##	252	1968	BAL	AL	0.5617284	1.1649899	1960
##	253	1968	BOS	AL	0.5308642	1.0049100	1960
##	254	1968	CAL	AL	0.4135802	0.8097561	1960
##	255	1968	CHA	AL	0.4135802	0.8785579	1960
##	256	1968	CHN	NL	0.5185185	1.0016367	1960
##	257	1968	CIN	NL	0.5123457	1.0252600	1960
##	258	1968	CLE	AL	0.5341615	1.0238095	1960
##	259	1968	DET	AL	0.6358025	1.3638211	1960
##	260	1968	HOU	NL	0.4444444	0.8673469	1960
##	261	1968	LAN	NL	0.4691358	0.9233792	1960
##	262	1968	MIN	AL	0.4876543	1.0293040	1960
##	263	1968	NYA	AL	0.5123457	1.0094162	1960
##	264	1968	NYN	NL	0.4506173	0.9478958	1960
##	265	1968	OAK	AL	0.5061728	1.0459559	1960
##	266	1968	PHI	NL	0.4691358	0.8829268	1960
##	267	1968	PIT	NL	0.4938272	1.0958647	1960
##	268	1968	SFN	NL	0.5432099	1.1323251	1960
##	269	1968	SLN	NL	0.5987654	1.2351695	1960
##	270	1968	WS2	AL	0.4037267	0.7879699	1960
##	271	1969	ATL	NL	0.5740741	1.0950872	1960
##	272	1969	BAL	AL	0.6728395	1.5067698	1960
##	273	1969	BOS	AL	0.5370370	1.0095109	1960
##	274	1969	CAL	AL	0.4382716	0.8098160	1960
##	275	1969	CHA	AL	0.4197531	0.8644537	1960
##	276	1969	CHN	NL	0.5679012	1.1783961	1960
##	277	1969	CIN	NL	0.5493827	1.0390625	1960
##	278	1969	CLE	AL	0.3850932	0.7991632	1960
##	279	1969	DET	AL	0.5555556	1.1663894	1960
##	280	1969	HOU	NL	0.5000000	1.0119760	1960
##	281	1969	KCA	AL	0.4259259	0.8517442	1960
##	282	1969	LAN	NL	0.5246914	1.1497326	1960
##	283	1969	MIN	AL	0.5987654	1.2783172	1960
##	284	1969	MON	NL	0.3209877	0.7357775	1960
##	285	1969	NYA	AL	0.4968944	0.9574106	1960
##	286	1969	NYN	NL	0.6172840	1.1682070	1960
##	287	1969	OAK	AL	0.5432099	1.0914454	1960
##	288	1969	PHI	NL	0.3888889	0.8657718	1960
##	289	1969	PIT	NL	0.5432099	1.1119632	1960
##	290	1969	SDN	NL	0.3209877	0.6273458	1960
##	291	1969	SE1	AL	0.3950617	0.7997497	1960
##	292	1969	SFN	NL	0.5555556	1.1210692	1960
##	293	1969	SLN	NL	0.5370370	1.1018519	1960
##	294	1969	WS2	AL	0.5308642	1.0776398	1960
##	295	1970	ATL	NL	0.4691358	0.9533679	1970
##	296	1970	BAL	AL	0.6666667	1.3797909	1970
##	297	1970	BOS	AL	0.5370370	1.0886427	1970
##	298	1970	CAL	AL	0.5308642	1.0015873	1970
##	299	1970	CHA	AL	0.3456790	0.7700730	1970
##	300	1970	CHN	NL	0.5185185	1.1870398	1970
##	301	1970	CIN	NL	0.6296296	1.1380323	1970
##	302	1970	CLE	AL	0.4691358	0.9614815	1970
##	303	1970	DET	AL	0.4876543	0.9110807	1970
##	304	1970	HOU	NL	0.4876543	0.9750983	1970

## 305	1970	KCA	AL	0.4012346	0.8666667	1970
## 306	1970	LAN	NL	0.5403727	1.0950292	1970
## 307	1970	MIN	AL	0.6049383	1.2297521	1970
## 308	1970	ML4	AL	0.4012346	0.8162450	1970
## 309	1970	MON	NL	0.4506173	0.8513011	1970
## 310	1970	NYA	AL	0.5740741	1.1111111	1970
## 311	1970	NYN	NL	0.5123457	1.1031746	1970
## 312	1970	OAK	AL	0.5493827	1.1433390	1970
## 313	1970	PHI	NL	0.4534161	0.8136986	1970
## 314	1970	PIT	NL	0.5493827	1.0978916	1970
## 315	1970	SDN	NL	0.3888889	0.8642132	1970
## 316	1970	SFN	NL	0.5308642	1.0060533	1970
## 317	1970	SLN	NL	0.4691358	0.9959839	1970
## 318	1970	WS2	AL	0.4320988	0.9085631	1970
## 319	1971	ATL	NL	0.5061728	0.9198856	1970
## 320	1971	BAL	AL	0.6392405	1.4000000	1970
## 321	1971	BOS	AL	0.5246914	1.0359820	1970
## 322	1971	CAL	AL	0.4691358	0.8871528	1970
## 323	1971	CHA	AL	0.4876543	1.0335008	1970
## 324	1971	CHN	NL	0.5123457	0.9830247	1970
## 325	1971	CIN	NL	0.4876543	1.0086059	1970
## 326	1971	CLE	AL	0.3703704	0.7269076	1970
## 327	1971	DET	AL	0.5617284	1.0868217	1970
## 328	1971	HOU	NL	0.4876543	1.0317460	1970
## 329	1971	KCA	AL	0.5279503	1.0653710	1970
## 330	1971	LAN	NL	0.5493827	1.1294719	1970
## 331	1971	MIN	AL	0.4625000	0.9761194	1970
## 332	1971	ML4	AL	0.4285714	0.8768473	1970
## 333	1971	MON	NL	0.4409938	0.8532236	1970
## 334	1971	NYA	AL	0.5061728	1.0109204	1970
## 335	1971	NYN	NL	0.5123457	1.0690909	1970
## 336	1971	OAK	AL	0.6273292	1.2251773	1970
## 337	1971	PHI	NL	0.4135802	0.8110465	1970
## 338	1971	PIT	NL	0.5987654	1.3155259	1970
## 339	1971	SDN	NL	0.3788820	0.7967213	1970
## 340	1971	SFN	NL	0.5555556	1.0962733	1970
## 341	1971	SLN	NL	0.5555556	1.0572246	1970
## 342	1971	WS2	AL	0.3962264	0.8136364	1970
## 343	1972	ATL	NL	0.4545455	0.8602740	1970
## 344	1972	BAL	AL	0.5194805	1.2069767	1970
## 345	1972	BOS	AL	0.5483871	1.0322581	1970
## 346	1972	CAL	AL	0.4838710	0.8517824	1970
## 347	1972	CHA	AL	0.5649351	1.0520446	1970
## 348	1972	CHN	NL	0.5483871	1.2081129	1970
## 349	1972	CIN	NL	0.6168831	1.2692998	1970
## 350	1972	CLE	AL	0.4615385	0.9094412	1970
## 351	1972	DET	AL	0.5512821	1.0856031	1970
## 352	1972	HOU	NL	0.5490196	1.1132075	1970
## 353	1972	KCA	AL	0.4935065	1.0642202	1970
## 354	1972	LAN	NL	0.5483871	1.1081594	1970
## 355	1972	MIN	AL	0.5000000	1.0037383	1970
## 356	1972	ML4	AL	0.4166667	0.8285714	1970
## 357	1972	MON	NL	0.4487179	0.8423645	1970
## 358	1972	NYA	AL	0.5096774	1.0569260	1970

## 359	1972	NYN	NL	0.5320513	0.9134948	1970
## 360	1972	OAK	AL	0.6000000	1.3216630	1970
## 361	1972	PHI	NL	0.3782051	0.7921260	1970
## 362	1972	PIT	NL	0.6193548	1.3496094	1970
## 363	1972	SDN	NL	0.3790850	0.7338346	1970
## 364	1972	SFN	NL	0.4451613	1.0200308	1970
## 365	1972	SLN	NL	0.4807692	0.9466667	1970
## 366	1972	TEX	AL	0.3506494	0.7340764	1970
## 367	1973	ATL	NL	0.4720497	1.0322997	1970
## 368	1973	BAL	AL	0.5987654	1.3440285	1970
## 369	1973	BOS	AL	0.5493827	1.1406491	1970
## 370	1973	CAL	AL	0.4876543	0.9573820	1970
## 371	1973	CHA	AL	0.4753086	0.9248227	1970
## 372	1973	CHN	NL	0.4782609	0.9374046	1970
## 373	1973	CIN	NL	0.6111111	1.1932367	1970
## 374	1973	CLE	AL	0.4382716	0.8232446	1970
## 375	1973	DET	AL	0.5246914	0.9525223	1970
## 376	1973	HOU	NL	0.5061728	1.0133929	1970
## 377	1973	KCA	AL	0.5432099	1.0039894	1970
## 378	1973	LAN	NL	0.5900621	1.1946903	1970
## 379	1973	MIN	AL	0.5000000	1.0664740	1970
## 380	1973	ML4	AL	0.4567901	0.9685363	1970
## 381	1973	MON	NL	0.4876543	0.9515670	1970
## 382	1973	NYA	AL	0.4938272	1.0508197	1970
## 383	1973	NYN	NL	0.5093168	1.0340136	1970
## 384	1973	OAK	AL	0.5802469	1.2325203	1970
## 385	1973	PHI	NL	0.4382716	0.8953975	1970
## 386	1973	PIT	NL	0.4938272	1.0158730	1970
## 387	1973	SDN	NL	0.3703704	0.7116883	1970
## 388	1973	SFN	NL	0.5432099	1.0527066	1970
## 389	1973	SLN	NL	0.5000000	1.0663350	1970
## 390	1973	TEX	AL	0.3518519	0.7334123	1970
## 391	1974	ATL	NL	0.5432099	1.1740675	1970
## 392	1974	BAL	AL	0.5617284	1.0767974	1970
## 393	1974	BOS	AL	0.5185185	1.0529501	1970
## 394	1974	CAL	AL	0.4197531	0.9406393	1970
## 395	1974	CHA	AL	0.5000000	0.9486824	1970
## 396	1974	CHN	NL	0.4074074	0.8099274	1970
## 397	1974	CIN	NL	0.6049383	1.2297940	1970
## 398	1974	CLE	AL	0.4753086	0.9538905	1970
## 399	1974	DET	AL	0.4444444	0.8072917	1970
## 400	1974	HOU	NL	0.5000000	1.0332278	1970
## 401	1974	KCA	AL	0.4753086	1.0075529	1970
## 402	1974	LAN	NL	0.6296296	1.4224599	1970
## 403	1974	MIN	AL	0.5061728	1.0059791	1970
## 404	1974	ML4	AL	0.4691358	0.9803030	1970
## 405	1974	MON	NL	0.4906832	1.0076104	1970
## 406	1974	NYA	AL	0.5493827	1.0770465	1970
## 407	1974	NYN	NL	0.4382716	0.8854489	1970
## 408	1974	OAK	AL	0.5555556	1.2504537	1970
## 409	1974	PHI	NL	0.4938272	0.9643367	1970
## 410	1974	PIT	NL	0.5432099	1.1430746	1970
## 411	1974	SDN	NL	0.3703704	0.6518072	1970
## 412	1974	SFN	NL	0.4444444	0.8769018	1970

## 413	1974	SLN	NL	0.5341615	1.0528771	1970
## 414	1974	TEX	AL	0.5250000	0.9885387	1970
## 415	1975	ATL	NL	0.4161491	0.7889039	1970
## 416	1975	BAL	AL	0.5660377	1.2332731	1970
## 417	1975	BOS	AL	0.5937500	1.1227080	1970
## 418	1975	CAL	AL	0.4472050	0.8686030	1970
## 419	1975	CHA	AL	0.4658385	0.9317212	1970
## 420	1975	CHN	NL	0.4629630	0.8609432	1970
## 421	1975	CIN	NL	0.6666667	1.4334471	1970
## 422	1975	CLE	AL	0.4968553	0.9786629	1970
## 423	1975	DET	AL	0.3584906	0.7251908	1970
## 424	1975	HOU	NL	0.3975155	0.9338959	1970
## 425	1975	KCA	AL	0.5617284	1.0939908	1970
## 426	1975	LAN	NL	0.5432099	1.2134831	1970
## 427	1975	MIN	AL	0.4779874	0.9836957	1970
## 428	1975	ML4	AL	0.4197531	0.8522727	1970
## 429	1975	MON	NL	0.4629630	0.8710145	1970
## 430	1975	NYA	AL	0.5187500	1.1581633	1970
## 431	1975	NYN	NL	0.5061728	1.0336000	1970
## 432	1975	OAK	AL	0.6049383	1.2508251	1970
## 433	1975	PHI	NL	0.5308642	1.0590778	1970
## 434	1975	PIT	NL	0.5714286	1.2601770	1970
## 435	1975	SDN	NL	0.4382716	0.8081991	1970
## 436	1975	SFN	NL	0.4968944	0.9821162	1970
## 437	1975	SLN	NL	0.5061728	0.9608128	1970
## 438	1975	TEX	AL	0.4876543	0.9740791	1970
## 439	1976	ATL	NL	0.4320988	0.8857143	1970
## 440	1976	BAL	AL	0.5432099	1.0351171	1970
## 441	1976	BOS	AL	0.5123457	1.0848485	1970
## 442	1976	CAL	AL	0.4691358	0.8716323	1970
## 443	1976	CHA	AL	0.3975155	0.7865772	1970
## 444	1976	CHN	NL	0.4629630	0.8392857	1970
## 445	1976	CIN	NL	0.6296296	1.3538705	1970
## 446	1976	CLE	AL	0.5094340	1.0000000	1970
## 447	1976	DET	AL	0.4596273	0.8589563	1970
## 448	1976	HOU	NL	0.4938272	0.9512938	1970
## 449	1976	KCA	AL	0.5555556	1.1669394	1970
## 450	1976	LAN	NL	0.5679012	1.1197053	1970
## 451	1976	MIN	AL	0.5246914	1.0553977	1970
## 452	1976	ML4	AL	0.4099379	0.8702290	1970
## 453	1976	MON	NL	0.3395062	0.7234332	1970
## 454	1976	NYA	AL	0.6100629	1.2695652	1970
## 455	1976	NYN	NL	0.5308642	1.1431227	1970
## 456	1976	OAK	AL	0.5403727	1.1471572	1970
## 457	1976	PHI	NL	0.6234568	1.3824057	1970
## 458	1976	PIT	NL	0.5679012	1.1238095	1970
## 459	1976	SDN	NL	0.4506173	0.8610272	1970
## 460	1976	SFN	NL	0.4567901	0.8673469	1970
## 461	1976	SLN	NL	0.4444444	0.9374069	1970
## 462	1976	TEX	AL	0.4691358	0.9447853	1970
## 463	1977	ATL	NL	0.3765432	0.7575419	1970
## 464	1977	BAL	AL	0.6024845	1.1010720	1970
## 465	1977	BOS	AL	0.6024845	1.2064607	1970
## 466	1977	CAL	AL	0.4567901	0.9712230	1970

## 467	1977	CHA	AL	0.5555556	1.0946822	1970
## 468	1977	CHN	NL	0.5000000	0.9364005	1970
## 469	1977	CIN	NL	0.5432099	1.1062069	1970
## 470	1977	CLE	AL	0.4409938	0.9147497	1970
## 471	1977	DET	AL	0.4567901	0.9507324	1970
## 472	1977	HOU	NL	0.5000000	1.0461538	1970
## 473	1977	KCA	AL	0.6296296	1.2626728	1970
## 474	1977	LAN	NL	0.6049383	1.3213058	1970
## 475	1977	MIN	AL	0.5217391	1.1172680	1970
## 476	1977	ML4	AL	0.4135802	0.8352941	1970
## 477	1977	MON	NL	0.4629630	0.9035326	1970
## 478	1977	NYA	AL	0.6172840	1.2764977	1970
## 479	1977	NYN	NL	0.3950617	0.8853695	1970
## 480	1977	OAK	AL	0.3913043	0.8077437	1970
## 481	1977	PHI	NL	0.6234568	1.2679641	1970
## 482	1977	PIT	NL	0.5925926	1.1037594	1970
## 483	1977	SDN	NL	0.4259259	0.8297362	1970
## 484	1977	SEA	AL	0.3950617	0.7298246	1970
## 485	1977	SFN	NL	0.4629630	0.9465541	1970
## 486	1977	SLN	NL	0.5123457	1.0712209	1970
## 487	1977	TEX	AL	0.5802469	1.1674277	1970
## 488	1977	TOR	AL	0.3354037	0.7360097	1970
## 489	1978	ATL	NL	0.4259259	0.8000000	1970
## 490	1978	BAL	AL	0.5590062	1.0410742	1970
## 491	1978	BOS	AL	0.6073620	1.2115677	1970
## 492	1978	CAL	AL	0.5370370	1.0375375	1970
## 493	1978	CHA	AL	0.4409938	0.8673051	1970
## 494	1978	CHN	NL	0.4876543	0.9171271	1970
## 495	1978	CIN	NL	0.5714286	1.0319767	1970
## 496	1978	CLE	AL	0.4339623	0.9207493	1970
## 497	1978	DET	AL	0.5308642	1.0934150	1970
## 498	1978	HOU	NL	0.4567901	0.9542587	1970
## 499	1978	KCA	AL	0.5679012	1.1719243	1970
## 500	1978	LAN	NL	0.5864198	1.2687609	1970
## 501	1978	MIN	AL	0.4506173	0.9823009	1970
## 502	1978	ML4	AL	0.5740741	1.2369231	1970
## 503	1978	MON	NL	0.4691358	1.0360065	1970
## 504	1978	NYA	AL	0.6134969	1.2628866	1970
## 505	1978	NYN	NL	0.4074074	0.8797101	1970
## 506	1978	OAK	AL	0.4259259	0.7710145	1970
## 507	1978	PHI	NL	0.5555556	1.2081911	1970
## 508	1978	PIT	NL	0.5465839	1.0737834	1970
## 509	1978	SDN	NL	0.5185185	0.9882943	1970
## 510	1978	SEA	AL	0.3500000	0.7362110	1970
## 511	1978	SFN	NL	0.5493827	1.0319865	1970
## 512	1978	SLN	NL	0.4259259	0.9132420	1970
## 513	1978	TEX	AL	0.5370370	1.0949367	1970
## 514	1978	TOR	AL	0.3664596	0.7612903	1970
## 515	1979	ATL	NL	0.4125000	0.8768021	1970
## 516	1979	BAL	AL	0.6415094	1.3006873	1970
## 517	1979	BOS	AL	0.5687500	1.1828411	1970
## 518	1979	CAL	AL	0.5432099	1.1276042	1970
## 519	1979	CHA	AL	0.4562500	0.9759358	1970
## 520	1979	CHN	NL	0.4938272	0.9985856	1970

## 521	1979	CIN	NL	0.5590062	1.1350932	1970
## 522	1979	CLE	AL	0.5031056	0.9440994	1970
## 523	1979	DET	AL	0.5279503	1.0433604	1970
## 524	1979	HOU	NL	0.5493827	1.0017182	1970
## 525	1979	KCA	AL	0.5246914	1.0428922	1970
## 526	1979	LAN	NL	0.4876543	1.0306834	1970
## 527	1979	MIN	AL	0.5061728	1.0537931	1970
## 528	1979	ML4	AL	0.5900621	1.1177285	1970
## 529	1979	MON	NL	0.5937500	1.2065404	1970
## 530	1979	NYA	AL	0.5562500	1.0922619	1970
## 531	1979	NYN	NL	0.3888889	0.8399433	1970
## 532	1979	OAK	AL	0.3333333	0.6662791	1970
## 533	1979	PHI	NL	0.5185185	0.9512535	1970
## 534	1979	PIT	NL	0.6049383	1.2052877	1970
## 535	1979	SDN	NL	0.4223602	0.8854626	1970
## 536	1979	SEA	AL	0.4135802	0.8670732	1970
## 537	1979	SFN	NL	0.4382716	0.8948069	1970
## 538	1979	SLN	NL	0.5308642	1.0548341	1970
## 539	1979	TEX	AL	0.5123457	1.0744986	1970
## 540	1979	TOR	AL	0.3271605	0.7111369	1970
## 541	1980	ATL	NL	0.5031056	0.9545455	1980
## 542	1980	BAL	AL	0.6172840	1.2578125	1980
## 543	1980	BOS	AL	0.5187500	0.9869622	1980
## 544	1980	CAL	AL	0.4062500	0.8757842	1980
## 545	1980	CHA	AL	0.4375000	0.8130194	1980
## 546	1980	CHN	NL	0.3950617	0.8434066	1980
## 547	1980	CIN	NL	0.5493827	1.0552239	1980
## 548	1980	CLE	AL	0.4937500	0.9144981	1980
## 549	1980	DET	AL	0.5185185	1.0964333	1980
## 550	1980	HOU	NL	0.5705521	1.0814941	1980
## 551	1980	KCA	AL	0.5987654	1.1657061	1980
## 552	1980	LAN	NL	0.5644172	1.1218274	1980
## 553	1980	MIN	AL	0.4782609	0.9254144	1980
## 554	1980	ML4	AL	0.5308642	1.1891496	1980
## 555	1980	MON	NL	0.5555556	1.1033386	1980
## 556	1980	NYA	AL	0.6358025	1.2386707	1980
## 557	1980	NYN	NL	0.4135802	0.8703704	1980
## 558	1980	OAK	AL	0.5123457	1.0685358	1980
## 559	1980	PHI	NL	0.5617284	1.1392801	1980
## 560	1980	PIT	NL	0.5123457	1.0309598	1980
## 561	1980	SDN	NL	0.4506173	0.9036697	1980
## 562	1980	SEA	AL	0.3641975	0.7692308	1980
## 563	1980	SFN	NL	0.4658385	0.9037855	1980
## 564	1980	SLN	NL	0.4567901	1.0394366	1980
## 565	1980	TEX	AL	0.4720497	1.0053191	1980
## 566	1980	TOR	AL	0.4135802	0.8188976	1980
## 567	1981	ATL	NL	0.4716981	0.9495192	1980
## 568	1981	BAL	AL	0.5619048	0.9816934	1980
## 569	1981	BOS	AL	0.5462963	1.0790021	1980
## 570	1981	CAL	AL	0.4636364	1.0507726	1980
## 571	1981	CHA	AL	0.5094340	1.1252955	1980
## 572	1981	CHN	NL	0.3689320	0.7660455	1980
## 573	1981	CIN	NL	0.6111111	1.0545455	1980
## 574	1981	CLE	AL	0.5048544	0.9751131	1980

## 575	1981	DET	AL	0.5504587	1.0569307	1980
## 576	1981	HOU	NL	0.5545455	1.1903323	1980
## 577	1981	KCA	AL	0.4854369	0.9802469	1980
## 578	1981	LAN	NL	0.5727273	1.2640449	1980
## 579	1981	MIN	AL	0.3761468	0.7777778	1980
## 580	1981	ML4	AL	0.5688073	1.0740741	1980
## 581	1981	MON	NL	0.5555556	1.1243655	1980
## 582	1981	NYA	AL	0.5514019	1.2274052	1980
## 583	1981	NYN	NL	0.3980583	0.8055556	1980
## 584	1981	OAK	AL	0.5871560	1.1364764	1980
## 585	1981	PHI	NL	0.5514019	1.0402542	1980
## 586	1981	PIT	NL	0.4509804	0.9576471	1980
## 587	1981	SDN	NL	0.3727273	0.8395604	1980
## 588	1981	SEA	AL	0.4036697	0.8176583	1980
## 589	1981	SFN	NL	0.5045045	1.0314010	1980
## 590	1981	SLN	NL	0.5784314	1.1127098	1980
## 591	1981	TEX	AL	0.5428571	1.1619537	1980
## 592	1981	TOR	AL	0.3490566	0.7060086	1980
## 593	1982	ATL	NL	0.5493827	1.0527066	1980
## 594	1982	BAL	AL	0.5802469	1.1266376	1980
## 595	1982	BOS	AL	0.5493827	1.0561010	1980
## 596	1982	CAL	AL	0.5740741	1.2149254	1980
## 597	1982	CHA	AL	0.5370370	1.1070423	1980
## 598	1982	CHN	NL	0.4506173	0.9534556	1980
## 599	1982	CIN	NL	0.3765432	0.8245083	1980
## 600	1982	CLE	AL	0.4814815	0.9131016	1980
## 601	1982	DET	AL	0.5123457	1.0642336	1980
## 602	1982	HOU	NL	0.4753086	0.9177419	1980
## 603	1982	KCA	AL	0.5555556	1.0934449	1980
## 604	1982	LAN	NL	0.5432099	1.1290850	1980
## 605	1982	MIN	AL	0.3703704	0.8021978	1980
## 606	1982	ML4	AL	0.5864198	1.2426778	1980
## 607	1982	MON	NL	0.5308642	1.1314935	1980
## 608	1982	NYA	AL	0.4876543	0.9902235	1980
## 609	1982	NYN	NL	0.4012346	0.8423237	1980
## 610	1982	OAK	AL	0.4197531	0.8437118	1980
## 611	1982	PHI	NL	0.5493827	1.0152905	1980
## 612	1982	PIT	NL	0.5185185	1.0402299	1980
## 613	1982	SDN	NL	0.5000000	1.0258359	1980
## 614	1982	SEA	AL	0.4691358	0.9143258	1980
## 615	1982	SFN	NL	0.5370370	0.9796215	1980
## 616	1982	SLN	NL	0.5679012	1.1247947	1980
## 617	1982	TEX	AL	0.3950617	0.7877170	1980
## 618	1982	TOR	AL	0.4814815	0.9286733	1980
## 619	1983	ATL	NL	0.5432099	1.1656250	1980
## 620	1983	BAL	AL	0.6049383	1.2254601	1980
## 621	1983	BOS	AL	0.4814815	0.9341935	1980
## 622	1983	CAL	AL	0.4320988	0.9268293	1980
## 623	1983	CHA	AL	0.6111111	1.2307692	1980
## 624	1983	CHN	NL	0.4382716	0.9749652	1980
## 625	1983	CIN	NL	0.4567901	0.8774648	1980
## 626	1983	CLE	AL	0.4320988	0.8968153	1980
## 627	1983	DET	AL	0.5679012	1.1620029	1980
## 628	1983	HOU	NL	0.5246914	0.9953560	1980

## 629	1983	KCA	AL	0.4876543	0.9074316	1980
## 630	1983	LAN	NL	0.5617284	1.0738916	1980
## 631	1983	MIN	AL	0.4320988	0.8625304	1980
## 632	1983	ML4	AL	0.5370370	1.0790960	1980
## 633	1983	MON	NL	0.5061728	1.0479876	1980
## 634	1983	NYA	AL	0.5617284	1.0953058	1980
## 635	1983	NYN	NL	0.4197531	0.8455882	1980
## 636	1983	OAK	AL	0.4567901	0.9053708	1980
## 637	1983	PHI	NL	0.5555556	1.0960630	1980
## 638	1983	PIT	NL	0.5185185	1.0169753	1980
## 639	1983	SDN	NL	0.5000000	1.0000000	1980
## 640	1983	SEA	AL	0.3703704	0.7540541	1980
## 641	1983	SFN	NL	0.4876543	0.9856528	1980
## 642	1983	SLN	NL	0.4876543	0.9563380	1980
## 643	1983	TEX	AL	0.4753086	1.0492611	1980
## 644	1983	TOR	AL	0.5493827	1.0950413	1980
## 645	1984	ATL	NL	0.4938272	0.9648855	1980
## 646	1984	BAL	AL	0.5246914	1.0209895	1980
## 647	1984	BOS	AL	0.5308642	1.0602094	1980
## 648	1984	CAL	AL	0.5000000	0.9985653	1980
## 649	1984	CHA	AL	0.4567901	0.9225543	1980
## 650	1984	CHN	NL	0.5962733	1.1580547	1980
## 651	1984	CIN	NL	0.4320988	0.8393574	1980
## 652	1984	CLE	AL	0.4629630	0.9934726	1980
## 653	1984	DET	AL	0.6419753	1.2892691	1980
## 654	1984	HOU	NL	0.4938272	1.1000000	1980
## 655	1984	KCA	AL	0.5185185	0.9810496	1980
## 656	1984	LAN	NL	0.4876543	0.9666667	1980
## 657	1984	MIN	AL	0.5000000	0.9970370	1980
## 658	1984	ML4	AL	0.4161491	0.8732970	1980
## 659	1984	MON	NL	0.4844720	1.0136752	1980
## 660	1984	NYA	AL	0.5370370	1.1163476	1980
## 661	1984	NYN	NL	0.5555556	0.9644970	1980
## 662	1984	OAK	AL	0.4753086	0.9271357	1980
## 663	1984	PHI	NL	0.5000000	1.0434783	1980
## 664	1984	PIT	NL	0.4629630	1.0846561	1980
## 665	1984	SDN	NL	0.5679012	1.0820189	1980
## 666	1984	SEA	AL	0.4567901	0.8811370	1980
## 667	1984	SFN	NL	0.4074074	0.8451053	1980
## 668	1984	SLN	NL	0.5185185	1.0108527	1980
## 669	1984	TEX	AL	0.4285714	0.9187675	1980
## 670	1984	TOR	AL	0.5493827	1.0775862	1980
## 671	1985	ATL	NL	0.4074074	0.8092190	1980
## 672	1985	BAL	AL	0.5155280	1.0706806	1980
## 673	1985	BOS	AL	0.5000000	1.1111111	1980
## 674	1985	CAL	AL	0.5555556	1.0412518	1980
## 675	1985	CHA	AL	0.5246914	1.0222222	1980
## 676	1985	CHN	NL	0.4782609	0.9410151	1980
## 677	1985	CIN	NL	0.5527950	1.0165165	1980
## 678	1985	CLE	AL	0.3703704	0.8466899	1980
## 679	1985	DET	AL	0.5217391	1.0595930	1980
## 680	1985	HOU	NL	0.5123457	1.0217077	1980
## 681	1985	KCA	AL	0.5617284	1.0751174	1980
## 682	1985	LAN	NL	0.5864198	1.1778929	1980

## 683	1985	MIN	AL	0.4753086	0.9015345	1980
## 684	1985	ML4	AL	0.4409938	0.8603491	1980
## 685	1985	MON	NL	0.5217391	0.9952830	1980
## 686	1985	NYA	AL	0.6024845	1.2712121	1980
## 687	1985	NYN	NL	0.6049383	1.2235915	1980
## 688	1985	OAK	AL	0.4753086	0.9618806	1980
## 689	1985	PHI	NL	0.4629630	0.9910847	1980
## 690	1985	PIT	NL	0.3540373	0.8022599	1980
## 691	1985	SDN	NL	0.5123457	1.0450161	1980
## 692	1985	SEA	AL	0.4567901	0.8789731	1980
## 693	1985	SFN	NL	0.3827160	0.8249258	1980
## 694	1985	SLN	NL	0.6234568	1.3059441	1980
## 695	1985	TEX	AL	0.3850932	0.7859873	1980
## 696	1985	TOR	AL	0.6149068	1.2908163	1980
## 697	1986	ATL	NL	0.4472050	0.8553547	1980
## 698	1986	BAL	AL	0.4506173	0.9315789	1980
## 699	1986	BOS	AL	0.5900621	1.1408046	1980
## 700	1986	CAL	AL	0.5679012	1.1491228	1980
## 701	1986	CHA	AL	0.4444444	0.9213162	1980
## 702	1986	CHN	NL	0.4375000	0.8706786	1980
## 703	1986	CIN	NL	0.5308642	1.0209205	1980
## 704	1986	CLE	AL	0.5185185	0.9881094	1980
## 705	1986	DET	AL	0.5370370	1.1176471	1980
## 706	1986	HOU	NL	0.5925926	1.1493849	1980
## 707	1986	KCA	AL	0.4691358	0.9717682	1980
## 708	1986	LAN	NL	0.4506173	0.9396171	1980
## 709	1986	MIN	AL	0.4382716	0.8831943	1980
## 710	1986	ML4	AL	0.4782609	0.9087193	1980
## 711	1986	MON	NL	0.4844720	0.9258721	1980
## 712	1986	NYA	AL	0.5555556	1.0799458	1980
## 713	1986	NYN	NL	0.6666667	1.3546713	1980
## 714	1986	OAK	AL	0.4691358	0.9618421	1980
## 715	1986	PHI	NL	0.5341615	1.0364656	1980
## 716	1986	PIT	NL	0.3950617	0.9471429	1980
## 717	1986	SDN	NL	0.4567901	0.9073306	1980
## 718	1986	SEA	AL	0.4135802	0.8598802	1980
## 719	1986	SFN	NL	0.5123457	1.1294498	1980
## 720	1986	SLN	NL	0.4906832	0.9836334	1980
## 721	1986	TEX	AL	0.5370370	1.0376851	1980
## 722	1986	TOR	AL	0.5308642	1.1036835	1980
## 723	1987	ATL	NL	0.4285714	0.9010856	1980
## 724	1987	BAL	AL	0.4135802	0.8284091	1980
## 725	1987	BOS	AL	0.4814815	1.0206061	1980
## 726	1987	CAL	AL	0.4629630	0.9589041	1980
## 727	1987	CHA	AL	0.4753086	1.0026810	1980
## 728	1987	CHN	NL	0.4720497	0.8988764	1980
## 729	1987	CIN	NL	0.5185185	1.0412234	1980
## 730	1987	CLE	AL	0.3765432	0.7753396	1980
## 731	1987	DET	AL	0.6049383	1.2190476	1980
## 732	1987	HOU	NL	0.4691358	0.9557522	1980
## 733	1987	KCA	AL	0.5123457	1.0347323	1980
## 734	1987	LAN	NL	0.4506173	0.9407407	1980
## 735	1987	MIN	AL	0.5246914	0.9751861	1980
## 736	1987	ML4	AL	0.5617284	1.0550796	1980

## 737	1987	MON	NL	0.5617284	1.0291667	1980
## 738	1987	NYA	AL	0.5493827	1.0395778	1980
## 739	1987	NYN	NL	0.5679012	1.1790831	1980
## 740	1987	OAK	AL	0.5000000	1.0215463	1980
## 741	1987	PHI	NL	0.4938272	0.9372497	1980
## 742	1987	PIT	NL	0.4938272	0.9717742	1980
## 743	1987	SDN	NL	0.4012346	0.8754915	1980
## 744	1987	SEA	AL	0.4814815	0.9488140	1980
## 745	1987	SFN	NL	0.5555556	1.1704036	1980
## 746	1987	SLN	NL	0.5864198	1.1515152	1980
## 747	1987	TEX	AL	0.4629630	0.9693757	1980
## 748	1987	TOR	AL	0.5925926	1.2900763	1980
## 749	1988	ATL	NL	0.3375000	0.7489879	1980
## 750	1988	BAL	AL	0.3354037	0.6970849	1980
## 751	1988	BOS	AL	0.5493827	1.1799710	1980
## 752	1988	CAL	AL	0.4629630	0.9260700	1980
## 753	1988	CHA	AL	0.4409938	0.8335535	1980
## 754	1988	CHN	NL	0.4753086	0.9510086	1980
## 755	1988	CIN	NL	0.5403727	1.0755034	1980
## 756	1988	CLE	AL	0.4814815	0.9110807	1980
## 757	1988	DET	AL	0.5432099	1.0683891	1980
## 758	1988	HOU	NL	0.5061728	0.9778130	1980
## 759	1988	KCA	AL	0.5217391	1.0864198	1980
## 760	1988	LAN	NL	0.5838509	1.1544118	1980
## 761	1988	MIN	AL	0.5617284	1.1294643	1980
## 762	1988	ML4	AL	0.5370370	1.1071429	1980
## 763	1988	MON	NL	0.5000000	1.0608108	1980
## 764	1988	NYA	AL	0.5279503	1.0320856	1980
## 765	1988	NYN	NL	0.6250000	1.3214286	1980
## 766	1988	OAK	AL	0.6419753	1.2903226	1980
## 767	1988	PHI	NL	0.4037267	0.8133515	1980
## 768	1988	PIT	NL	0.5312500	1.0568182	1980
## 769	1988	SDN	NL	0.5155280	1.0188679	1980
## 770	1988	SEA	AL	0.4223602	0.8924731	1980
## 771	1988	SFN	NL	0.5123457	1.0702875	1980
## 772	1988	SLN	NL	0.4691358	0.9131122	1980
## 773	1988	TEX	AL	0.4347826	0.8666667	1980
## 774	1988	TOR	AL	0.5370370	1.1220588	1980
## 775	1989	ATL	NL	0.3937500	0.8588235	1980
## 776	1989	BAL	AL	0.5370370	1.0320700	1980
## 777	1989	BOS	AL	0.5123457	1.0530612	1980
## 778	1989	CAL	AL	0.5617284	1.1574394	1980
## 779	1989	CHA	AL	0.4285714	0.9240000	1980
## 780	1989	CHN	NL	0.5740741	1.1268058	1980
## 781	1989	CIN	NL	0.4629630	0.9146165	1980
## 782	1989	CLE	AL	0.4506173	0.9235474	1980
## 783	1989	DET	AL	0.3641975	0.7561275	1980
## 784	1989	HOU	NL	0.5308642	0.9671151	1980
## 785	1989	KCA	AL	0.5679012	1.0866142	1980
## 786	1989	LAN	NL	0.4812500	1.0335821	1980
## 787	1989	MIN	AL	0.4938272	1.0027100	1980
## 788	1989	ML4	AL	0.5000000	1.0412371	1980
## 789	1989	MON	NL	0.5000000	1.0031746	1980
## 790	1989	NYA	AL	0.4596273	0.8813131	1980

## 791	1989	NYN	NL	0.5370370	1.1478992	1980
## 792	1989	OAK	AL	0.6111111	1.2361111	1980
## 793	1989	PHI	NL	0.4135802	0.8557823	1980
## 794	1989	PIT	NL	0.4567901	0.9367647	1980
## 795	1989	SDN	NL	0.5493827	1.0255591	1980
## 796	1989	SEA	AL	0.4506173	0.9532967	1980
## 797	1989	SFN	NL	0.5679012	1.1650000	1980
## 798	1989	SLN	NL	0.5308642	1.0394737	1980
## 799	1989	TEX	AL	0.5123457	0.9733894	1980
## 800	1989	TOR	AL	0.5493827	1.1228879	1980
## 801	1990	ATL	NL	0.4012346	0.8306943	1990
## 802	1990	BAL	AL	0.4720497	0.9584527	1990
## 803	1990	BOS	AL	0.5432099	1.0527108	1990
## 804	1990	CAL	AL	0.4938272	0.9773371	1990
## 805	1990	CHA	AL	0.5802469	1.0774092	1990
## 806	1990	CHN	NL	0.4753086	0.8914729	1990
## 807	1990	CIN	NL	0.5617284	1.1608040	1990
## 808	1990	CLE	AL	0.4753086	0.9932157	1990
## 809	1990	DET	AL	0.4876543	0.9946950	1990
## 810	1990	HOU	NL	0.4629630	0.8734756	1990
## 811	1990	KCA	AL	0.4658385	0.9971791	1990
## 812	1990	LAN	NL	0.5308642	1.0627737	1990
## 813	1990	MIN	AL	0.4567901	0.9135802	1990
## 814	1990	ML4	AL	0.4567901	0.9631579	1990
## 815	1990	MON	NL	0.5246914	1.1070234	1990
## 816	1990	NYA	AL	0.4135802	0.8050734	1990
## 817	1990	NYN	NL	0.5617284	1.2642741	1990
## 818	1990	OAK	AL	0.6358025	1.2859649	1990
## 819	1990	PHI	NL	0.4753086	0.8861454	1990
## 820	1990	PIT	NL	0.5864198	1.1841680	1990
## 821	1990	SDN	NL	0.4629630	1.0000000	1990
## 822	1990	SEA	AL	0.4753086	0.9411765	1990
## 823	1990	SFN	NL	0.5246914	1.0126761	1990
## 824	1990	SLN	NL	0.4320988	0.8581662	1990
## 825	1990	TEX	AL	0.5123457	0.9712644	1990
## 826	1990	TOR	AL	0.5308642	1.1603631	1990
## 827	1991	ATL	NL	0.5802469	1.1630435	1990
## 828	1991	BAL	AL	0.4135802	0.8618090	1990
## 829	1991	BOS	AL	0.5185185	1.0266854	1990
## 830	1991	CAL	AL	0.5000000	1.0061633	1990
## 831	1991	CHA	AL	0.5370370	1.1130690	1990
## 832	1991	CHN	NL	0.4812500	0.9468665	1990
## 833	1991	CIN	NL	0.4567901	0.9971056	1990
## 834	1991	CLE	AL	0.3518519	0.7588933	1990
## 835	1991	DET	AL	0.5185185	1.0289673	1990
## 836	1991	HOU	NL	0.4012346	0.8437936	1990
## 837	1991	KCA	AL	0.5061728	1.0069252	1990
## 838	1991	LAN	NL	0.5740741	1.1769912	1990
## 839	1991	MIN	AL	0.5864198	1.1901840	1990
## 840	1991	ML4	AL	0.5123457	1.0739247	1990
## 841	1991	MON	NL	0.4409938	0.8839695	1990
## 842	1991	NYA	AL	0.4382716	0.8674389	1990
## 843	1991	NYN	NL	0.4782609	0.9907121	1990
## 844	1991	OAK	AL	0.5185185	0.9793814	1990

## 845	1991	PHI	NL	0.4814815	0.9250000	1990
## 846	1991	PIT	NL	0.6049383	1.2151899	1990
## 847	1991	SDN	NL	0.5185185	0.9845201	1990
## 848	1991	SEA	AL	0.5123457	1.0415430	1990
## 849	1991	SFN	NL	0.4629630	0.9311334	1990
## 850	1991	SLN	NL	0.5185185	1.0046296	1990
## 851	1991	TEX	AL	0.5246914	1.0184275	1990
## 852	1991	TOR	AL	0.5617284	1.0996785	1990
## 853	1992	ATL	NL	0.6049383	1.1985940	1990
## 854	1992	BAL	AL	0.5493827	1.0746951	1990
## 855	1992	BOS	AL	0.4506173	0.8953662	1990
## 856	1992	CAL	AL	0.4444444	0.8628912	1990
## 857	1992	CHA	AL	0.5308642	1.0695652	1990
## 858	1992	CHN	NL	0.4814815	0.9503205	1990
## 859	1992	CIN	NL	0.5555556	1.0837438	1990
## 860	1992	CLE	AL	0.4691358	0.9034853	1990
## 861	1992	DET	AL	0.4629630	0.9962217	1990
## 862	1992	HOU	NL	0.5000000	0.9101796	1990
## 863	1992	KCA	AL	0.4444444	0.9145427	1990
## 864	1992	LAN	NL	0.3888889	0.8616352	1990
## 865	1992	MIN	AL	0.5555556	1.1439510	1990
## 866	1992	ML4	AL	0.5679012	1.2251656	1990
## 867	1992	MON	NL	0.5370370	1.1153184	1990
## 868	1992	NYA	AL	0.4691358	0.9825737	1990
## 869	1992	NYN	NL	0.4444444	0.9173047	1990
## 870	1992	OAK	AL	0.5925926	1.1086310	1990
## 871	1992	PHI	NL	0.4320988	0.9567643	1990
## 872	1992	PIT	NL	0.5925926	1.1647059	1990
## 873	1992	SDN	NL	0.5061728	0.9701258	1990
## 874	1992	SEA	AL	0.3950617	0.8498123	1990
## 875	1992	SFN	NL	0.4444444	0.8871716	1990
## 876	1992	SLN	NL	0.5123457	1.0447020	1990
## 877	1992	TEX	AL	0.4753086	0.9057105	1990
## 878	1992	TOR	AL	0.5925926	1.1436950	1990
## 879	1993	ATL	NL	0.6419753	1.3720930	1990
## 880	1993	BAL	AL	0.5246914	1.0550336	1990
## 881	1993	BOS	AL	0.4938272	0.9828080	1990
## 882	1993	CAL	AL	0.4382716	0.8883117	1990
## 883	1993	CHA	AL	0.5802469	1.1686747	1990
## 884	1993	CHN	NL	0.5185185	0.9986468	1990
## 885	1993	CIN	NL	0.4506173	0.9197452	1990
## 886	1993	CLE	AL	0.4691358	0.9717097	1990
## 887	1993	COL	NL	0.4135802	0.7838676	1990
## 888	1993	DET	AL	0.5246914	1.0740741	1990
## 889	1993	FLO	NL	0.3950617	0.8024862	1990
## 890	1993	HOU	NL	0.5246914	1.1365079	1990
## 891	1993	KCA	AL	0.5185185	0.9726225	1990
## 892	1993	LAN	NL	0.5000000	1.0196375	1990
## 893	1993	MIN	AL	0.4382716	0.8349398	1990
## 894	1993	ML4	AL	0.4259259	0.9255051	1990
## 895	1993	MON	NL	0.5802469	1.0733138	1990
## 896	1993	NYA	AL	0.5432099	1.0788436	1990
## 897	1993	NYN	NL	0.3641975	0.9032258	1990
## 898	1993	OAK	AL	0.4197531	0.8451537	1990

## 899	1993	PHI	NL	0.5987654	1.1851351	1990
## 900	1993	PIT	NL	0.4629630	0.8771712	1990
## 901	1993	SDN	NL	0.3765432	0.8795337	1990
## 902	1993	SEA	AL	0.5061728	1.0041040	1990
## 903	1993	SFN	NL	0.6358025	1.2704403	1990
## 904	1993	SLN	NL	0.5370370	1.0188172	1990
## 905	1993	TEX	AL	0.5308642	1.1118509	1990
## 906	1993	TOR	AL	0.5864198	1.1415094	1990
## 907	1994	ATL	NL	0.5964912	1.2098214	1990
## 908	1994	BAL	AL	0.5625000	1.1851107	1990
## 909	1994	BOS	AL	0.4695652	0.8888889	1990
## 910	1994	CAL	AL	0.4086957	0.8227273	1990
## 911	1994	CHA	AL	0.5929204	1.2710843	1990
## 912	1994	CHN	NL	0.4336283	0.9107468	1990
## 913	1994	CIN	NL	0.5789474	1.2428571	1990
## 914	1994	CLE	AL	0.5840708	1.2081851	1990
## 915	1994	COL	NL	0.4529915	0.8981191	1990
## 916	1994	DET	AL	0.4608696	0.9716841	1990
## 917	1994	FLO	NL	0.4434783	0.8125000	1990
## 918	1994	HOU	NL	0.5739130	1.1968191	1990
## 919	1994	KCA	AL	0.5565217	1.0789474	1990
## 920	1994	LAN	NL	0.5087719	1.0451866	1990
## 921	1994	MIN	AL	0.4690265	0.8633721	1990
## 922	1994	ML4	AL	0.4608696	0.9334471	1990
## 923	1994	MON	NL	0.6491228	1.2885463	1990
## 924	1994	NYA	AL	0.6194690	1.2546816	1990
## 925	1994	NYN	NL	0.4867257	0.9619772	1990
## 926	1994	OAK	AL	0.4473684	0.9320883	1990
## 927	1994	PHI	NL	0.4695652	1.0482897	1990
## 928	1994	PIT	NL	0.4649123	0.8034483	1990
## 929	1994	SDN	NL	0.4017094	0.9020716	1990
## 930	1994	SEA	AL	0.4375000	0.9237013	1990
## 931	1994	SFN	NL	0.4782609	1.0080000	1990
## 932	1994	SLN	NL	0.4649123	0.8615137	1990
## 933	1994	TEX	AL	0.4561404	0.8794835	1990
## 934	1994	TOR	AL	0.4782609	0.9775475	1990
## 935	1995	ATL	NL	0.6250000	1.1944444	1990
## 936	1995	BAL	AL	0.4930556	1.1000000	1990
## 937	1995	BOS	AL	0.5972222	1.1332378	1990
## 938	1995	CAL	AL	0.5379310	1.1492109	1990
## 939	1995	CHA	AL	0.4722222	0.9960422	1990
## 940	1995	CHN	NL	0.5069444	1.0327869	1990
## 941	1995	CIN	NL	0.5902778	1.1990369	1990
## 942	1995	CLE	AL	0.6944444	1.3838550	1990
## 943	1995	COL	NL	0.5347222	1.0025543	1990
## 944	1995	DET	AL	0.4166667	0.7748815	1990
## 945	1995	FLO	NL	0.4685315	1.0000000	1990
## 946	1995	HOU	NL	0.5277778	1.1083086	1990
## 947	1995	KCA	AL	0.4861111	0.9102750	1990
## 948	1995	LAN	NL	0.5416667	1.0410509	1990
## 949	1995	MIN	AL	0.3888889	0.7907762	1990
## 950	1995	ML4	AL	0.4513889	0.9906292	1990
## 951	1995	MON	NL	0.4583333	0.9733542	1990
## 952	1995	NYA	AL	0.5486111	1.0886628	1990

## 953	1995	NYN	NL	0.4791667	1.0631068	1990
## 954	1995	OAK	AL	0.4652778	0.9592641	1990
## 955	1995	PHI	NL	0.4791667	0.9346505	1990
## 956	1995	PIT	NL	0.4027778	0.8546196	1990
## 957	1995	SDN	NL	0.4861111	0.9940476	1990
## 958	1995	SEA	AL	0.5448276	1.1242938	1990
## 959	1995	SFN	NL	0.4652778	0.8402062	1990
## 960	1995	SLN	NL	0.4335664	0.8556231	1990
## 961	1995	TEX	AL	0.5138889	0.9597222	1990
## 962	1995	TOR	AL	0.3888889	0.8262548	1990
## 963	1996	ATL	NL	0.5925926	1.1929012	1990
## 964	1996	BAL	AL	0.5432099	1.0509413	1990
## 965	1996	BOS	AL	0.5246914	1.0076004	1990
## 966	1996	CAL	AL	0.4347826	0.8080594	1990
## 967	1996	CHA	AL	0.5246914	1.1309824	1990
## 968	1996	CHN	NL	0.4691358	1.0012970	1990
## 969	1996	CIN	NL	0.5000000	1.0064683	1990
## 970	1996	CLE	AL	0.6149068	1.2379714	1990
## 971	1996	COL	NL	0.5123457	0.9968880	1990
## 972	1996	DET	AL	0.3271605	0.7098821	1990
## 973	1996	FLO	NL	0.4938272	0.9786629	1990
## 974	1996	HOU	NL	0.5061728	0.9507576	1990
## 975	1996	KCA	AL	0.4658385	0.9491094	1990
## 976	1996	LAN	NL	0.5555556	1.0782209	1990
## 977	1996	MIN	AL	0.4814815	0.9744444	1990
## 978	1996	ML4	AL	0.4938272	0.9944383	1990
## 979	1996	MON	NL	0.5432099	1.1092814	1990
## 980	1996	NYA	AL	0.5679012	1.1067344	1990
## 981	1996	NYN	NL	0.4382716	0.9576380	1990
## 982	1996	OAK	AL	0.4814815	0.9566667	1990
## 983	1996	PHI	NL	0.4135802	0.8227848	1990
## 984	1996	PIT	NL	0.4506173	0.9315726	1990
## 985	1996	SDN	NL	0.5617284	1.1304985	1990
## 986	1996	SEA	AL	0.5279503	1.1094972	1990
## 987	1996	SFN	NL	0.4197531	0.8723898	1990
## 988	1996	SLN	NL	0.5432099	1.0750708	1990
## 989	1996	TEX	AL	0.5555556	1.1614518	1990
## 990	1996	TOR	AL	0.4567901	0.9468480	1990
## 991	1997	ANA	AL	0.5185185	1.0440806	1990
## 992	1997	ATL	NL	0.6234568	1.3614458	1990
## 993	1997	BAL	AL	0.6049383	1.1923642	1990
## 994	1997	BOS	AL	0.4814815	0.9929988	1990
## 995	1997	CHA	AL	0.4968944	0.9351741	1990
## 996	1997	CHN	NL	0.4197531	0.9051383	1990
## 997	1997	CIN	NL	0.4691358	0.8520942	1990
## 998	1997	CLE	AL	0.5341615	1.0650307	1990
## 999	1997	COL	NL	0.5123457	1.0165198	1990
## 1000	1997	DET	AL	0.4876543	0.9924051	1990
## 1001	1997	FLO	NL	0.5679012	1.1061286	1990
## 1002	1997	HOU	NL	0.5185185	1.1772727	1990
## 1003	1997	KCA	AL	0.4161491	0.9109756	1990
## 1004	1997	LAN	NL	0.5432099	1.1503876	1990
## 1005	1997	MIN	AL	0.4197531	0.8966318	1990
## 1006	1997	ML4	AL	0.4844720	0.9177898	1990

##	1007	1997	MON	NL	0.4814815	0.9337838	1990
##	1008	1997	NYA	AL	0.5925926	1.2950581	1990
##	1009	1997	NYN	NL	0.5432099	1.0959097	1990
##	1010	1997	OAK	AL	0.4012346	0.8076110	1990
##	1011	1997	PHI	NL	0.4197531	0.7952381	1990
##	1012	1997	PIT	NL	0.4876543	0.9539474	1990
##	1013	1997	SDN	NL	0.4691358	0.8922559	1990
##	1014	1997	SEA	AL	0.5555556	1.1104442	1990
##	1015	1997	SFN	NL	0.5555556	0.9886507	1990
##	1016	1997	SLN	NL	0.4506173	0.9731638	1990
##	1017	1997	TEX	AL	0.4753086	0.9805589	1990
##	1018	1997	TOR	AL	0.4691358	0.9423631	1990
##	1019	1998	ANA	AL	0.5246914	1.0051086	1990
##	1020	1998	ARI	NL	0.4012346	0.8189655	1990
##	1021	1998	ATL	NL	0.6543210	1.4216867	1990
##	1022	1998	BAL	AL	0.4876543	1.0407643	1990
##	1023	1998	BOS	AL	0.5679012	1.2016461	1990
##	1024	1998	CHA	AL	0.4938272	0.9248120	1990
##	1025	1998	CHN	NL	0.5521472	1.0492424	1990
##	1026	1998	CIN	NL	0.4753086	0.9868421	1990
##	1027	1998	CLE	AL	0.5493827	1.0911425	1990
##	1028	1998	COL	NL	0.4753086	0.9660819	1990
##	1029	1998	DET	AL	0.4012346	0.8366165	1990
##	1030	1998	FLO	NL	0.3333333	0.7226436	1990
##	1031	1998	HOU	NL	0.6296296	1.4096774	1990
##	1032	1998	KCA	AL	0.4472050	0.7942158	1990
##	1033	1998	LAN	NL	0.5123457	0.9867257	1990
##	1034	1998	MIL	NL	0.4567901	0.8706897	1990
##	1035	1998	MIN	AL	0.4320988	0.8973105	1990
##	1036	1998	MON	NL	0.4012346	0.8224777	1990
##	1037	1998	NYA	AL	0.7037037	1.4710366	1990
##	1038	1998	NYN	NL	0.5432099	1.0945736	1990
##	1039	1998	OAK	AL	0.4567901	0.9284065	1990
##	1040	1998	PHI	NL	0.4629630	0.8824257	1990
##	1041	1998	PIT	NL	0.4259259	0.9052925	1990
##	1042	1998	SDN	NL	0.6049383	1.1795276	1990
##	1043	1998	SEA	AL	0.4720497	1.0046784	1990
##	1044	1998	SFN	NL	0.5460123	1.1434371	1990
##	1045	1998	SLN	NL	0.5123457	1.0358056	1990
##	1046	1998	TBA	AL	0.3888889	0.8255659	1990
##	1047	1998	TEX	AL	0.5432099	1.0792193	1990
##	1048	1998	TOR	AL	0.5432099	1.0625000	1990
##	1049	1999	ANA	AL	0.4320988	0.8607748	1990
##	1050	1999	ARI	NL	0.6172840	1.3431953	1990
##	1051	1999	ATL	NL	0.6358025	1.2708018	1990
##	1052	1999	BAL	AL	0.4814815	1.0441718	1990
##	1053	1999	BOS	AL	0.5802469	1.1643454	1990
##	1054	1999	CHA	AL	0.4658385	0.8931034	1990
##	1055	1999	CHN	NL	0.4135802	0.8119565	1990
##	1056	1999	CIN	NL	0.5889571	1.2165963	1990
##	1057	1999	CLE	AL	0.5987654	1.1732558	1990
##	1058	1999	COL	NL	0.4444444	0.8813230	1990
##	1059	1999	DET	AL	0.4285714	0.8469388	1990
##	1060	1999	FLO	NL	0.3950617	0.8110329	1990

##	1061	1999	HOU	NL	0.5987654	1.2192593	1990
##	1062	1999	KCA	AL	0.3975155	0.9294245	1990
##	1063	1999	LAN	NL	0.4753086	1.0076239	1990
##	1064	1999	MIL	NL	0.4596273	0.9198646	1990
##	1065	1999	MIN	AL	0.3937500	0.8118343	1990
##	1066	1999	MON	NL	0.4197531	0.8417351	1990
##	1067	1999	NYA	AL	0.6049383	1.2311902	1990
##	1068	1999	NYN	NL	0.5950920	1.1997187	1990
##	1069	1999	OAK	AL	0.5370370	1.0555556	1990
##	1070	1999	PHI	NL	0.4753086	0.9940898	1990
##	1071	1999	PIT	NL	0.4844720	0.9910486	1990
##	1072	1999	SDN	NL	0.4567901	0.9090909	1990
##	1073	1999	SEA	AL	0.4876543	0.9491713	1990
##	1074	1999	SFN	NL	0.5308642	1.0493381	1990
##	1075	1999	SLN	NL	0.4658385	0.9653938	1990
##	1076	1999	TBA	AL	0.4259259	0.8455641	1990
##	1077	1999	TEX	AL	0.5864198	1.1001164	1990
##	1078	1999	TOR	AL	0.5185185	1.0243619	1990
##	1079	2000	ANA	AL	0.5061728	0.9942463	2000
##	1080	2000	ARI	NL	0.5246914	1.0503979	2000
##	1081	2000	ATL	NL	0.5864198	1.1344538	2000
##	1082	2000	BAL	AL	0.4567901	0.8696605	2000
##	1083	2000	BOS	AL	0.5246914	1.0630872	2000
##	1084	2000	CHA	AL	0.5864198	1.1656734	2000
##	1085	2000	CHN	NL	0.4012346	0.8451327	2000
##	1086	2000	CIN	NL	0.5246914	1.0784314	2000
##	1087	2000	CLE	AL	0.5555556	1.1642157	2000
##	1088	2000	COL	NL	0.5061728	1.0791527	2000
##	1089	2000	DET	AL	0.4876543	0.9951632	2000
##	1090	2000	FLO	NL	0.4906832	0.9171895	2000
##	1091	2000	HOU	NL	0.4444444	0.9936441	2000
##	1092	2000	KCA	AL	0.4753086	0.9451613	2000
##	1093	2000	LAN	NL	0.5308642	1.0946502	2000
##	1094	2000	MIL	NL	0.4506173	0.8958838	2000
##	1095	2000	MIN	AL	0.4259259	0.8500000	2000
##	1096	2000	MON	NL	0.4135802	0.8181818	2000
##	1097	2000	NYA	AL	0.5403727	1.0700246	2000
##	1098	2000	NYN	NL	0.5802469	1.0934959	2000
##	1099	2000	OAK	AL	0.5652174	1.1648216	2000
##	1100	2000	PHI	NL	0.4012346	0.8530120	2000
##	1101	2000	PIT	NL	0.4259259	0.8930180	2000
##	1102	2000	SDN	NL	0.4691358	0.9226994	2000
##	1103	2000	SEA	AL	0.5617284	1.1628205	2000
##	1104	2000	SFN	NL	0.5987654	1.2382865	2000
##	1105	2000	SLN	NL	0.5864198	1.1504540	2000
##	1106	2000	TBA	AL	0.4285714	0.8705463	2000
##	1107	2000	TEX	AL	0.4382716	0.8706366	2000
##	1108	2000	TOR	AL	0.5123457	0.9482379	2000
##	1109	2001	ANA	AL	0.4629630	0.9465753	2000
##	1110	2001	ARI	NL	0.5679012	1.2082718	2000
##	1111	2001	ATL	NL	0.5432099	1.1337481	2000
##	1112	2001	BAL	AL	0.3913043	0.8287093	2000
##	1113	2001	BOS	AL	0.5093168	1.0362416	2000
##	1114	2001	CHA	AL	0.5123457	1.0037736	2000

##	1115	2001	CHN	NL	0.5432099	1.1084165	2000
##	1116	2001	CIN	NL	0.4074074	0.8647059	2000
##	1117	2001	CLE	AL	0.5617284	1.0925700	2000
##	1118	2001	COL	NL	0.4506173	1.0187638	2000
##	1119	2001	DET	AL	0.4074074	0.8264840	2000
##	1120	2001	FLO	NL	0.4691358	0.9973118	2000
##	1121	2001	HOU	NL	0.5740741	1.1014304	2000
##	1122	2001	KCA	AL	0.4012346	0.8496503	2000
##	1123	2001	LAN	NL	0.5308642	1.0188172	2000
##	1124	2001	MIL	NL	0.4197531	0.9181141	2000
##	1125	2001	MIN	AL	0.5246914	1.0065274	2000
##	1126	2001	MON	NL	0.4197531	0.8251232	2000
##	1127	2001	NYA	AL	0.5937500	1.1276297	2000
##	1128	2001	NYN	NL	0.5061728	0.9004208	2000
##	1129	2001	OAK	AL	0.6296296	1.3705426	2000
##	1130	2001	PHI	NL	0.5308642	1.0375522	2000
##	1131	2001	PIT	NL	0.3827160	0.7657343	2000
##	1132	2001	SDN	NL	0.4876543	0.9716749	2000
##	1133	2001	SEA	AL	0.7160494	1.4784689	2000
##	1134	2001	SFN	NL	0.5555556	1.0681818	2000
##	1135	2001	SLN	NL	0.5740741	1.1900585	2000
##	1136	2001	TBA	AL	0.3827160	0.7576099	2000
##	1137	2001	TEX	AL	0.4506173	0.9194215	2000
##	1138	2001	TOR	AL	0.4938272	1.0185923	2000
##	1139	2002	ANA	AL	0.6111111	1.3214286	2000
##	1140	2002	ARI	NL	0.6049383	1.2151335	2000
##	1141	2002	ATL	NL	0.6312500	1.2530973	2000
##	1142	2002	BAL	AL	0.4135802	0.8628719	2000
##	1143	2002	BOS	AL	0.5740741	1.2917293	2000
##	1144	2002	CHA	AL	0.5000000	1.0726817	2000
##	1145	2002	CHN	NL	0.4135802	0.9301713	2000
##	1146	2002	CIN	NL	0.4814815	0.9160207	2000
##	1147	2002	CLE	AL	0.4567901	0.8829152	2000
##	1148	2002	COL	NL	0.4506173	0.8663697	2000
##	1149	2002	DET	AL	0.3416149	0.6655093	2000
##	1150	2002	FLO	NL	0.4876543	0.9161206	2000
##	1151	2002	HOU	NL	0.5185185	1.0776978	2000
##	1152	2002	KCA	AL	0.3827160	0.8271605	2000
##	1153	2002	LAN	NL	0.5679012	1.1088647	2000
##	1154	2002	MIL	NL	0.3456790	0.7637028	2000
##	1155	2002	MIN	AL	0.5838509	1.0786517	2000
##	1156	2002	MON	NL	0.5123457	1.0236769	2000
##	1157	2002	NYA	AL	0.6397516	1.2869440	2000
##	1158	2002	NYN	NL	0.4658385	0.9815078	2000
##	1159	2002	OAK	AL	0.6358025	1.2232416	2000
##	1160	2002	PHI	NL	0.4968944	0.9806630	2000
##	1161	2002	PIT	NL	0.4472050	0.8780822	2000
##	1162	2002	SDN	NL	0.4074074	0.8122699	2000
##	1163	2002	SEA	AL	0.5740741	1.1645207	2000
##	1164	2002	SFN	NL	0.5900621	1.2711039	2000
##	1165	2002	SLN	NL	0.5987654	1.2145062	2000
##	1166	2002	TBA	AL	0.3416149	0.7331155	2000
##	1167	2002	TEX	AL	0.4444444	0.9557823	2000
##	1168	2002	TOR	AL	0.4814815	0.9818841	2000

##	1169	2003	ANA	AL	0.4753086	0.9905787	2000
##	1170	2003	ARI	NL	0.5185185	1.0467153	2000
##	1171	2003	ATL	NL	0.6234568	1.2256757	2000
##	1172	2003	BAL	AL	0.4382716	0.9060976	2000
##	1173	2003	BOS	AL	0.5864198	1.1878863	2000
##	1174	2003	CHA	AL	0.5308642	1.1062937	2000
##	1175	2003	CHN	NL	0.5432099	1.0600293	2000
##	1176	2003	CIN	NL	0.4259259	0.7832957	2000
##	1177	2003	CLE	AL	0.4197531	0.8984576	2000
##	1178	2003	COL	NL	0.4567901	0.9562780	2000
##	1179	2003	DET	AL	0.2654321	0.6368534	2000
##	1180	2003	FLO	NL	0.5617284	1.0852601	2000
##	1181	2003	HOU	NL	0.5370370	1.1890694	2000
##	1182	2003	KCA	AL	0.5123457	0.9642445	2000
##	1183	2003	LAN	NL	0.5246914	1.0323741	2000
##	1184	2003	MIL	NL	0.4197531	0.8178694	2000
##	1185	2003	MIN	AL	0.5555556	1.0567282	2000
##	1186	2003	MON	NL	0.5123457	0.9930168	2000
##	1187	2003	NYA	AL	0.6234568	1.2248603	2000
##	1188	2003	NYN	NL	0.4099379	0.8514589	2000
##	1189	2003	OAK	AL	0.5925926	1.1944012	2000
##	1190	2003	PHI	NL	0.5308642	1.1348637	2000
##	1191	2003	PIT	NL	0.4629630	0.9400749	2000
##	1192	2003	SDN	NL	0.3950617	0.8158845	2000
##	1193	2003	SEA	AL	0.5740741	1.2480377	2000
##	1194	2003	SFN	NL	0.6211180	1.1833856	2000
##	1195	2003	SLN	NL	0.5246914	1.1005025	2000
##	1196	2003	TBA	AL	0.3888889	0.8392019	2000
##	1197	2003	TEX	AL	0.4382716	0.8524252	2000
##	1198	2003	TOR	AL	0.5308642	1.0823245	2000
##	1199	2004	ANA	AL	0.5679012	1.1389646	2000
##	1200	2004	ARI	NL	0.3148148	0.6840934	2000
##	1201	2004	ATL	NL	0.5925926	1.2020958	2000
##	1202	2004	BAL	AL	0.4814815	1.0144578	2000
##	1203	2004	BOS	AL	0.6049383	1.2356771	2000
##	1204	2004	CHA	AL	0.5123457	1.0409146	2000
##	1205	2004	CHN	NL	0.5493827	1.1864662	2000
##	1206	2004	CIN	NL	0.4691358	0.8269019	2000
##	1207	2004	CLE	AL	0.4938272	1.0011669	2000
##	1208	2004	COL	NL	0.4197531	0.9024919	2000
##	1209	2004	DET	AL	0.4444444	0.9798578	2000
##	1210	2004	FLO	NL	0.5123457	1.0257143	2000
##	1211	2004	HOU	NL	0.5679012	1.1504298	2000
##	1212	2004	KCA	AL	0.3580247	0.7955801	2000
##	1213	2004	LAN	NL	0.5740741	1.1125731	2000
##	1214	2004	MIL	NL	0.4161491	0.8375165	2000
##	1215	2004	MIN	AL	0.5679012	1.0909091	2000
##	1216	2004	MON	NL	0.4135802	0.8257477	2000
##	1217	2004	NYA	AL	0.6234568	1.1101485	2000
##	1218	2004	NYN	NL	0.4382716	0.9357045	2000
##	1219	2004	OAK	AL	0.5617284	1.0687332	2000
##	1220	2004	PHI	NL	0.5308642	1.0755442	2000
##	1221	2004	PIT	NL	0.4472050	0.9139785	2000
##	1222	2004	SDN	NL	0.5370370	1.0893617	2000

##	1223	2004	SEA	AL	0.3888889	0.8481166	2000
##	1224	2004	SFN	NL	0.5617284	1.1038961	2000
##	1225	2004	SLN	NL	0.6481481	1.2974203	2000
##	1226	2004	TBA	AL	0.4347826	0.8479810	2000
##	1227	2004	TEX	AL	0.5493827	1.0831234	2000
##	1228	2004	TOR	AL	0.4161491	0.8736330	2000
##	1229	2005	ARI	NL	0.4753086	0.8130841	2000
##	1230	2005	ATL	NL	0.5555556	1.1409496	2000
##	1231	2005	BAL	AL	0.4567901	0.9112500	2000
##	1232	2005	BOS	AL	0.5864198	1.1304348	2000
##	1233	2005	CHA	AL	0.6111111	1.1488372	2000
##	1234	2005	CHN	NL	0.4876543	0.9845938	2000
##	1235	2005	CIN	NL	0.4506173	0.9223847	2000
##	1236	2005	CLE	AL	0.5740741	1.2305296	2000
##	1237	2005	COL	NL	0.4135802	0.8584687	2000
##	1238	2005	DET	AL	0.4382716	0.9186785	2000
##	1239	2005	FLO	NL	0.5123457	0.9795082	2000
##	1240	2005	HOU	NL	0.5493827	1.1379310	2000
##	1241	2005	KCA	AL	0.3456790	0.7497326	2000
##	1242	2005	LAA	AL	0.5864198	1.1835148	2000
##	1243	2005	LAN	NL	0.4382716	0.9072848	2000
##	1244	2005	MIL	NL	0.5000000	1.0416069	2000
##	1245	2005	MIN	AL	0.5123457	1.0392749	2000
##	1246	2005	NYA	AL	0.5864198	1.1229404	2000
##	1247	2005	NYN	NL	0.5123457	1.1141975	2000
##	1248	2005	OAK	AL	0.5432099	1.1732523	2000
##	1249	2005	PHI	NL	0.5432099	1.1115702	2000
##	1250	2005	PIT	NL	0.4135802	0.8842653	2000
##	1251	2005	SDN	NL	0.5061728	0.9421488	2000
##	1252	2005	SEA	AL	0.4259259	0.9307590	2000
##	1253	2005	SFN	NL	0.4629630	0.8711409	2000
##	1254	2005	SLN	NL	0.6172840	1.2697161	2000
##	1255	2005	TBA	AL	0.4135802	0.8012821	2000
##	1256	2005	TEX	AL	0.4876543	1.0081585	2000
##	1257	2005	TOR	AL	0.4938272	1.0992908	2000
##	1258	2005	WAS	NL	0.5000000	0.9494799	2000
##	1259	2006	ARI	NL	0.4691358	0.9809645	2000
##	1260	2006	ATL	NL	0.4876543	1.0546584	2000
##	1261	2006	BAL	AL	0.4320988	0.8542825	2000
##	1262	2006	BOS	AL	0.5308642	0.9939394	2000
##	1263	2006	CHA	AL	0.5555556	1.0931990	2000
##	1264	2006	CHN	NL	0.4074074	0.8585132	2000
##	1265	2006	CIN	NL	0.4938272	0.9350811	2000
##	1266	2006	CLE	AL	0.4814815	1.1125320	2000
##	1267	2006	COL	NL	0.4691358	1.0012315	2000
##	1268	2006	DET	AL	0.5864198	1.2177778	2000
##	1269	2006	FLO	NL	0.4814815	0.9818653	2000
##	1270	2006	HOU	NL	0.5061728	1.0222531	2000
##	1271	2006	KCA	AL	0.3827160	0.7796087	2000
##	1272	2006	LAA	AL	0.5493827	1.0464481	2000
##	1273	2006	LAN	NL	0.5432099	1.0918775	2000
##	1274	2006	MIL	NL	0.4629630	0.8763505	2000
##	1275	2006	MIN	AL	0.5925926	1.1727672	2000
##	1276	2006	NYA	AL	0.5987654	1.2125163	2000

##	1277	2006	NYN	NL	0.5987654	1.1409029	2000
##	1278	2006	OAK	AL	0.5740741	1.0605227	2000
##	1279	2006	PHI	NL	0.5246914	1.0652709	2000
##	1280	2006	PIT	NL	0.4135802	0.8670013	2000
##	1281	2006	SDN	NL	0.5432099	1.0765832	2000
##	1282	2006	SEA	AL	0.4814815	0.9545455	2000
##	1283	2006	SFN	NL	0.4720497	0.9443038	2000
##	1284	2006	SLN	NL	0.5155280	1.0249344	2000
##	1285	2006	TBA	AL	0.3765432	0.8049065	2000
##	1286	2006	TEX	AL	0.4938272	1.0650510	2000
##	1287	2006	TOR	AL	0.5370370	1.0729443	2000
##	1288	2006	WAS	NL	0.4382716	0.8555046	2000
##	1289	2007	ARI	NL	0.5555556	0.9726776	2000
##	1290	2007	ATL	NL	0.5185185	1.1050477	2000
##	1291	2007	BAL	AL	0.4259259	0.8709677	2000
##	1292	2007	BOS	AL	0.5925926	1.3196347	2000
##	1293	2007	CHA	AL	0.4444444	0.8259833	2000
##	1294	2007	CHN	NL	0.5246914	1.0898551	2000
##	1295	2007	CIN	NL	0.4444444	0.9179367	2000
##	1296	2007	CLE	AL	0.5925926	1.1519886	2000
##	1297	2007	COL	NL	0.5521472	1.1345646	2000
##	1298	2007	DET	AL	0.5432099	1.1129235	2000
##	1299	2007	FLO	NL	0.4382716	0.8866442	2000
##	1300	2007	HOU	NL	0.4506173	0.8892989	2000
##	1301	2007	KCA	AL	0.4259259	0.9074550	2000
##	1302	2007	LAA	AL	0.5802469	1.1244870	2000
##	1303	2007	LAN	NL	0.5061728	1.0110041	2000
##	1304	2007	MIL	NL	0.5123457	1.0322165	2000
##	1305	2007	MIN	AL	0.4876543	0.9903448	2000
##	1306	2007	NYA	AL	0.5802469	1.2458172	2000
##	1307	2007	NYN	NL	0.5432099	1.0720000	2000
##	1308	2007	OAK	AL	0.4691358	0.9775726	2000
##	1309	2007	PHI	NL	0.5493827	1.0864799	2000
##	1310	2007	PIT	NL	0.4197531	0.8557920	2000
##	1311	2007	SDN	NL	0.5460123	1.1126126	2000
##	1312	2007	SEA	AL	0.5432099	0.9766298	2000
##	1313	2007	SFN	NL	0.4382716	0.9486111	2000
##	1314	2007	SLN	NL	0.4814815	0.8745476	2000
##	1315	2007	TBA	AL	0.4074074	0.8283898	2000
##	1316	2007	TEX	AL	0.4629630	0.9668246	2000
##	1317	2007	TOR	AL	0.5123457	1.0772532	2000
##	1318	2007	WAS	NL	0.4506173	0.8595147	2000
##	1319	2008	ARI	NL	0.5061728	1.0198300	2000
##	1320	2008	ATL	NL	0.4444444	0.9678663	2000
##	1321	2008	BAL	AL	0.4223602	0.8998849	2000
##	1322	2008	BOS	AL	0.5864198	1.2175793	2000
##	1323	2008	CHA	AL	0.5460123	1.1124829	2000
##	1324	2008	CHN	NL	0.6024845	1.2742176	2000
##	1325	2008	CIN	NL	0.4567901	0.8800000	2000
##	1326	2008	CLE	AL	0.5000000	1.0578187	2000
##	1327	2008	COL	NL	0.4567901	0.9087591	2000
##	1328	2008	DET	AL	0.4567901	0.9579930	2000
##	1329	2008	FLO	NL	0.5217391	1.0039113	2000
##	1330	2008	HOU	NL	0.5341615	0.9582773	2000

##	1331	2008	KCA	AL	0.4629630	0.8847631	2000
##	1332	2008	LAA	AL	0.6172840	1.0975610	2000
##	1333	2008	LAN	NL	0.5185185	1.0802469	2000
##	1334	2008	MIL	NL	0.5555556	1.0885341	2000
##	1335	2008	MIN	AL	0.5398773	1.1127517	2000
##	1336	2008	NYA	AL	0.5493827	1.0852820	2000
##	1337	2008	NYN	NL	0.5493827	1.1174825	2000
##	1338	2008	OAK	AL	0.4658385	0.9362319	2000
##	1339	2008	PHI	NL	0.5679012	1.1750000	2000
##	1340	2008	PIT	NL	0.4135802	0.8314480	2000
##	1341	2008	SDN	NL	0.3888889	0.8337696	2000
##	1342	2008	SEA	AL	0.3765432	0.8273736	2000
##	1343	2008	SFN	NL	0.4444444	0.8432148	2000
##	1344	2008	SLN	NL	0.5308642	1.0744828	2000
##	1345	2008	TBA	AL	0.5987654	1.1535022	2000
##	1346	2008	TEX	AL	0.4876543	0.9317477	2000
##	1347	2008	TOR	AL	0.5308642	1.1704918	2000
##	1348	2008	WAS	NL	0.3664596	0.7769697	2000
##	1349	2009	ARI	NL	0.4320988	0.9207161	2000
##	1350	2009	ATL	NL	0.5308642	1.1466459	2000
##	1351	2009	BAL	AL	0.3950617	0.8458904	2000
##	1352	2009	BOS	AL	0.5864198	1.1847826	2000
##	1353	2009	CHA	AL	0.4876543	0.9890710	2000
##	1354	2009	CHN	NL	0.5155280	1.0520833	2000
##	1355	2009	CIN	NL	0.4814815	0.9308437	2000
##	1356	2009	CLE	AL	0.4012346	0.8936416	2000
##	1357	2009	COL	NL	0.5679012	1.1244755	2000
##	1358	2009	DET	AL	0.5276074	0.9973154	2000
##	1359	2009	FLO	NL	0.5370370	1.0078329	2000
##	1360	2009	HOU	NL	0.4567901	0.8350649	2000
##	1361	2009	KCA	AL	0.4012346	0.8147268	2000
##	1362	2009	LAA	AL	0.5987654	1.1603154	2000
##	1363	2009	LAN	NL	0.5864198	1.2765957	2000
##	1364	2009	MIL	NL	0.4938272	0.9596577	2000
##	1365	2009	MIN	AL	0.5337423	1.0679739	2000
##	1366	2009	NYA	AL	0.6358025	1.2151394	2000
##	1367	2009	NYN	NL	0.4320988	0.8863937	2000
##	1368	2009	OAK	AL	0.4629630	0.9973719	2000
##	1369	2009	PHI	NL	0.5740741	1.1565585	2000
##	1370	2009	PIT	NL	0.3850932	0.8281250	2000
##	1371	2009	SDN	NL	0.4629630	0.8296489	2000
##	1372	2009	SEA	AL	0.5246914	0.9248555	2000
##	1373	2009	SFN	NL	0.5432099	1.0752864	2000
##	1374	2009	SLN	NL	0.5617284	1.1406250	2000
##	1375	2009	TBA	AL	0.5185185	1.0649867	2000
##	1376	2009	TEX	AL	0.5370370	1.0594595	2000
##	1377	2009	TOR	AL	0.4629630	1.0350195	2000
##	1378	2009	WAS	NL	0.3641975	0.8123570	2000
##	1379	2010	ARI	NL	0.4012346	0.8528708	2010
##	1380	2010	ATL	NL	0.5617284	1.1732909	2010
##	1381	2010	BAL	AL	0.4074074	0.7808917	2010
##	1382	2010	BOS	AL	0.5493827	1.0994624	2010
##	1383	2010	CHA	AL	0.5432099	1.0681818	2010
##	1384	2010	CHN	NL	0.4629630	0.8930900	2010

##	1385	2010	CIN	NL	0.5617284	1.1532847	2010
##	1386	2010	CLE	AL	0.4259259	0.8590426	2010
##	1387	2010	COL	NL	0.5123457	1.0739191	2010
##	1388	2010	DET	AL	0.5000000	1.0107672	2010
##	1389	2010	FLO	NL	0.4938272	1.0027894	2010
##	1390	2010	HOU	NL	0.4691358	0.8381344	2010
##	1391	2010	KCA	AL	0.4135802	0.8000000	2010
##	1392	2010	LAA	AL	0.4938272	0.9700855	2010
##	1393	2010	LAN	NL	0.4938272	0.9638728	2010
##	1394	2010	MIL	NL	0.4753086	0.9328358	2010
##	1395	2010	MIN	AL	0.5802469	1.1639344	2010
##	1396	2010	NYA	AL	0.5864198	1.2395382	2010
##	1397	2010	NYN	NL	0.4876543	1.0061350	2010
##	1398	2010	OAK	AL	0.5000000	1.0591054	2010
##	1399	2010	PHI	NL	0.5987654	1.2062500	2010
##	1400	2010	PIT	NL	0.3518519	0.6778291	2010
##	1401	2010	SDN	NL	0.5555556	1.1445783	2010
##	1402	2010	SEA	AL	0.3765432	0.7349570	2010
##	1403	2010	SFN	NL	0.5679012	1.1955403	2010
##	1404	2010	SLN	NL	0.5308642	1.1482059	2010
##	1405	2010	TBA	AL	0.5925926	1.2357473	2010
##	1406	2010	TEX	AL	0.5555556	1.1455604	2010
##	1407	2010	TOR	AL	0.5246914	1.0370879	2010
##	1408	2010	WAS	NL	0.4259259	0.8827493	2010
##	1409	2011	ARI	NL	0.5802469	1.1042296	2010
##	1410	2011	ATL	NL	0.5493827	1.0595041	2010
##	1411	2011	BAL	AL	0.4259259	0.8232558	2010
##	1412	2011	BOS	AL	0.5555556	1.1872456	2010
##	1413	2011	CHA	AL	0.4876543	0.9263456	2010
##	1414	2011	CHN	NL	0.4382716	0.8650794	2010
##	1415	2011	CIN	NL	0.4876543	1.0208333	2010
##	1416	2011	CLE	AL	0.4938272	0.9263158	2010
##	1417	2011	COL	NL	0.4506173	0.9496124	2010
##	1418	2011	DET	AL	0.5864198	1.1068917	2010
##	1419	2011	FLO	NL	0.4444444	0.8903134	2010
##	1420	2011	HOU	NL	0.3456790	0.7726131	2010
##	1421	2011	KCA	AL	0.4382716	0.9580052	2010
##	1422	2011	LAA	AL	0.5308642	1.0537125	2010
##	1423	2011	LAN	NL	0.5093168	1.0522876	2010
##	1424	2011	MIL	NL	0.5925926	1.1300940	2010
##	1425	2011	MIN	AL	0.3888889	0.7699005	2010
##	1426	2011	NYA	AL	0.5987654	1.3196347	2010
##	1427	2011	NYN	NL	0.4753086	0.9676550	2010
##	1428	2011	OAK	AL	0.4567901	0.9499264	2010
##	1429	2011	PHI	NL	0.6296296	1.3478261	2010
##	1430	2011	PIT	NL	0.4444444	0.8567416	2010
##	1431	2011	SDN	NL	0.4382716	0.9705401	2010
##	1432	2011	SEA	AL	0.4135802	0.8237037	2010
##	1433	2011	SFN	NL	0.5308642	0.9861592	2010
##	1434	2011	SLN	NL	0.5555556	1.1011561	2010
##	1435	2011	TBA	AL	0.5617284	1.1514658	2010
##	1436	2011	TEX	AL	0.5925926	1.2629247	2010
##	1437	2011	TOR	AL	0.5000000	0.9763469	2010
##	1438	2011	WAS	NL	0.4968944	0.9704510	2010

##	1439	2012	ARI	NL	0.5000000	1.0668605	2010
##	1440	2012	ATL	NL	0.5802469	1.1666667	2010
##	1441	2012	BAL	AL	0.5740741	1.0099291	2010
##	1442	2012	BOS	AL	0.4259259	0.9106700	2010
##	1443	2012	CHA	AL	0.5246914	1.1065089	2010
##	1444	2012	CHN	NL	0.3765432	0.8076416	2010
##	1445	2012	CIN	NL	0.5987654	1.1377551	2010
##	1446	2012	CLE	AL	0.4197531	0.7893491	2010
##	1447	2012	COL	NL	0.3950617	0.8516854	2010
##	1448	2012	DET	AL	0.5432099	1.0835821	2010
##	1449	2012	HOU	NL	0.3395062	0.7342569	2010
##	1450	2012	KCA	AL	0.4444444	0.9061662	2010
##	1451	2012	LAA	AL	0.5493827	1.0972818	2010
##	1452	2012	LAN	NL	0.5308642	1.0670017	2010
##	1453	2012	MIA	NL	0.4259259	0.8411602	2010
##	1454	2012	MIL	NL	0.5123457	1.0586630	2010
##	1455	2012	MIN	AL	0.4074074	0.8425481	2010
##	1456	2012	NYA	AL	0.5864198	1.2035928	2010
##	1457	2012	NYN	NL	0.4567901	0.9167842	2010
##	1458	2012	OAK	AL	0.5802469	1.1612378	2010
##	1459	2012	PHI	NL	0.5000000	1.0058824	2010
##	1460	2012	PIT	NL	0.4876543	0.9658754	2010
##	1461	2012	SDN	NL	0.4691358	0.9169014	2010
##	1462	2012	SEA	AL	0.4629630	0.9508449	2010
##	1463	2012	SFN	NL	0.5802469	1.1063174	2010
##	1464	2012	SLN	NL	0.5432099	1.1805556	2010
##	1465	2012	TBA	AL	0.5555556	1.2079723	2010
##	1466	2012	TEX	AL	0.5740741	1.1428571	2010
##	1467	2012	TOR	AL	0.4506173	0.9132653	2010
##	1468	2012	WAS	NL	0.6049383	1.2306397	2010
##	1469	2013	ARI	NL	0.5000000	0.9856115	2010
##	1470	2013	ATL	NL	0.5925926	1.2554745	2010
##	1471	2013	BAL	AL	0.5246914	1.0507757	2010
##	1472	2013	BOS	AL	0.5987654	1.3003049	2010
##	1473	2013	CHA	AL	0.3888889	0.8271093	2010
##	1474	2013	CHN	NL	0.4074074	0.8737300	2010
##	1475	2013	CIN	NL	0.5555556	1.1850594	2010
##	1476	2013	CLE	AL	0.5679012	1.1253776	2010
##	1477	2013	COL	NL	0.4567901	0.9289474	2010
##	1478	2013	DET	AL	0.5740741	1.2756410	2010
##	1479	2013	HOU	AL	0.3148148	0.7193396	2010
##	1480	2013	KCA	AL	0.5308642	1.0782030	2010
##	1481	2013	LAA	AL	0.4814815	0.9945726	2010
##	1482	2013	LAN	NL	0.5679012	1.1151203	2010
##	1483	2013	MIA	NL	0.3827160	0.7941176	2010
##	1484	2013	MIL	NL	0.4567901	0.9315866	2010
##	1485	2013	MIN	AL	0.4074074	0.7791878	2010
##	1486	2013	NYA	AL	0.5246914	0.9687034	2010
##	1487	2013	NYN	NL	0.4567901	0.9049708	2010
##	1488	2013	OAK	AL	0.5925926	1.2272000	2010
##	1489	2013	PHI	NL	0.4506173	0.8144192	2010
##	1490	2013	PIT	NL	0.5802469	1.0987868	2010
##	1491	2013	SDN	NL	0.4691358	0.8828571	2010
##	1492	2013	SEA	AL	0.4382716	0.8275862	2010

##	1493	2013	SFN	NL	0.4691358	0.9102750	2010
##	1494	2013	SLN	NL	0.5987654	1.3137584	2010
##	1495	2013	TBA	AL	0.5644172	1.0835913	2010
##	1496	2013	TEX	AL	0.5582822	1.1477987	2010
##	1497	2013	TOR	AL	0.4567901	0.9417989	2010
##	1498	2013	WAS	NL	0.5308642	1.0479233	2010
##	1499	2014	ARI	NL	0.3950617	0.8288410	2010
##	1500	2014	ATL	NL	0.4876543	0.9597990	2010
##	1501	2014	BAL	AL	0.5925926	1.1888702	2010
##	1502	2014	BOS	AL	0.4382716	0.8867133	2010
##	1503	2014	CHA	AL	0.4506173	0.8707124	2010
##	1504	2014	CHN	NL	0.4506173	0.8684583	2010
##	1505	2014	CIN	NL	0.4691358	0.9722222	2010
##	1506	2014	CLE	AL	0.5246914	1.0245023	2010
##	1507	2014	COL	NL	0.4074074	0.9229829	2010
##	1508	2014	DET	AL	0.5555556	1.0737589	2010
##	1509	2014	HOU	AL	0.4320988	0.8699862	2010
##	1510	2014	KCA	AL	0.5493827	1.0432692	2010
##	1511	2014	LAA	AL	0.6049383	1.2269841	2010
##	1512	2014	LAN	NL	0.5802469	1.1636953	2010
##	1513	2014	MIA	NL	0.4753086	0.9569733	2010
##	1514	2014	MIL	NL	0.5061728	0.9893455	2010
##	1515	2014	MIN	AL	0.4320988	0.9202059	2010
##	1516	2014	NYA	AL	0.5185185	0.9533133	2010
##	1517	2014	NYN	NL	0.4876543	1.0177994	2010
##	1518	2014	OAK	AL	0.5432099	1.2744755	2010
##	1519	2014	PHI	NL	0.4506173	0.9010189	2010
##	1520	2014	PIT	NL	0.5432099	1.0808241	2010
##	1521	2014	SDN	NL	0.4753086	0.9272097	2010
##	1522	2014	SEA	AL	0.5370370	1.1444043	2010
##	1523	2014	SFN	NL	0.5432099	1.0830619	2010
##	1524	2014	SLN	NL	0.5555556	1.0265340	2010
##	1525	2014	TBA	AL	0.4753086	0.9792000	2010
##	1526	2014	TEX	AL	0.4135802	0.8240621	2010
##	1527	2014	TOR	AL	0.5123457	1.0539359	2010
##	1528	2014	WAS	NL	0.5925926	1.2360360	2010
##	1529	2015	ARI	NL	0.4876543	1.0098177	2010
##	1530	2015	ATL	NL	0.4135802	0.7539474	2010
##	1531	2015	BAL	AL	0.5000000	1.0288600	2010
##	1532	2015	BOS	AL	0.4814815	0.9933599	2010
##	1533	2015	CHA	AL	0.4691358	0.8873039	2010
##	1534	2015	CHN	NL	0.5987654	1.1332237	2010
##	1535	2015	CIN	NL	0.3950617	0.8488064	2010
##	1536	2015	CLE	AL	0.5031056	1.0453125	2010
##	1537	2015	COL	NL	0.4197531	0.8732227	2010
##	1538	2015	DET	AL	0.4596273	0.8580324	2010
##	1539	2015	HOU	AL	0.5308642	1.1796117	2010
##	1540	2015	KCA	AL	0.5864198	1.1294852	2010
##	1541	2015	LAA	AL	0.5246914	0.9792593	2010
##	1542	2015	LAN	NL	0.5679012	1.1210084	2010
##	1543	2015	MIA	NL	0.4382716	0.9041298	2010
##	1544	2015	MIL	NL	0.4197531	0.8887381	2010
##	1545	2015	MIN	AL	0.5123457	0.9942857	2010
##	1546	2015	NYA	AL	0.5370370	1.0945559	2010

##	1547	2015	NYN	NL	0.5555556	1.1141925	2010
##	1548	2015	OAK	AL	0.4197531	0.9519890	2010
##	1549	2015	PHI	NL	0.3888889	0.7737948	2010
##	1550	2015	PIT	NL	0.6049383	1.1694631	2010
##	1551	2015	SDN	NL	0.4567901	0.8891929	2010
##	1552	2015	SEA	AL	0.4691358	0.9035813	2010
##	1553	2015	SFN	NL	0.5185185	1.1100478	2010
##	1554	2015	SLN	NL	0.6172840	1.2323810	2010
##	1555	2015	TBA	AL	0.4938272	1.0031153	2010
##	1556	2015	TEX	AL	0.5432099	1.0245566	2010
##	1557	2015	TOR	AL	0.5740741	1.3298507	2010
##	1558	2015	WAS	NL	0.5123457	1.1070866	2010
##	1559	2016	ARI	NL	0.4259259	0.8449438	2010
##	1560	2016	ATL	NL	0.4223602	0.8331194	2010
##	1561	2016	BAL	AL	0.5493827	1.0405594	2010
##	1562	2016	BOS	AL	0.5740741	1.2651297	2010
##	1563	2016	CHA	AL	0.4814815	0.9594406	2010
##	1564	2016	CHN	NL	0.6397516	1.4532374	2010
##	1565	2016	CIN	NL	0.4197531	0.8384075	2010
##	1566	2016	CLE	AL	0.5838509	1.1494083	2010
##	1567	2016	COL	NL	0.4629630	0.9825581	2010
##	1568	2016	DET	AL	0.5341615	1.0402219	2010
##	1569	2016	HOU	AL	0.5185185	1.0328103	2010
##	1570	2016	KCA	AL	0.5000000	0.9480337	2010
##	1571	2016	LAA	AL	0.4567901	0.9862448	2010
##	1572	2016	LAN	NL	0.5617284	1.1363636	2010
##	1573	2016	MIA	NL	0.4906832	0.9604106	2010
##	1574	2016	MIL	NL	0.4506173	0.9154161	2010
##	1575	2016	MIN	AL	0.3641975	0.8121485	2010
##	1576	2016	NYA	AL	0.5185185	0.9686610	2010
##	1577	2016	NYN	NL	0.5370370	1.0875203	2010
##	1578	2016	OAK	AL	0.4259259	0.8580815	2010
##	1579	2016	PHI	NL	0.4382716	0.7663317	2010
##	1580	2016	PIT	NL	0.4844720	0.9617414	2010
##	1581	2016	SDN	NL	0.4197531	0.8909091	2010
##	1582	2016	SEA	AL	0.5308642	1.0862801	2010
##	1583	2016	SFN	NL	0.5370370	1.1331220	2010
##	1584	2016	SLN	NL	0.5308642	1.0941011	2010
##	1585	2016	TBA	AL	0.4197531	0.9424965	2010
##	1586	2016	TEX	AL	0.5864198	1.0105680	2010
##	1587	2016	TOR	AL	0.5493827	1.1396396	2010
##	1588	2016	WAS	NL	0.5864198	1.2467320	2010
##	1589	2017	ARI	NL	0.5740741	1.2321700	2010
##	1590	2017	ATL	NL	0.4444444	0.8915956	2010
##	1591	2017	BAL	AL	0.4629630	0.8834721	2010
##	1592	2017	BOS	AL	0.5740741	1.1751497	2010
##	1593	2017	CHA	AL	0.4135802	0.8609756	2010
##	1594	2017	CHN	NL	0.5679012	1.1827338	2010
##	1595	2017	CIN	NL	0.4197531	0.8665132	2010
##	1596	2017	CLE	AL	0.6296296	1.4503546	2010
##	1597	2017	COL	NL	0.5370370	1.0885073	2010
##	1598	2017	DET	AL	0.3950617	0.8221477	2010
##	1599	2017	HOU	AL	0.6234568	1.2800000	2010
##	1600	2017	KCA	AL	0.4938272	0.8874842	2010

##	1601	2017	LAA	AL	0.4938272	1.0014104	2010
##	1602	2017	LAN	NL	0.6419753	1.3275862	2010
##	1603	2017	MIA	NL	0.4753086	0.9464720	2010
##	1604	2017	MIL	NL	0.5308642	1.0502152	2010
##	1605	2017	MIN	AL	0.5246914	1.0342640	2010
##	1606	2017	NYA	AL	0.5617284	1.3000000	2010
##	1607	2017	NYN	NL	0.4320988	0.8516802	2010
##	1608	2017	OAK	AL	0.4629630	0.8946731	2010
##	1609	2017	PHI	NL	0.4074074	0.8823529	2010
##	1610	2017	PIT	NL	0.4629630	0.9138167	2010
##	1611	2017	SDN	NL	0.4382716	0.7401961	2010
##	1612	2017	SEA	AL	0.4814815	0.9715026	2010
##	1613	2017	SFN	NL	0.3950617	0.8234536	2010
##	1614	2017	SLN	NL	0.5123457	1.0794326	2010
##	1615	2017	TBA	AL	0.4938272	0.9857955	2010
##	1616	2017	TEX	AL	0.4814815	0.9791667	2010
##	1617	2017	TOR	AL	0.4691358	0.8839286	2010
##	1618	2017	WAS	NL	0.5987654	1.2187500	2010
##	1619	2018	ARI	NL	0.5061728	1.0760870	2010
##	1620	2018	ATL	NL	0.5555556	1.1552511	2010
##	1621	2018	BAL	AL	0.2901235	0.6973094	2010
##	1622	2018	BOS	AL	0.6666667	1.3539413	2010
##	1623	2018	CHA	AL	0.3827160	0.7735849	2010
##	1624	2018	CHN	NL	0.5828221	1.1798450	2010
##	1625	2018	CIN	NL	0.4135802	0.8498168	2010
##	1626	2018	CLE	AL	0.5617284	1.2623457	2010
##	1627	2018	COL	NL	0.5582822	1.0469799	2010
##	1628	2018	DET	AL	0.3950617	0.7914573	2010
##	1629	2018	HOU	AL	0.6358025	1.4925094	2010
##	1630	2018	KCA	AL	0.3580247	0.7659064	2010
##	1631	2018	LAA	AL	0.4938272	0.9986150	2010
##	1632	2018	LAN	NL	0.5644172	1.3180328	2010
##	1633	2018	MIA	NL	0.3913043	0.7280593	2010
##	1634	2018	MIL	NL	0.5889571	1.1441578	2010
##	1635	2018	MIN	AL	0.4814815	0.9522581	2010
##	1636	2018	NYA	AL	0.6172840	1.2720478	2010
##	1637	2018	NYN	NL	0.4753086	0.9561528	2010
##	1638	2018	OAK	AL	0.5987654	1.2062315	2010
##	1639	2018	PHI	NL	0.4938272	0.9299451	2010
##	1640	2018	PIT	NL	0.5093168	0.9985570	2010
##	1641	2018	SDN	NL	0.4074074	0.8044329	2010
##	1642	2018	SEA	AL	0.5493827	0.9521800	2010
##	1643	2018	SFN	NL	0.4506173	0.8626609	2010
##	1644	2018	SLN	NL	0.5432099	1.0984081	2010
##	1645	2018	TBA	AL	0.5555556	1.1083591	2010
##	1646	2018	TEX	AL	0.4135802	0.8691038	2010
##	1647	2018	TOR	AL	0.4506173	0.8521635	2010
##	1648	2018	WAS	NL	0.5061728	1.1304985	2010
##	1649	2019	ARI	NL	0.5246914	1.0942127	2010
##	1650	2019	ATL	NL	0.5987654	1.1507402	2010
##	1651	2019	BAL	AL	0.3333333	0.7431193	2010
##	1652	2019	BOS	AL	0.5185185	1.0881643	2010
##	1653	2019	CHA	AL	0.4472050	0.8509615	2010
##	1654	2019	CHN	NL	0.5185185	1.1352859	2010

```
## 1655 2019 CIN NL 0.4629630 0.9859353 2010
## 1656 2019 CLE AL 0.5740741 1.1704718 2010
## 1657 2019 COL NL 0.4382716 0.8716075 2010
## 1658 2019 DET AL 0.2919255 0.6360656 2010
## 1659 2019 HOU AL 0.6604938 1.4375000 2010
## 1660 2019 KCA AL 0.3641975 0.7951669 2010
## 1661 2019 LAA AL 0.4444444 0.8859447 2010
## 1662 2019 LAN NL 0.6543210 1.4453507 2010
## 1663 2019 MIA NL 0.3518519 0.7611386 2010
## 1664 2019 MIL NL 0.5493827 1.0039164 2010
## 1665 2019 MIN AL 0.6234568 1.2453581 2010
## 1666 2019 NYA AL 0.6358025 1.2760487 2010
## 1667 2019 NYN NL 0.5308642 1.0732700 2010
## 1668 2019 OAK AL 0.5987654 1.2426471 2010
## 1669 2019 PHI NL 0.5000000 0.9748111 2010
## 1670 2019 PIT NL 0.4259259 0.8320527 2010
## 1671 2019 SDN NL 0.4320988 0.8643853 2010
## 1672 2019 SEA AL 0.4197531 0.8488242 2010
## 1673 2019 SFN NL 0.4753086 0.8771022 2010
## 1674 2019 SLN NL 0.5617284 1.1540785 2010
## 1675 2019 TBA AL 0.5925926 1.1722561 2010
## 1676 2019 TEX AL 0.4814815 0.9225513 2010
## 1677 2019 TOR AL 0.4135802 0.8768116 2010
## 1678 2019 WAS NL 0.5740741 1.2058011 2010
```

```
n_TeamRuns2 <- TeamRuns2 %>% group_by(decade) %>%
  nest()
n_TeamRuns2
```

```
## # A tibble: 7 x 2
## # Groups:   decade [7]
##   decade data
##   <dbl> <list>
## 1  1950 <tibble [96 x 5]>
## 2  1960 <tibble [198 x 5]>
## 3  1970 <tibble [246 x 5]>
## 4  1980 <tibble [260 x 5]>
## 5  1990 <tibble [278 x 5]>
## 6  2000 <tibble [300 x 5]>
## 7  2010 <tibble [300 x 5]>
```

```
m_TeamRuns2 <- n_TeamRuns2 %>%
  mutate(decade, model = map(data, fit_k))
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model

## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model

## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model

## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model
```

```
m_TeamRuns2
```

```
## # A tibble: 7 x 3
## # Groups:   decade [7]
##   decade data          model
##   <dbl> <list>         <list>
## 1  1950 <tibble [96 x 5]> <df[,1] [1 x 1]>
## 2  1960 <tibble [198 x 5]> <df[,1] [1 x 1]>
## 3  1970 <tibble [246 x 5]> <df[,1] [1 x 1]>
## 4  1980 <tibble [260 x 5]> <df[,1] [1 x 1]>
## 5  1990 <tibble [278 x 5]> <df[,1] [1 x 1]>
## 6  2000 <tibble [300 x 5]> <df[,1] [1 x 1]>
## 7  2010 <tibble [300 x 5]> <df[,1] [1 x 1]>
```

```
m_TeamRuns2 %>% mutate( model = unlist(model) ) %>%
  select(-data)
```

```
## # A tibble: 7 x 2
## # Groups:   decade [7]
##   decade model
##   <dbl> <dbl>
## 1  1950  1.69
## 2  1960  1.90
## 3  1970  1.74
## 4  1980  1.93
## 5  1990  1.88
## 6  2000  1.94
## 7  2010  1.77
```

Make the homerun leaders plot by league

```
hr_leader <- function(x){
  x %>%
    select(teamID, HR) %>%
    arrange(desc(HR)) %>%
    head(n=1)
}
```

```
Teams %>%
  filter(yearID == 1961 & lgID == "AL") %>%
  arrange(desc(HR)) %>%
  head(1)

##   yearID lgID teamID franchID divID Rank   G Ghome   W   L DivWin WCWin LgWin
## 1  1961   AL   NYA      NYY  <NA>    1 163    81 109 53  <NA>  <NA>    Y
##   WSwIn   R   AB   H X2B X3B  HR  BB  SO SB CS HBP SF  RA  ER  ERA CG SHO SV
## 1      Y 827 5559 1461 194   40 240 543 785 28 18  NA NA 612 558 3.46 47  14 39
##   IPouts   HA HRA BBA SOA   E  DP   FP           name           park
## 1  4353 1288 137 542 866 124 180 0.98 New York Yankees Yankee Stadium I
##   attendance BPF PPF teamIDBR teamIDlahman45 teamIDretro
## 1  1747725 95 93      NYY      NYA      NYA

n_TeamRuns2 <- Teams %>% group_by(yearID, lgID) %>%
  nest()

n_TeamRuns2

## # A tibble: 282 x 3
## # Groups:   yearID, lgID [282]
##   yearID lgID data
##   <int> <fct> <list>
## 1  1871 NA    <tibble [9 x 46]>
## 2  1872 NA    <tibble [11 x 46]>
## 3  1873 NA    <tibble [9 x 46]>
## 4  1874 NA    <tibble [8 x 46]>
## 5  1875 NA    <tibble [13 x 46]>
## 6  1876 NL    <tibble [8 x 46]>
## 7  1877 NL    <tibble [6 x 46]>
## 8  1878 NL    <tibble [6 x 46]>
## 9  1879 NL    <tibble [8 x 46]>
## 10 1880 NL    <tibble [8 x 46]>
## # ... with 272 more rows

hr_leaders <- n_TeamRuns2 %>%
  mutate(yearID, lgID, hr = map(data, hr_leader) ) %>%
  arrange(yearID) %>%
  select(-data) %>%
  unnest(hr)

head(hr_leaders, 10)

## # A tibble: 10 x 4
## # Groups:   yearID, lgID [10]
##   yearID lgID teamID  HR
##   <int> <fct> <fct>  <int>
## 1  1871 NA    CH1      10
## 2  1872 NA    BL1      14
## 3  1873 NA    BS1      13
## 4  1874 NA    BS1      17
## 5  1875 NA    BS1      15
## 6  1876 NL    BSN       9
## 7  1877 NL    LS1       9
## 8  1878 NL    PR0       8
```



```
## 9 1879 NL BSN 20
## 10 1880 NL BSN 20

hr_leaders %>% group_by(lgID) %>%
  summarize(homerun_mean = mean(HR))

## `summarise()` ungrouping output (override with `.groups` argument)

## # A tibble: 7 x 2
##   lgID homerun_mean
##   <fct>         <dbl>
## 1 AA             40.5
## 2 AL            157.
## 3 FL             51
## 4 NA             13.8
## 5 NL            129.
## 6 PL             66
## 7 UA             32

mean(HR ~ lgID, data = hr_leaders)

##           AA           AL           FL           NA           NL           PL           UA
## 40.5000 157.1092  51.0000  13.8000 129.2917  66.0000  32.0000

hr_leaders %>% filter(yearID >= 1916) %>%
  group_by(lgID) %>%
  summarize(homerun_mean = mean(HR))

## `summarise()` ungrouping output (override with `.groups` argument)

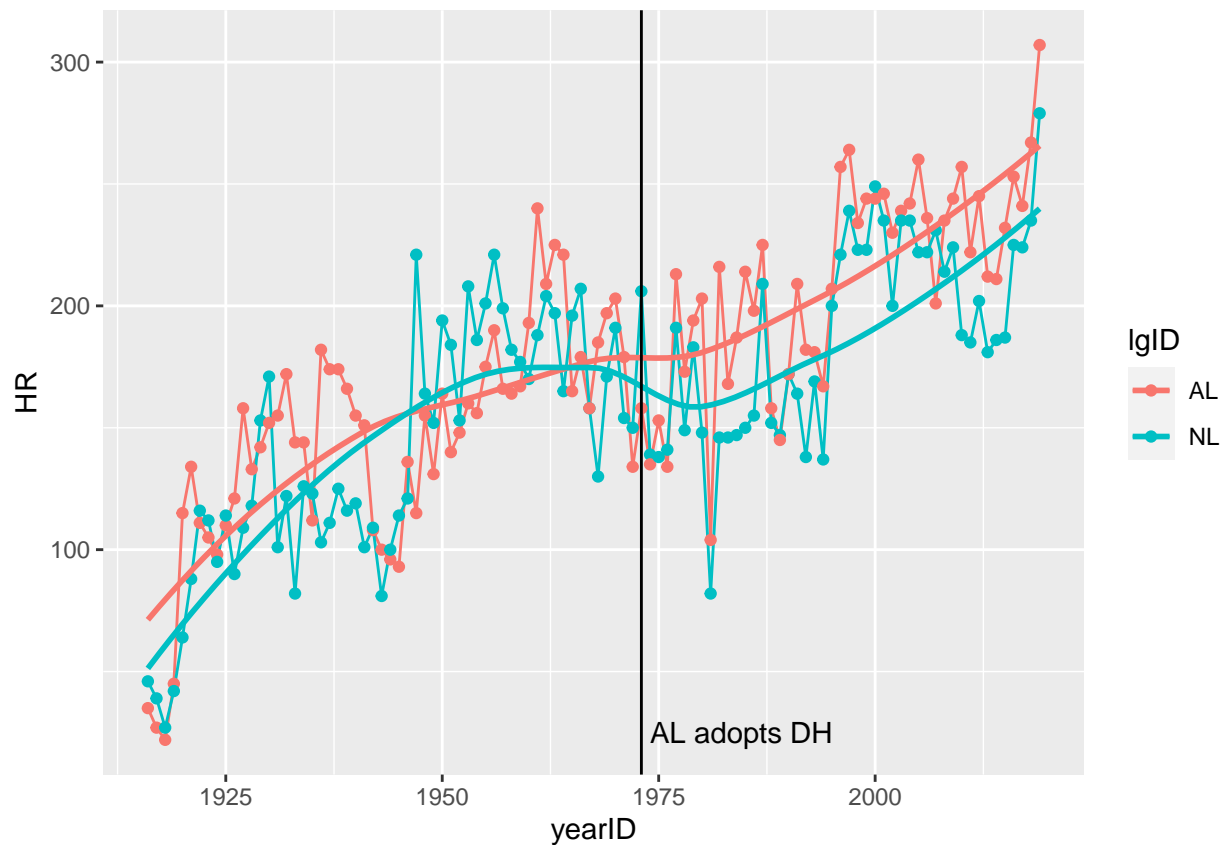
## # A tibble: 2 x 2
##   lgID homerun_mean
##   <fct>         <dbl>
## 1 AL            175.
## 2 NL            161.

mean(HR ~ lgID, data = hr_leaders)

##           AA           AL           FL           NA           NL           PL           UA
## 40.5000 157.1092  51.0000  13.8000 129.2917  66.0000  32.0000

hr_leaders %>%
  filter(yearID >= 1916) %>%
  ggplot(aes(x = yearID, y = HR, color = lgID)) +
  geom_line() +
  geom_point() +
  geom_smooth(se=0) +
  geom_vline(xintercept = 1973) +
  annotate("text", x=1974, y=25, label = "AL adopts DH", hjust="left")

## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



Iteration for the Bootstrap using rerun

```
n_TeamRuns3 <- TeamRuns %>%
  group_by(yearID) %>%
  nest()
n_TeamRuns3

## # A tibble: 66 x 2
## # Groups:   yearID [66]
##   yearID data
##   <int> <list>
## 1  1954 <tibble [16 x 4]>
## 2  1955 <tibble [16 x 4]>
## 3  1956 <tibble [16 x 4]>
## 4  1957 <tibble [16 x 4]>
## 5  1958 <tibble [16 x 4]>
## 6  1959 <tibble [16 x 4]>
## 7  1960 <tibble [16 x 4]>
## 8  1961 <tibble [18 x 4]>
## 9  1962 <tibble [20 x 4]>
## 10 1963 <tibble [20 x 4]>
## # ... with 56 more rows

k_actual <- n_TeamRuns3 %>%                                # m_TeamRuns3
  mutate(model = map(data, fit_k))
```

[illegible]

[illegible]

[illegible]

[illegible]

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
```

```
## Initializing 'k' to '1.'.
```

```
## Consider specifying 'start' or using a selfStart model
```

```
## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
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## Initializing 'k' to '1.'.
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```

## Warning in nls(formula = WPct ~ 1/(1 + (1/run_ratio)^k), data = x): No starting values specified for
## Initializing 'k' to '1.'.
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## Initializing 'k' to '1.'.
## Consider specifying 'start' or using a selfStart model

k_actual <- k_actual %>% select(-data) %>%
  unnest(model)

k_actual %>% ungroup() %>%
  summarize(
    min = min(k),

```

```

median = median(k),
max = max(k),
mean = mean(k),
sd = sd(k),
n = n()
)

```

```

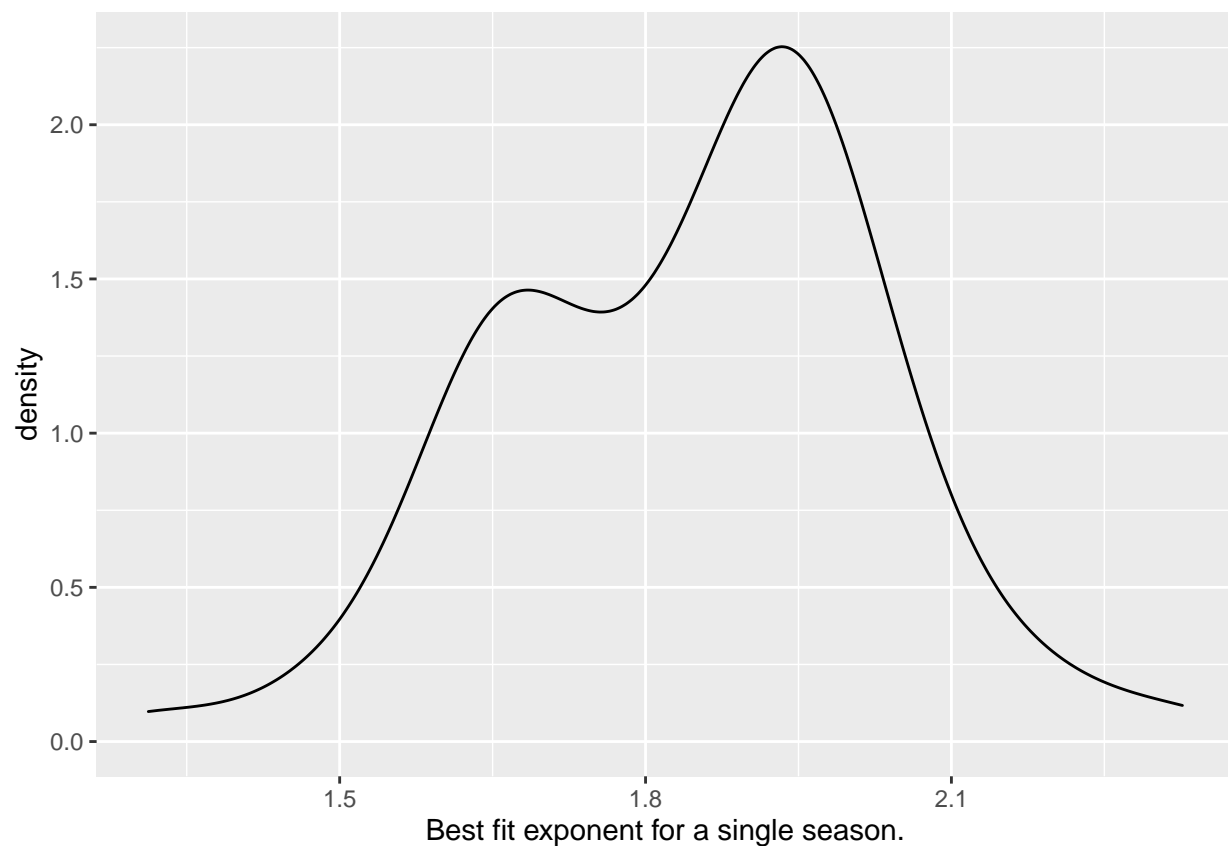
## # A tibble: 1 x 6
##   min median  max mean  sd    n
##   <dbl> <dbl> <dbl> <dbl> <dbl> <int>
## 1  1.31  1.89  2.33  1.84 0.188   66

```

```

k_actual %>% ggplot(aes(x = k)) +
  geom_density() +
  xlab("Best fit exponent for a single season.")

```



Bootstrap

Use moderndive

```

library(moderndive)

virtual_resamples <- k_actual %>%
  rep_sample_n(size = 66, replace = TRUE, reps = 1000)

virtual_resampled_means <- virtual_resamples %>%

```

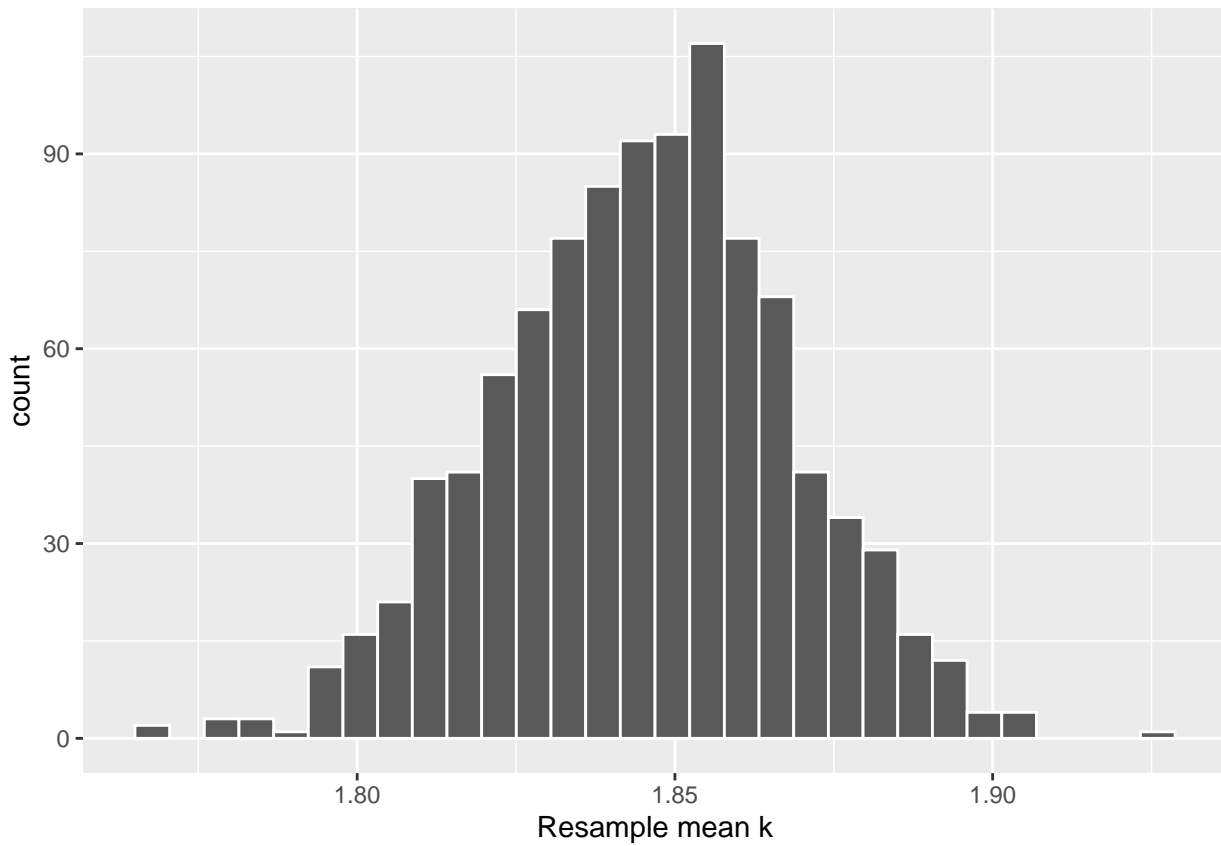


```
group_by(replicate) %>%
  summarize(mean_k = mean(k))
```

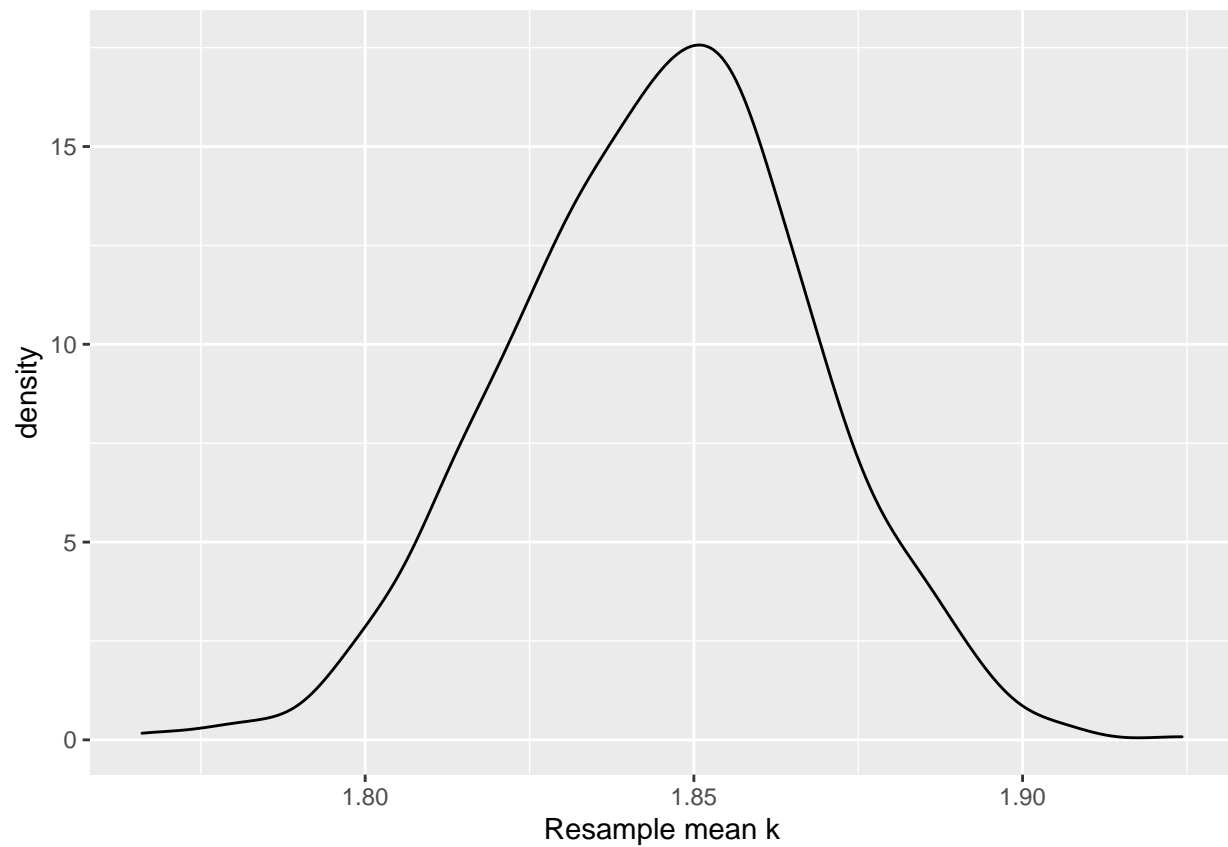
```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
virtual_resampled_means %>% ggplot( aes(x = mean_k)) +
  geom_histogram(color = "white") +
  labs(x = "Resample mean k")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



```
virtual_resampled_means %>% ggplot( aes(x = mean_k)) +
  geom_density() +
  labs(x = "Resample mean k")
```

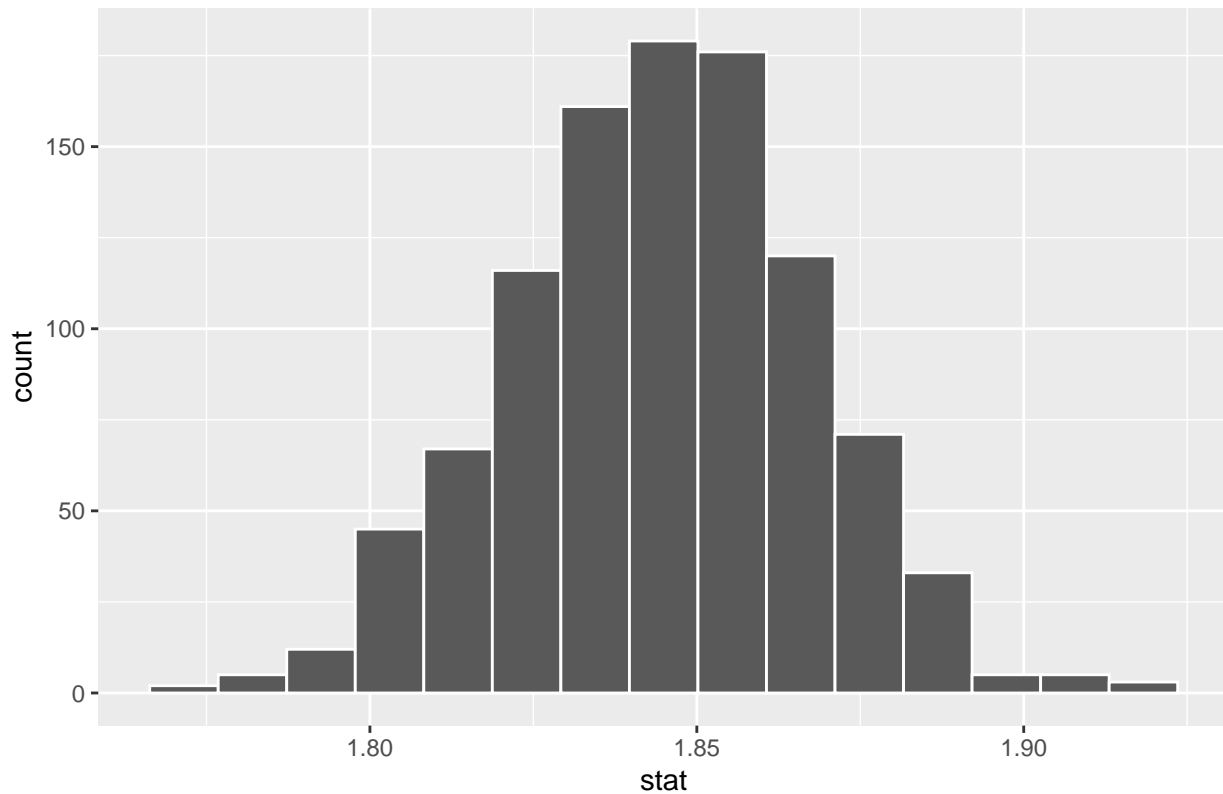


```
library(infer)

bootstrap_distribution <- k_actual %>%
  specify(response = k) %>%
  generate(reps = 1000, type = "bootstrap") %>%
  calculate(stat = "mean")

bootstrap_distribution %>%
  visualise()
```

Simulation-Based Bootstrap Distribution



```
percentile_ci <- bootstrap_distribution %>%
  get_confidence_interval(level = 0.95, type = "percentile")
percentile_ci
```

```
## # A tibble: 1 x 2
##   `2.5%` `97.5%`
##   <dbl>  <dbl>
## 1    1.80    1.89
```

To do: Add further Bootstrapping code.

Use tidymodels to implement this.

From the purrr cheatsheet.

```
n_iris <- iris %>% group_by(Species) %>%
  nest()
n_iris
```

```
## # A tibble: 3 x 2
## # Groups:   Species [3]
##   Species    data
##   <fct>     <list>
## 1 setosa    <tibble [50 x 4]>
## 2 versicolor <tibble [50 x 4]>
## 3 virginica <tibble [50 x 4]>
```

```
mod_fun <- function(df){
  lm(Sepal.Length ~ ., data = df)
}
```

```

m_iris <- n_iris %>%
  mutate(model = map(data, mod_fun))
m_iris

## # A tibble: 3 x 3
## # Groups:   Species [3]
##   Species    data          model
##   <fct>    <list>        <list>
## 1 setosa   <tibble [50 x 4]> <lm>
## 2 versicolor <tibble [50 x 4]> <lm>
## 3 virginica <tibble [50 x 4]> <lm>

b_fun <- function(mod){
  coefficients(mod)[[1]]
}

m_iris %>% transmute( Species, beta = map_dbl(model, b_fun) )

## # A tibble: 3 x 2
## # Groups:   Species [3]
##   Species    beta
##   <fct>    <dbl>
## 1 setosa    2.35
## 2 versicolor 1.90
## 3 virginica 0.700

```