plyr

US baby names

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Baby names

Top 1000 male and female baby names in the US, from 1880 to 2008.

258,000 records (1000 * 2 * 129)

But only four variables: year, name, sex and percent.

```
> head(bnames, 15)
   year    name  percent sex
1  1880    John 0.081541 boy
2  1880 William 0.080511 boy
3  1880   James 0.050057 boy
4  1880 Charles 0.045167 boy
5  1880  George 0.043292 boy
6  1880   Frank 0.027380 boy
7  1880  Joseph 0.022229 boy
8  1880  Thomas 0.021401 boy
9  1880   Henry 0.020641 boy
10 1880  Robert 0.020404 boy
11 1880  Edward 0.019965 boy
12 1880   Harry 0.018175 boy
13 1880  Walter 0.014822 boy
14 1880  Arthur 0.013504 boy
15 1880    Fred 0.013251 boy
```

```
> tail(bnames, 15)
       year     name  percent  sex
257986 2008   Neveah 0.000130 girl
257987 2008   Amaris 0.000129 girl
257988 2008 Hadassah 0.000129 girl
257989 2008    Dania 0.000129 girl
257990 2008   Hailie 0.000129 girl
257991 2008   Jamiya 0.000129 girl
257992 2008    Kathy 0.000129 girl
257993 2008   Laylah 0.000129 girl
257994 2008     Riya 0.000129 girl
257995 2008     Diya 0.000128 girl
257996 2008 Carleigh 0.000128 girl
257997 2008    Iyana 0.000128 girl
257998 2008   Kenley 0.000127 girl
257999 2008   Sloane 0.000127 girl
258000 2008  Elianna 0.000127 girl
```

Brainstorm

What variables and summaries might you want to generate from this data? What questions would you like to be able to answer about the data?

With your partner, you have 2 minutes to come up with as many as possible.

Some of my ideas

- First/last letter
- Length
- Number/percent of vowels
- Biblical names?
- Rank
- Ecdf (how many babies have a name in the top 2, 3, 5, 100 etc)

Transform & summarise

```
transform(df, var1 = expr1, ...)

summarise(df, var1 = expr1, ...)
```

Transform modifies an existing data frame. **Summarise** creates a new data frame.

```r
letter <- function(x, n = 1) {
  if (n < 0) {
    nc <- nchar(x)
    n <- nc + n + 1
  }
  tolower(substr(x, n, n))
}
vowels <- function(x) {
  nchar(gsub("[^aeiou]", "", x))
}

bnames <- transform(bnames,
  first = letter(name, 1),
  last = letter(name, -1),
  length = nchar(name),
  vowels = vowels(name)
)

summarise(bnames,
  max_perc = max(percent),
  min_perc = min(percent))
```

Many interesting transformations and summaries can be calculated for the whole dataset

Group-wise

What about group-wise **transformations** or **summaries**? e.g. what if we want to compute the rank of a name within a sex and year?

This task is easy if we have a single year & sex, but hard otherwise.

```
one <- subset(bnames, sex == "boy" & year == 2008)
one$rank <- rank(-one$percent,
  ties.method = "first")

# or
one <- transform(one,
  rank = rank(-percent, ties.method = "first"))
head(one)
```

What if we want to transform every sex and year?

```
# Split
pieces <- split(bnames,
  list(bnames$sex, bnames$year))

# Apply
results <- vector("list", length(pieces))
for(i in seq_along(pieces)) {
  piece <- pieces[[i]]
  piece <- transform(piece,
    rank = rank(-percent, ties.method = "first"))
  results[[i]] <- piece
}

# Combine
result <- do.call("rbind", results)
```

```
# Or equivalently

bnames <- ddply(bnames, c("sex", "year"), transform,
  rank = rank(-percent, ties.method = "first"))
```

Input data

Way to split up input

Function to apply to each piece

```
# Or equivalent

bnames <- ddply(bnames, c("sex", "year"), transform,
  rank = rank(-percent, ties.method = "first"))
```

2nd argument to `transform()`

ddply

- `.data`: data frame to process
- `.variables`: combination of variables to split by
- `.fun`: function to call on each piece
- `...`: extra arguments passed to .fun

Variable specification syntax

- Character: `c("sex", "year")`
- Numeric: `1:3`
- Formula: `~ sex + year`
- Special:
  - `.(sex, year)`
  - `.(first = letter(name, 1))`

Match function with use

scale(x)	randomisation/permutation tests
rank(x)	scale to [0, 1] within each group
x - min(x) / diff(range(x))	scale to mean 0, sd 1 within each group
x / x[1]	compute per-group rankings
sample(x)	index a time series

Summaries

In a similar way, we can use `ddply()` for group-wise summaries.

There are many base R functions for special cases. Where available, these are often much faster; but you have to know they exist, and have to remember how to use them.

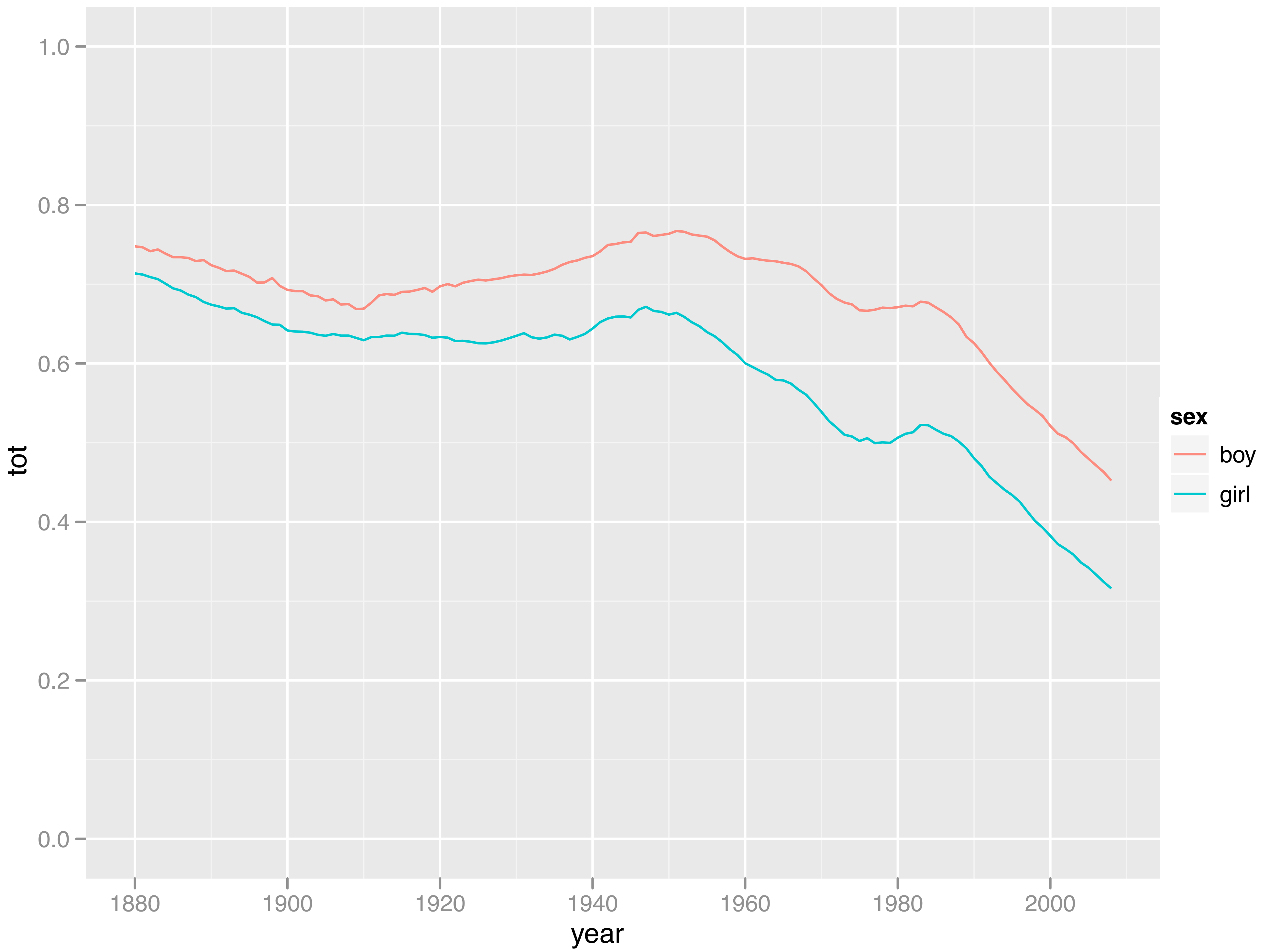
```r
ddply(bnames, c("name"), summarise,
  tot = sum(percent))
ddply(bnames, c("length"), summarise,
  tot = sum(percent))
ddply(bnames, c("year", "sex"), summarise,
  tot = sum(percent))

fl <- ddply(bnames, c("year", "sex", "first"),
  summarise, tot = sum(percent))
library(ggplot2)
qplot(year, tot, data = fl, geom = "line",
  colour = sex, facets = ~ first)
```

Challenge

Create a plot that shows (by year) the proportion of US children who have a name in the top 100.

Extra challenge: break it down by sex.

What does this suggest about baby naming trends in the US?



1.0
0.8
0.6
0.4
0.2
0.0
tot
1880
1900
1920
1940
1960
1980
2000
year
sex
boy
girl