

Questions vs directives

Question

“Does treatment duration have an effect on survival?”

Directive

“Make a figure of survival probability as a function of treatment duration.”

Questions end in a question mark!

Conceptual vs procedural questions

Conceptual question

“Does treatment duration have an effect on survival?”

Procedural question

“What is the difference in mean survival between a treatment duration of 1 month and of 2 months?”

**Conceptual questions do not prompt
a specific analysis procedure!**

Working with tidy data in R: dplyr

Fundamental actions on data tables:

- choose rows — `filter()`
- choose columns — `select()`
- make new columns — `mutate()`
- arrange rows — `arrange()`
- calculate summary statistics — `summarize()`
- work on groups of data — `group_by()`

We can combine these verbs using the pipe operator: %>%

Standard R:

```
> mean(iris$Sepal.Length)
[1] 5.843333
```

With pipe:

```
> iris$Sepal.Length %>% mean()
[1] 5.843333
```

We can combine these verbs using the pipe operator: %>%

Standard R:

```
> head(iris)
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1          5.1         3.5         1.4         0.2   setosa
2          4.9         3.0         1.4         0.2   setosa
3          4.7         3.2         1.3         0.2   setosa
4          4.6         3.1         1.5         0.2   setosa
5          5.0         3.6         1.4         0.2   setosa
6          5.4         3.9         1.7         0.4   setosa
```

We can combine these verbs using the pipe operator: %>%

With pipe:

```
> iris %>% head()
```

	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
1	5.1	3.5	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
3	4.7	3.2	1.3	0.2	setosa
4	4.6	3.1	1.5	0.2	setosa
5	5.0	3.6	1.4	0.2	setosa
6	5.4	3.9	1.7	0.4	setosa

Left and right assignment: <- and ->

Left assignment:

```
> x <- 5
```

```
> x
```

```
[1] 5
```

Right assignment:

```
> 6 -> x
```

```
> x
```

```
[1] 6
```

Combining pipe and right assignment

These three lines do all the same thing:

```
> mean_length <- mean(iris$Sepal.Length)
> mean_length <- iris$Sepal.Length %>% mean()
> iris$Sepal.Length %>% mean() -> mean_length
> mean_length
[1] 5.843333
```

Pipe example 1: count how many herbivores of different orders there are in `msleep`

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```
msleep %>%  
  filter(vore == "herbi")
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```
msleep %>%  
  filter(vore == "herbi") %>%  
  group_by(order)
```

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  arrange(desc(count))
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```
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  filter(vore == "herbi") %>%  
  group_by(order) %>%  
  summarize(count = n()) %>%  
  arrange(desc(count))
```

	order	count
1	Rodentia	16
2	Artiodactyla	5
3	Perissodactyla	3
4	Hyracoidea	2
5	Proboscidea	2
6	Diprotodontia	1
7	Lagomorpha	1
8	Pilosa	1
9	Primates	1

Pipe example 2: What is total day time for each animal in `msleep`?

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```
msleep %>%  
  mutate(total_day_time = awake + sleep_total)
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```
msleep %>%  
  mutate(total_day_time = awake + sleep_total) %>%  
  select(name, total_day_time)
```

Pipe example 2: What is total day time for each animal in `msleep`?

```
msleep %>%  
  mutate(total_day_time = awake + sleep_total) %>%  
  select(name, total_day_time)
```

	name	total_day_time
1	Cheetah	24.00
2	Owl monkey	24.00
3	Mountain beaver	24.00
4	Greater short-tailed shrew	24.00
5	Cow	24.00
6	Three-toed sloth	24.00
7	Northern fur seal	24.00
8	Vesper mouse	24.00
9	Dog	24.00
10	Roe deer	24.00

Pipe example 3: What is the median awake time of different orders in `msleep`?

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msleep %>%  
  group_by(order)
```

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```
msleep %>%  
  group_by(order) %>%  
  summarize(med_awake = median(awake))
```

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```
msleep %>%  
  group_by(order) %>%  
  summarize(med_awake = median(awake)) %>%  
  arrange(med_awake)
```

Pipe example 3: What is the median awake time of different orders in `msleep`?

```
msleep %>%  
  group_by(order) %>%  
  summarize(med_awake = median(awake)) %>%  
  arrange(med_awake)
```

	order	med_awake
1	Chiroptera	4.20
2	Didelphimorphia	5.30
3	Cingulata	6.25
4	Afrosoricida	8.40
5	Pilosa	9.60
6	Rodentia	11.10
7	Diprotodontia	11.60
8	Soricomorpha	13.70
9	Carnivora	13.75
10	Erinaceomorpha	13.80