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Some tips on creating reports with Quarto with a focus on tables and replicated tables and figures

Jane Doe, Eva Nováková and Matti Meikäläinen

The Publisher PL

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	cidunt libero facilisis posuere. Nam congue velit non elit	
	sollicitudin aliquet.	20
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	Morbi elementum ullamcorper augue, et tincidunt libero	
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Citation

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1 Preface

Phasellus non diam posuere, laoreet velit sed, egestas felis. Etiam eget neque in tellus lacinia tincidunt. Pellentesque scelerisque odio velit, nec fringilla nibh iaculis non. Aenean sit amet nulla ipsum. Cras felis lacus, pulvinar ac nisi et, convallis pulvinar turpis. Morbi non nibh lacus. Morbi vitae lorem massa. Sed ut turpis vel felis posuere commodo lacinia ac mi. Donec finibus lectus sit amet elit finibus, vitae rhoncus ligula tincidunt. Phasellus vitae blandit lacus. Integer sed nisl fermentum, pulvinar mauris in, posuere enim. Proin sit amet semper urna. Vivamus aliquet rutrum diam ac luctus.

Abstract

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2 Tips

2.1 Overview

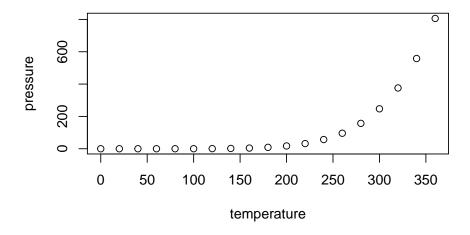


Figure 2.1: chapter 1 plot

2.2 General set-up

- Be as modular and simple as you can.
- Don't make everyone in your team be the markdown wizard. You only need one person to build the framework.
- Use simple child Rmds so that other team members work only on simple Rmd/qmd flat files.
- Don't put all your tables or figures in one huge file: Table xyz.Rmd/qmd, Table abc.Rmd/qmd. Have your dedicated markdown wizard figure out the automatic numbering.
- Copy reports built by others who are doing something similar to you. TALK within your center or across centers and share work.

2.3 Tips

2.3.1 Cross-references

This can be really troublesome unless you use an output that already has cross-references as part of the design. For R Markdown,

- {bookdown} outputs for html and PDF
- {officedown} for Word

These output formats give you access to cross-referencing via the \@ref(xxx:yyy) format and if you use bookdown::pdf_book, this will also work with PDF.

However, Quarto makes cross-references, auto-numbering and cross-referencing of tables and figures super easy. Quarto cross-ref page.

For example, we can make a figure with the chunk label fig-plot like so.

The later in the text we use Ofig-plot to get Figure 2.2.

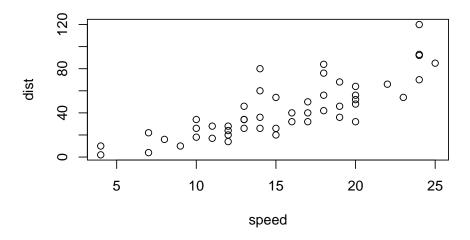


Figure 2.2: This is a plot of some data

2.3.2 Chunk labels

• When using R Markdown (or Quarto), it is best not to use chunk labels in the your Rmd/qmd children. It's too easy to get duplicate labels accidentally.

2.3.3 File paths

• if you need to reference a file in a folder, let R create the path so that it is compatible across systems:

```
file.path('figures', 'figure1.Rmd')
```

• I typically use the {here} package so that my code doesn't break if I happen to issue a change workspace directory command.

```
here::here('images', 'logo.png')
```

2.3.4 Tables in for loops

Making tables within for loops is tricky and it is different if you are outputting to Word versus html and also depends on what package that you use. See my Rmd/qmd files in the tables folder for examples of how to set it up, but also be prepared for things breaking in the future as package writers change things. This feature is really fluid. Web searches on stackoverflow are key for solving these problems.

2.4 Working with Word

For many of us, Word is part of our team's workflow. Here are some tips if that is the case for you:

- Check out the officeverse: officedown and flextable R packages.
- Quarto has greatly improved Word integration so many of the problems we faced with Word output may soon be solved.
- Don't build the whole report in one file. Work on individual text sections and then have RStudio (via pandoc/knitr) assemble the report (text, figures, tables) from the individual parts.

- How to deal with the team needing to review the assembled document (text, figures, tables):
 - Try to modularize. So maybe make individual chapters and have review happen at that level. Then you incorporate the changes into the plain text manually.
 - Use templates to make your Word doc look the way you want. The default Word template is bare bones. See my example and read about using Word templates with Quartro here and R Markdown here.

2.4.1 Making tables look nice in Word

The example in Table_Counts.Rmd and Table_Counts_flex.Rmd shows you tricks to make nice Word tables.

- how to include a page break in your Word doc between tables.
- using format="pandoc" for the table
- using results='asis' and print() so you can use for loops.
- centering your tables is next to impossible with kable(). Use the {flextable} package if you need that.

2.4.2 New pages

This is how to get a new page in Word. Make sure you are in print view on the word doc, otherwise you won't see any of the pages.

```
'''{=openxml}
<w:p><w:r><w:r><w:br w:type="page"/></w:r></w:p>
```

2.5 Output templates with Quarto

Quarto is working on templates to make output to different formats easy. Here is an example of journal templates quarto-journals.

2.6 Weird Quarto quirks

• If you use

--title: MyTitle

as your title spec, then you won't get the first header 2 in your pdf. Use # instead.

- If you have 2 # levels in a qmd file, you only the first chapter appearing in the TOC. The others appear weirdly as sub-chapters.
- with flextable, your table captions from knitr yaml disappear if the table breaks across a page.

This chapter shows a few simple examples of including tables and getting cross-referencing to work across formats (HTML, Word, PDF). See Chapter 5 for more examples and comparisons of different table outputs.

In this chapter, I am going to use {flextable} for Word and HTML and {kabelExtra} for PDF. See Chapter 5 for a comparison of {flextable}, {kable-Extra} and {gt}. There is a current problem that Quarto is not processing the cross-references with {flextable} into PDF and Word. But this is a known problem and they are working on it. {flextable} is the only table package that I have found the tends to work as expected across platforms. The {officer} package uses it so it works well with Word and works well with LaTeX.

*Note, I am using some customized functions to be able have a uniform look for my tables. These are in tables/_common.R.

3.1 Example table

This is an example a table. We can reference Table 3.1 easily and it is auto-numbered.

Table 3.1: This is a simple table.

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160.0	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875
Datsun 710	22.8	4	108.0	93	3.85	2.320
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440
Valiant	18.1	6	225.0	105	2.76	3.460
Duster 360	14.3	8	360.0	245	3.21	3.570
Merc 240D	24.4	4	146.7	62	3.69	3.190
Merc 230	22.8	4	140.8	95	3.92	3.150
Merc 280	19.2	6	167.6	123	3.92	3.440

Note:

kable

3.2 Including table files

It is often good to have your files in separate files so that when you edit your tables, you only have to work on the table code.

```
```{r child=here::here("tables", "Table_flex.Rmd")}
...
```

	$\mathbf{Df}$	Deviance	Resid. Df	Resid. Dev
NULL			99	129.5
ethnicty	3	47.2	96	82.2
$\operatorname{grade}$	1	1.7	95	80.5
ethnicty:grade	3	7.2	92	73.3

We can add a captions to a flextable with set\_caption but then we won't have access to Quarto's cross-format (Word, HTML, PDF) cross-referencing engine. We can also use tab.cap="caption" in the chunk yaml but again we don't get the cross-referencing engine.

```
set_caption(ft,
 caption = "a table caption with set_caption",
 style = "Table Caption")
```

#### 3.3 Cross-references

In Quarto, table links use the table label @tbl-tablabel where tablabel is the label you put on the table chunk. In the text it looks like this Table 3.3. The chunk yaml looks like this

Table 3.3: This is a table with a number.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1954	NA	NA	NA	NA	NA	NA	1	0	3	5	5	8
1955	10	9	10	11	10	11	11	12	14	14	16	17
1956	18	19	20	22	23	23	24	25	27	28	29	31
1957	32	33	34	34	34	34	34	35	35	37	38	40
1958	40	41	43	43	43	45	48	49	50	53	53	54
1959	55	55	55	53	55	53	54	55	56	58	60	61
1960	61	64	65	66	67	69	68	70	70	70	70	71
1961	71	72	74	74	75	77	79	80	81	82	84	86
1962	86	88	89	89	91	90	92	92	94	97	NA	NA

Note:

kable

#| label: tbl-tablabel
#| tbl-cap: "my caption"

## 3.4 Dynamic table captions

You can create captions dynamically.

```
dt <- mtcars[1:10, 1:6]
tbl_cap <- paste("This is a dynamically created caption. The length of mtcars is"</pre>
```

Unfortunately you cannot dynamically create your chunk labels too.

Table 3.4: This is a dynamically created caption. The length of mtcars is 32 rows. Here we show 10 rows.

	mpg	cyl	disp	hp	drat	wt
Mazda RX4	21.0	6	160.0	110	3.90	2.620
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875
Datsun 710	22.8	4	108.0	93	3.85	2.320
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440
Valiant	18.1	6	225.0	105	2.76	3.460
Duster 360	14.3	8	360.0	245	3.21	3.570
Merc 240D	24.4	4	146.7	62	3.69	3.190
Merc 230	22.8	4	140.8	95	3.92	3.150
Merc 280	19.2	6	167.6	123	3.92	3.440

Note:

kable

Outputting tables (or figure) in a for loop works fine in Quarto, but there is no way to set the table numbers dynamically and get all the cross-references working in Word, HTML and PDF. We really need that dynamic numbering and cross-reference feature in a big report.

#### 4.1 Example of tables produced in a for loop

Look at the Code (link at top in HTML output) to see the cat(knitr::knit\_print(tab)) trick for getting your tables to appear.

#### 4.2 Getting the cross-reference links

We have to use a bit of magic to get our dynamic table numbers and links using Quarto's cross-referencing. The trick is to use a child Rmd (or qmd) in a for loop. This trick can be used for figures too but I'll just show it here with tables. This code inspired from this gist.

We use knit\_expand() and make a child Rmd that uses double curly braces like {{value.to.match}} in the code. That way the value at the time this Rmd was embedded can be referenced. Note that if value.to.match were a string (which it is not in this example), we would need to add quotes around {{value.to.match}} in our code.

Table 4.1: We can set a caption but no way to cross-reference it

	mpg	cyl	disp	hp
Mazda RX4	21	6	160	110
Mazda RX4 Wag	21	6	160	110
Note:				

Table 4.2: We can set a caption but no way to cross-reference it

	mpg	cyl	disp	hp
Mazda RX4	21	6	160	110
Mazda RX4 Wag	21	6	160	110

Note:

kable

kable

Table 4.3: Cars with 4 cylinders. These tables have cross-ref links via @tbl-xyz.

	mpg	cyl	disp	hp
Datsun 710	22.8	4	108.0	93
Merc 240D	24.4	4	146.7	62
Merc 230	22.8	4	140.8	95
Note:				
kable				

With this approach we get our numbered tables and we can reference the tables usual such as Table 4.4. Click on the Code link at top (HTML output) to see how it's done.

Table 4.4: Cars with 8 cylinders. These tables have cross-ref links via @tbl-xyz.

	mpg	cyl	disp	hp
Hornet Sportabout	18.7	8	360.0	175
Duster 360	14.3	8	360.0	245
$\rm Merc~450SE$	16.4	8	275.8	180

Note:

kable

## 5 Kable vs Flex vs qt

Here I compare a three different ways to make tables.

#### 5.1 kable

Here is the {kable} table Table 5.1. {kabel} is part of {knitr} so definitely going to be supported by Quarto since Quarto uses the {knitr} engine. Cross-referencing works across HTML, PDF and Word but output to Word is not always great.

```
library(knitr)
library(kableExtra)
note hold_position not working in Quarto v1.0.38.
kbl(dt, booktabs = TRUE) %>%
 kable_styling(latex_options = c("scale_down")) %>%
 kableExtra::footnote(symbol = c(f1, f2))
```

#### 5.1.1 kable quirks

- Make sure to put always\_allow\_html: true in the yaml at the top of your Rmd or qmd file if outputting to Word. I can't figure out how to put it in the '
- Word output is often not good looking. This is a known issue with kable

#### 5 Kable vs Flex vs qt

Table 5.1: kable: Donec bibendum pharetra arcu vitae porttitor. Morbi ac quam nunc. Ut cursus dolor a mauris aliquet vulputate. Morbi elementum ullamcorper augue, et tincidunt libero facilisis posuere. Nam congue velit non elit sollicitudin aliquet.

	mpg c	yl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	1
Duster 360	14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	4
Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4

<sup>\*</sup> Here is a footnote about this table

 $<sup>^{\</sup>dagger}$  Here is a second footnote.

- Do not pass in caption to kbl() if you want to use Quarto's cross-reference engine.
- kbl(..., format="pandoc") can help for Word if your templates stop working but destroys the PDF output.

#### 5.2 flextable

Here is the {flextable} table **?@tbl-flex**. {flextable} gives you a lot more control over your tables with a grammar format (like ggplot2). It also gives nice output to Word, PDF and HTML. Sadly in Quarto v1.0.38 cross-reference and table captioning for Word and PDF is completely broken, but the developers know about this. The {officer} package, which I think Quarto is leaning on for Word generation, use {flextable} so I am hoping that {flextable} gets moved into the RStudio suite.

$\mathrm{mpg}^{\mathrm{a}}$	$\mathrm{cyl}^\mathrm{b}$	disp	hp	drat	wt	qsec	vs	am	gear	C
21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	

<sup>&</sup>lt;sup>a</sup>Here is a footnote about this table

<sup>&</sup>lt;sup>b</sup>Here is a second footnote.

5 Kable vs Flex vs qt

$\mathrm{mpg}^{\mathrm{a}}$	$\mathrm{cyl}^\mathrm{b}$	$\operatorname{disp}$	hp	drat	wt	qsec	vs	am	gear	Ca
21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	
22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	
21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	
18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	
18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	
14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	
24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	
22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	
19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	

<sup>&</sup>lt;sup>a</sup>Here is a footnote about this table

#### 5.2.1 flextable quirks

• Cross-refs broken in Word and PDF. Known issue.

### **5.3** gt

Here is the  $\{gt\}$  table Table 5.3.  $\{gt\}$  has many of the same features as  $\{flextable\}$  and is in the RStudio suite so maybe it'll get more Quarto

<sup>&</sup>lt;sup>b</sup>Here is a second footnote.

#### 5 Kable vs Flex vs qt

support in the long run. But like {kable}, the Word output is not so great, at least not by default.

```
library(gt)
dt %>%
 gt() %>%
 tab_source_note(source_note = f1) %>%
 tab_source_note(source_note = f2) %>%
 tab_options(
 table.font.size = px(18),
 table.font.names = "Times New Roman",
 data_row.padding = px(1))
```

gt: Donec bibendum pharetra arcu vitae porttitor. Morbi ac quam nunc. Ut cursus dolor a mauris aliquet vulputate. Morbi elementum ullamcorper augue, et tincidunt libero facilisis posuere. Nam congue velit non elit sollicitudin aliquet.

carb	gear	am	vs	qsec	wt	drat	hp	disp	cyl	mpg
4	4	1	0	16.46	2.620	3.90	110	160.0	6	21.0
4	4	1	0	17.02	2.875	3.90	110	160.0	6	21.0
1	4	1	1	18.61	2.320	3.85	93	108.0	4	22.8
1	3	0	1	19.44	3.215	3.08	110	258.0	6	21.4
2	3	0	0	17.02	3.440	3.15	175	360.0	8	18.7
1	3	0	1	20.22	3.460	2.76	105	225.0	6	18.1
4	3	0	0	15.84	3.570	3.21	245	360.0	8	14.3
2	4	0	1	20.00	3.190	3.69	62	146.7	4	24.4
2	4	0	1	22.90	3.150	3.92	95	140.8	4	22.8

#### 5 Kable vs Flex vs qt

#### 19.2 6 167.6 123 3.92 3.440 18.30 1 0 4

Here is a footnote about this table Here is a second footnote.

#### 5.3.1 qt quirks

- Table captions broken in PDF. Known issue. The "Table X." part is missing.
- I couldn't get  $\{gt\}$  to respect my font request for HTML unlike for  $\{flextable\}$

# 6 Figures intro

This chapter shows a few simple examples of including figures and getting cross-referencing to work across formats (HTML, Word, PDF).

## **6.1** ggplot2

We can see in Figure 6.1 that there are many time series. The number of panels is choosen automatically using {ggplot2}.

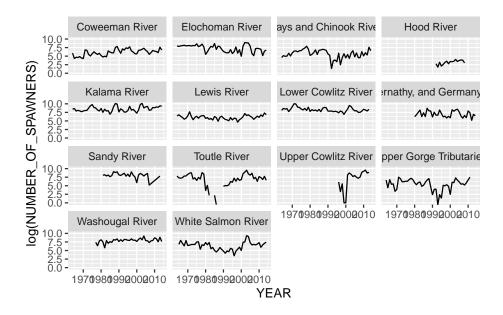


Figure 6.1: Plot of the data

### 7 Conclusion

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nam commodo sit amet nibh non molestie. Maecenas hendrerit nisl velit, a condimentum enim lobortis sit amet. Ut vitae nunc sed mauris condimentum fermentum. Mauris pellentesque nec neque id elementum. Suspendisse a quam aliquam, facilisis urna venenatis, malesuada diam. Pellentesque in fringilla orci. Cras sed purus urna. Ut pharetra enim ut ligula egestas mattis.

Phasellus non diam posuere, laoreet velit sed, egestas felis. Etiam eget neque in tellus lacinia tincidunt. Pellentesque scelerisque odio velit, nec fringilla nibh iaculis non. Aenean sit amet nulla ipsum. Cras felis lacus, pulvinar ac nisi et, convallis pulvinar turpis. Morbi non nibh lacus. Morbi vitae lorem massa. Sed ut turpis vel felis posuere commodo lacinia ac mi. Donec finibus lectus sit amet elit finibus, vitae rhoncus ligula tincidunt. Phasellus vitae blandit lacus. Integer sed nisl fermentum, pulvinar mauris in, posuere enim. Proin sit amet semper urna. Vivamus aliquet rutrum diam ac luctus.

Quisque in nibh sit amet nunc mollis porttitor quis et mauris. Sed non condimentum leo, ac condimentum est. Duis ac venenatis nulla, et aliquet elit. Suspendisse potenti. Duis mollis dui at semper luctus. Maecenas euismod finibus condimentum. Fusce vitae gravida massa. Mauris metus est, pretium non semper vel, dictum vel augue.

Curabitur tempus, leo quis volutpat rhoncus, turpis elit vehicula dolor, id tincidunt augue nunc at enim. In vel enim mattis, varius orci at, tempus ante. Morbi massa elit, pharetra ac libero at, porta tempus quam. Ut fringilla, tortor ac tristique euismod, magna felis vestibulum turpis, quis

#### 7 Conclusion

congue mauris leo nec felis. Aliquam viverra et nibh ut blandit. Praesent sed luctus odio. Pellentesque finibus velit dolor. Morbi ac pulvinar ex, id dapibus eros. Cras interdum arcu viverra auctor tristique. Suspendisse venenatis volutpat ultricies.

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## References

# **Appendices**

This is an example of a large number of tables in appendices. All the data are in the data folder.

# Appendix A

Fracwild	Spawners	Year
1.00	290	2000
0.73	802	2001
0.97	877	2002
0.89	1,106	2003
0.91	1,503	2004
0.60	853	2005
1.00	566	2006
1.00	251	2007
0.52	424	2008
0.63	783	2009
0.70	639	2010

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\*\* data file: Lower\_Columbia\_River\_Chinook.csv mod date: Fri Jul 29 07:21:42 2022 -0400

 $<sup>\</sup>sp{*}$  These spawner counts are from river redd surveys.

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Year	Spawners	Fracwild
2000	146	0.62
2001	2,806	0.82
2002	7,893	0.00
2003	7,348	0.65
2004	6,880	0.01
2005	2,699	0.05
2006	324	1.00
2007	168	1.00
2008	1,320	0.10
2009	1,467	0.18
2010	1,318	0.12

\*\* data file: Lower\_Columbia\_River\_Chinook.csv mod date: Fri Jul 29 07:21:42 2022 -0400

 $<sup>\</sup>sp{*}$  These spawner counts are from river redd surveys.