Print it in grey and see what is left

A chart that works on your screen has been tested on the one display it will never be read on. The handout is greyscale, the projector washes out mid-tones, the room is lit, and about one man in twelve cannot separate your red from your green.

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Lesson 5 of 8

What this lesson covers

- The four displays a chart has to survive
- The greyscale test, which takes ten seconds
- Colour vision deficiency
- Type, lines and the size the chart is actually read at
- Everything that can be deleted
- Alt text, which is a caption doing a second job
- Report it whole
- What comes next

The four displays a chart has to survive

Display	What it does	What fails first
A laser printer	Removes all hue	Two series distinguished only by colour
A projector in a lit room	Crushes mid-tones, lifts blacks	Light greys, thin lines, subtle shading
A phone on a metered connection	Shrinks everything	Type below 9 pt, dense axis labels
A colour-blind reader	Merges red and green	The signal palette, and any red/green pair

The four displays a chart has to survive

- Every one of those is the normal case in this sector — not an accessibility edge case

The greyscale test, which takes ten seconds — In Python

```
import matplotlib.pyplot as plt

fig.savefig("chart.png", dpi=150)
grey = plt.imread("chart.png").mean(axis=2)      # crude luminance
plt.imsave("chart-grey.png", grey, cmap="gray")
```

The greyscale test, which takes ten seconds — In R

```
# ggsave(), then open it in any viewer and desaturate. Or just print it.
```

The greyscale test, which takes ten seconds

- Run it on every chart before it ships — If two series became one, the chart was encoding a distinction in hue alone
- The fix is never "pick better colours" — It is to add a second channel:

The greyscale test, which takes ten seconds

Distinguish by	**How**
Two lines	**Direct labels at the line ends**, plus solid and dashed
Bars, one emphasised	**Lightness contrast**, not hue contrast
Categories	Small multiples, so nothing needs distinguishing
Points in a scatter	Shape as well as colour

The greyscale test, which takes ten seconds

- Lightness survives greyscale by definition — The platform's figures use a dark spruce against a mid slate, which are…

Colour vision deficiency

- The signal palette is the problem case and it is unavoidable — because green, amber and red are the sector's convention. . .

Colour vision deficiency — In Python

```
SIGNAL = {"normal": "#2f8f5b", "moderate": "#d9a02b", "severe": "#c0442f"}
```

Colour vision deficiency — In R

```
# Keep the hues. Add a second channel so the hue is not load-bearing.
```

Colour vision deficiency

- Three ways to keep the convention and still be readable
- Order the categories — Normal, moderate, severe in that order means position carries the severity even when hue does not
- Label directly — The word "severe" on the bar costs nothing and removes the dependence entirely
- Vary the lightness deliberately — The three signal colours on this platform are not equally light: the green is darker. . .

Type, lines and the size the chart is actually read at — In Python

```
plt.rcParams.update({
    "font.size": 10,          # 9 pt is the floor for a printed figure
    "axes.labelsize": 10,
    "axes.titlesize": 11,
    "xtick.labelsize": 9,
    "lines.linewidth": 1.6,   # 1 pt disappears on a projector
})
fig.set_size_inches(6.5, 4)   # the width of a text column, not of a monitor
```

Type, lines and the size the chart is actually read at — In R

```
theme_set(theme_minimal(base_size = 11))
```

Type, lines and the size the chart is actually read at

- Author at the size it will be printed — A chart designed at 12 inches wide and dropped into a 6.5-inch column has...
- 9 pt is the floor for print and 18 pt for a projected slide — The lesson decks this platform generates are 1280×720;...
- Thin lines and light greys are the first casualties of a projector — Use 1.5 pt or heavier, and do not rely on a grey...

Everything that can be deleted

Delete	Because
The legend, for two series	Direct labels are read in place
Gridlines, most of them	Four is enough; twelve is a texture
The chart border and top/right spines	They carry nothing
Redundant axis units on every tick	"%" on the axis label, not on each number
The title, when the caption says it	Two headings compete
Decimal places	42.9% not 42.94%; the interval is wider than the decimal

Everything that can be deleted — In Python

```
plt.rcParams.update({"axes.spines.top": False, "axes.spines.right": False})
ax.grid(axis="x", alpha=0.3)
ax.set_axisbelow(True)              # gridlines behind the bars
```

Everything that can be deleted — In R

```
theme(panel.grid.minor = element_blank(), panel.border = element_blank())
```

Everything that can be deleted

- Gridlines go behind the data — A gridline drawn over a bar reads as a division in the bar, which is a mark that means. . .

Alt text, which is a caption doing a second job — Example

```
![Global acute malnutrition by commune with 95% confidence intervals. The three
highlighted communes are the only ones whose interval clears the district
median.](/figures/muac-gam-by-commune.en.svg)
```

Alt text, which is a caption doing a second job

- "Chart of GAM by commune" describes the file, not the finding — A reader who cannot see the chart gets nothing from it
- A caption that states the finding serves four readers at once — the screen-reader user, the reader of the printed…
- This is why the platform requires it rather than recommending it — `figures.test.ts` fails a figure whose caption is…

Report it whole — Example

Figure accessibility conventions

All figures are readable in greyscale: emphasis is carried by lightness contrast rather than hue, and series are labelled directly rather than through a legend.

Signal colours (green/amber/red) are used only where the categories are ordered by severity, so position carries the meaning independently of hue.

Figures are drawn at the width they are printed. Minimum type size is 9 pt in the report and 18 pt on slides.

Every figure carries a caption stating its finding, which is also its alternative text.

Report it whole

- Four lines, and they are checkable by anyone with a printer — An accessibility statement that cannot be verified from...

What comes next

- A figure is rarely read where it was written.

Read the full lesson, with runnable code

https://data-analysis.cassion.dev/courses/data-visualisation/viz-05-greyscale-and-the-projector