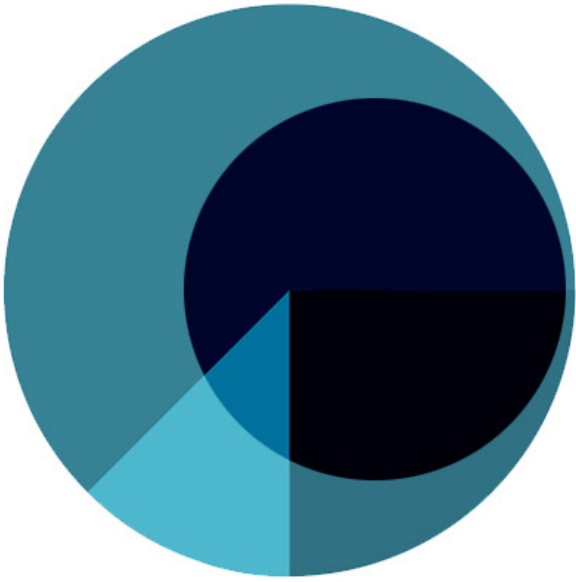


A new set of evidence-based guidelines to help the production & commissioning of health infographics for use with the general public.

Dr Catherine Stones  
School of Design,  
University of Leeds, UK

Dr Mike Gent  
Public Health England  
Yorkshire & The Humber, UK



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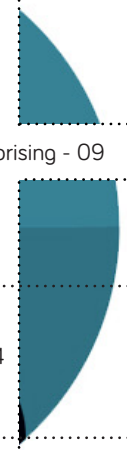
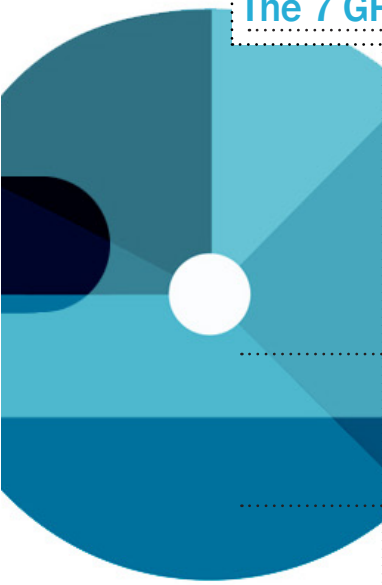
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# INTRODUCTION

## Who is this guide for?

These guidelines are for any organisation or designer who needs to design or commission public health infographics for the general public.

## Using the Guidelines:

The 7 GRAPHIC principles are all equally important. We strongly recommend that you go through each one in turn.

## Where did the guidelines come from?

1. Results of interviews and viewing tasks with 85 members of the general public across Leeds, Wakefield and Halifax in West Yorkshire, UK.
2. Original findings from focus groups with 25 members of the general public in Leeds and York, UK.
3. Original analysis of popular health infographic formats.
4. Principles from key academic literature.

## Add your own findings

The section on research methods is designed to encourage you to contribute your own research findings to [www.visualisinghealth.com](http://www.visualisinghealth.com). The more we know about reception to and understanding of infographics, the more effectively we can design them.

# WHAT IS AN INFOGRAPHIC?

The word 'Infographic' is an abbreviation of 'Information Graphic'. According to Lankow, Ritchie & Crooks (2012), put simply:

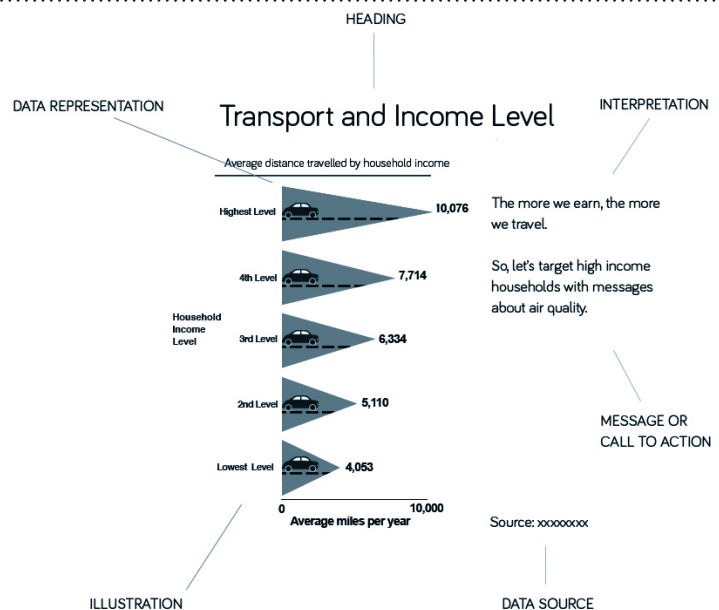
**“AN INFOGRAPHIC USES VISUAL CUES TO COMMUNICATE INFORMATION”**

This guide focuses on infographics that communicate a clear message and that simplify information for a general audience.

This guide does not offer support for more complex data visualisations for subject-specialists.



Lankow, J., Ritchie, J., & Crooks, R. (2012). *Infographics: The power of visual storytelling*. John Wiley & Sons.



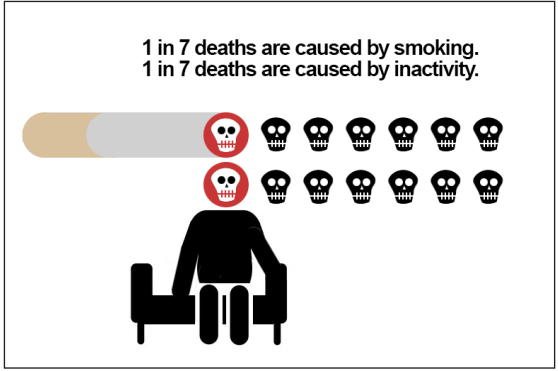
Many infographics contain combinations of the following:

- 1) An appropriate heading
- 2) A visual representation of data in the form of charts/graphs. The aim of the data representation is to draw attention to the statistics and also to make them easier to understand and remember
- 3) Illustration representing, say, the subject of the infographic
- 4) Brief Interpretation that highlights the main message
- 5) Key message or call to action
- 6) Source of the data



# HEALTH PROBABILITIES

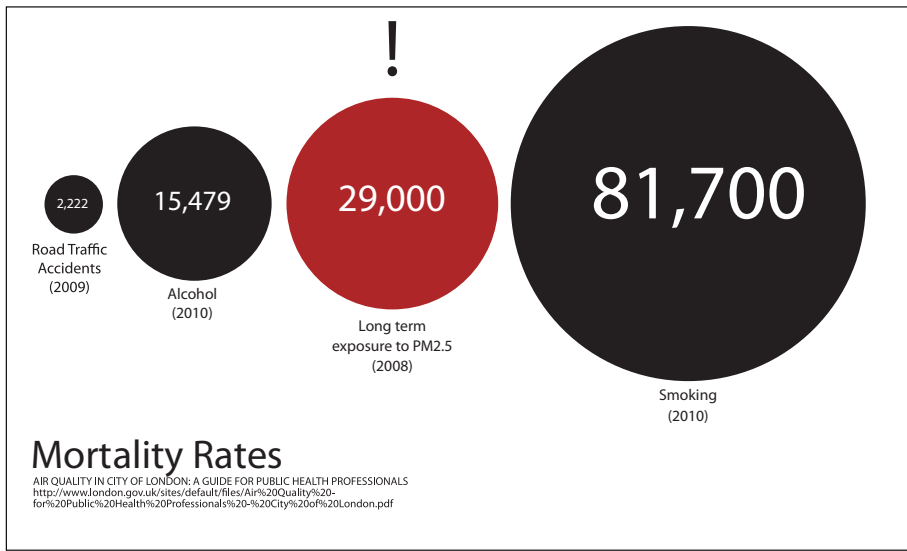
Often public health data is used to communicate personal health risks -e.g. frequencies or probabilities. Such information may play a role in behavioural change.



# COMMON TYPES OF INFORMATION USED IN PUBLIC HEALTH INFOGRAPHICS

## HEALTH QUANTITIES

Some data is concerned with quantities and comparisons, sometimes comparing rates over time or comparing causes of death or disease. Whilst not as personally relevant as risk information, it is still useful for the general public to understand societal trends and to appreciate what the largest health problems are.



G

**01 GET TO KNOW YOUR AUDIENCE**

# 01 GET TO KNOW YOUR AUDIENCE

## DEFINE YOUR AUDIENCE

The first 4 questions you need to ask when creating an infographic is:

- 1) Who is your audience?
- 2) How will they see it?
- 3) What is the key message you want them to 'take away'?
- 4) What are the key barriers to communication?

We'll look at each one of these questions in turn in this section.

We asked a group of 15 public health professionals in the UK to identify the audiences who see their data. This is what they said:

### PUBLIC HEALTH SPECIALISTS

**PUBLIC HEALTH COLLEAGUES**  
**LOCAL AUTHORITIES/COUNCILS**  
**DIRECTORS OF PUBLIC HEALTH**

### HEALTH PROFESSIONALS

**PRACTICE NURSES**  
**GENERAL PRACTITIONERS**

### NON HEALTH AUDIENCES

**THE PUBLIC**  
**STUDENTS**  
**VOLUNTARY SERVICES**  
**CULTURAL/ARTS SECTOR**  
**FUNDING BODIES**  
**LOCAL COUNCILLORS**  
**DEVELOPERS (HOUSING/TRANSPORT)**  
**PORTS/AIRPORTS**

Whilst this guide focuses on the design of infographics for the general public, there are many other non-specialist, non-health audiences who might benefit from an infographics approach.

How can you present the data in a way that connects with a particular audience?

For instance a local councillor may want to **quickly** understand the financial implications of disease prevalence whilst a member of the general public needs to be able to **first notice** and then **understand** the risks of getting a disease.

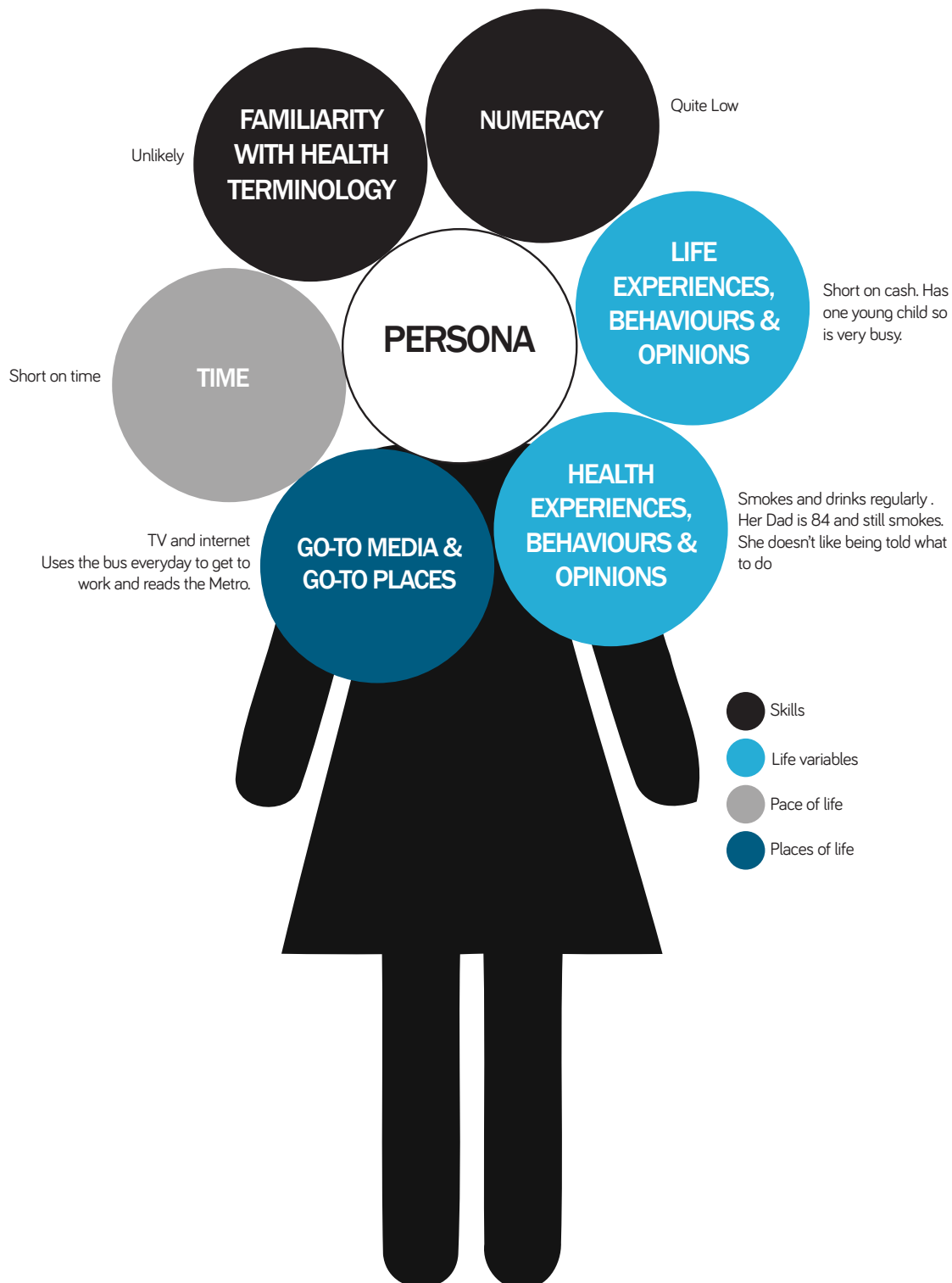
## BUILD A PERSONA TO HELP UNDERSTAND YOUR AUDIENCE

The 'general public' is made up of individuals with different personalities and needs. One of the first things we need to do is create a design persona for the kind of individuals you want to reach. You can consult the persona documents whenever you want to question particular design and content decisions.

To build a design persona, create, say 4 'archetypal' audience members and write down their characteristics according to the structure below. You can also create your own structure to tailor the persona further. You can also include 'fictional' photographs too to aid designers in imagining the audience more clearly.

Predicting the life variables, in particular, will be hard so build your personas by researching the audience more via interviews and focus groups.

Personas will help to bring your audience more into focus.



## CONSIDER WHERE YOUR AUDIENCE WILL SEE THE INFOGRAPHIC

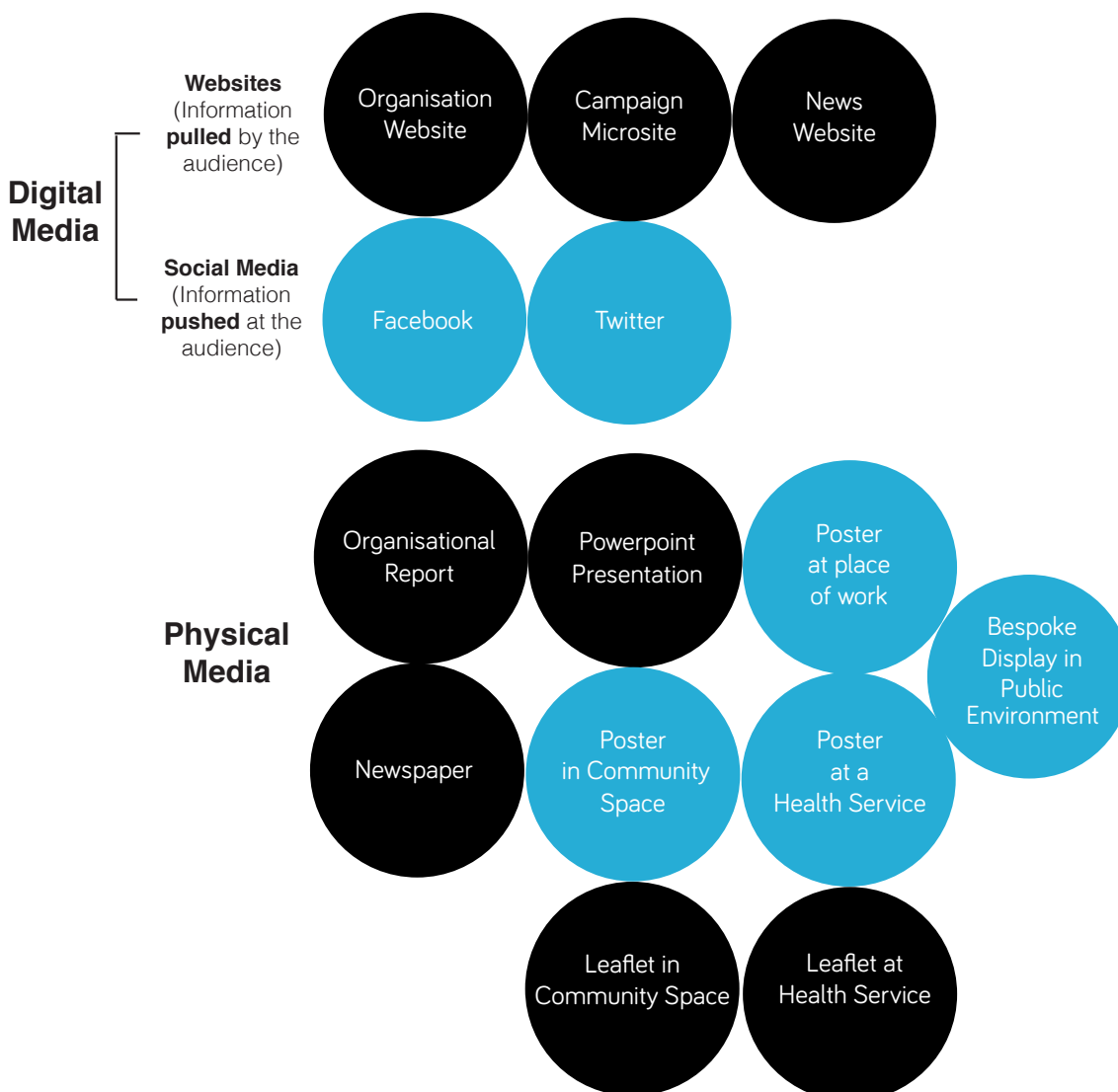
Infographics can be used in a wide variety of locations. Unlike pure text-based approaches the images and bright colours within infographics make them highly suitable for media that requires an immediate impact such as social media or posters. All these locations demand efficiency of communication, as non-specialists are unlikely to spend time studying your designs.

- Attention-Seeking**  
 These infographics will require simple messages presented with greater attention to visual qualities such as bright colours and relevant images.

- Accompaniment**  
 These infographics will require simple messages that provide a clear accompaniment to surrounding text.

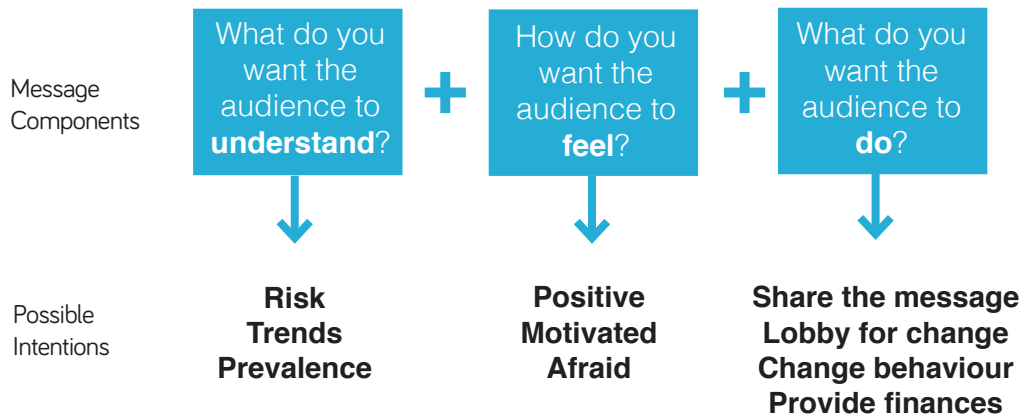
### Sharing

Be clear in your identification of appropriate media. Consider scenerios and critique your distribution strategies. Why would a health infographic be shared on social media amongst teenage friends?



## DEVISE A KEY MESSAGE AND TONE TO GUIDE CONTENT AND VISUAL DESIGN CHOICES

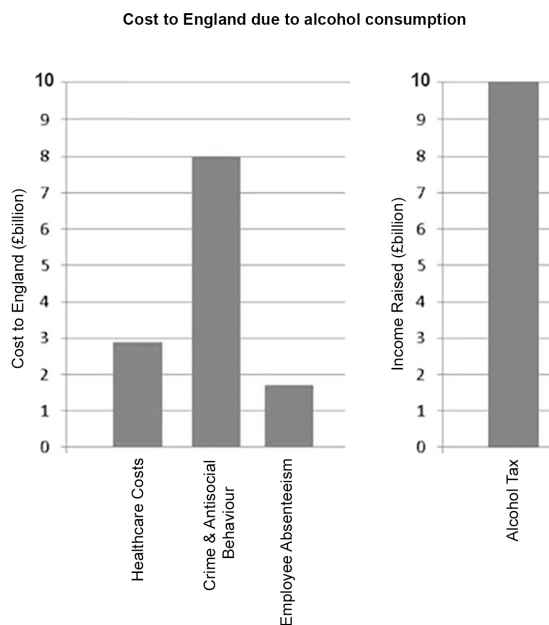
Once you've identified your audience and appropriate media, consider the key messages you want the infographic to communicate. This 3 step structure for planning is useful.



## PROVIDE A KEY MESSAGE IN WORDS

When 85 people were asked to interpret the simple bar graph (shown below) related to the costs caused by alcohol versus the amount raised in alcohol taxes, 19% of participants focused their answer on the high amount raised by alcohol tax, sometimes claiming that the government were making more money by alcohol tax than they spent.

People generally were not prepared to add values together and instead they tended to make assumptions based on quick glances. It's therefore important to pick out key messages for the general reader.



“So they’re not going to stop us drinking cos they’re making too much money out of it”

Female, 63

“After paying for this we’re still in profit”

Female, 41



Shah, P., & Hoeffner, J. (2002). Review of graph comprehension research: Implications for instruction. *Educational Psychology Review*, 14(1), 47-69.

Shah & Hoeffner, (2002) compared viewers' interpretation of graphs that depicted familiar data for which they had expectations and unfamiliar relationships for which viewers did not have any expectations. Overall, when viewers were familiar with the data they tended to describe those relationships ignoring data points that didn't 'fit' with their expectation.

## BARRIERS TO THE RECEPTION OF YOUR MESSAGE

As part of our interview and focus group research we spoke to over 100 members of the general public and we were met with a variety of responses to infographics, not just relating to their visual appearance but also to their content.

### CHOOSE KEY MESSAGES THAT ARE PERSONALLY RELEVANT & SURPRISING

“Congestion in Leeds is a real issue for me”

Male, 31

“I didn’t realise liver disease had gone up that much”

Male, 50

During a recall test of 12 infographics 85 participants were asked why they thought they could remember a particular infographic or a fact.

The top 4 reasons cited for their recall of particular infographics were:

1. Personal Experience/Relevance
2. Surprise
3. No Reason
4. Visual Appearance of Infographic

To try to ensure as much personal relevance ensure that your target audience is tightly specified. If you want to target smokers, ensure it reaches them through specific media.

Notice also how ‘surprise’ appears on the list. Avoid familiar facts and highlight new findings or equivalencies. For instance, the fact that smoking and inactivity have equal risk of mortality was cited as being surprising in our study.

### ACKNOWLEDGE DISBELIEF

“I think that’s a load of rubbish...I don’t believe a word of it. That’s not my experience”

Female, 51

“But executives have a different type of stress so I thought it would be pretty even”

Female, 63

“I think they’re useful as I’ve always tried to be healthy but where do they get their figures from? How do they know? It’s 50/50 I believe”

Female, 71

Just because the infographic is based on a reliable source it doesn’t mean the viewer will always believe it. People apply their own knowledge when considering facts. Some people will integrate their own personal anecdotes and experiences to the data and will be keen to question it.

People may also question how the information has been found. A simplified statement about ‘How we know’ may be useful to append.

In your own field of public health where does scepticism lie? Counter it through use of a small piece of simplified text such as :

‘Even accounting for where you live, or your genetic history, 20 studies in 5 countries found the above to be true’

## CONSIDER AN INFOGRAPHIC'S ROLE IN BEHAVIOURAL CHANGE

There are many triggers that can influence behavioural change. During our focus group discussions most participants expressed the view that personal risk statistics could play a role in their decision making, though not as strongly as direct experience of their own health and body. Local health statistics played a smaller role than personal risk statistics.

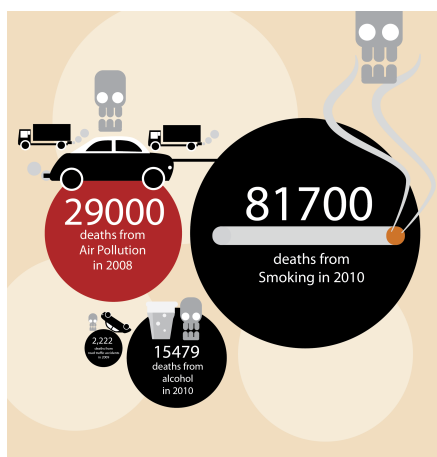
The most common triggers judged likely to lead to behavioural change by the participants were (in order of rated 'likelihood'):

1. How my body feels
2. A personal health scare
3. How my body looks
4. Experiences of friends/family members & how my body used to feel & look
5. Reading/seeing health statistics about my own personal risk

Statistics and thus infographics are only one part of a complex mix of influences on behaviour. By trying to ensure that the infographic is both noticeable, understandable and memorable, we can maximise its chances of making a difference.

## AVOID COMPLEXITY

People, in general, value simplicity and simple messages



Whilst the image on the left resembles contemporary infographics in terms of busyness, people interviewed generally thought it had too much information on it. This was particularly the case for people in the sample who left school at 16 or had no qualifications.

“Too confusing for me”

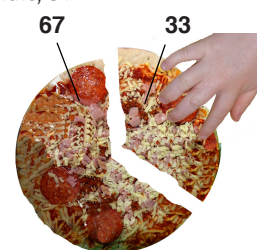
Female, 49

“Too many numbers”

Female, 40

“It's obvious – people would get the message straight away”

Male, 31



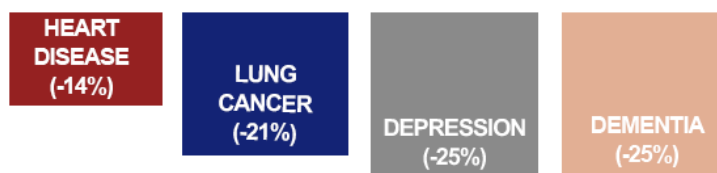
OBESEITY IN AMERICA  
33% of children are obese or overweight

## FIND SIMPLER WAYS TO EXPRESS RISK REDUCTION

Check that the statistic is as simply described as possible. For example, risk can be complex to describe. In our focus groups there was some confusion about relative risk percentages, with participants wanting to know absolute risk values too. This tended to make people suspicious of the numbers and in some cases people felt figures were over-inflated, despite being based on good evidence.

Do precise figures always have to be used? In the example below, is it just as effective to say 'exercise reduces your chances of getting dementia'?

### Exercise can reduce your risks of disease





## EVALUATE DESIGNS WITH YOUR AUDIENCE

### AUDIENCE EVALUATION 1: EYE TRACKING

You may want to consider researching into how effective your infographic is at gaining attention. One way you can do this is to set up an eye tracking study. An eye tracking device varies in cost to buy and can also be hired. You need both an eye tracking camera and software. Participants must be in the room with the camera and sat in front of your designs.

Pros:

1. Gives 'objective' views about where people look.

Most eye tracking software will tell you where people look within a graphic and the order of their viewing. They will also tell you how long viewers look at certain areas. To the right is an example of a screenshot of some eye tracking scanpaths. Raw data is also usually available from the programs to statistically analyse for significance.

Cons:

1. Doesn't tell you why people look where they do unless followed up with interview or 'talking out loud' methods.
2. Not always suitable for older audience where vision problems exist.
3. Generates a lot of data



### AUDIENCE EVALUATION 2: COMPREHENSION TASKS

To gauge how people understand certain infographics, you can either ask fixed questions e.g. how many people have diabetes in the UK, or you can ask for the overall meaning of the infographic.

You can time people's reactions if speed is an issue though remember that all participants will process information at different speeds.

There are two main types of knowledge (Hawley et al, 2008) you could measure:

VERBATIM: Accurate reading of the numbers/details within the infographic.

GIST: Getting the overall message/meaning of the infographic.

Since we are dealing with a non-specialist audience in this guide, it is recommended to focus on overall understanding rather than on rates of being able to read numbers from a legend on a chart. Since reading public health data is essentially 'optional' we need to examine how people engage with infographics generally first - e.g. do they process the information or make comparisons. Are they, for instance, prepared to read 'into' the data to reach a conclusion?

We tested for 'gist' knowledge in our study though where you are developing specific designs you may well want to test verbatim knowledge associated with identifying key areas or reading the text with ease.

Pros:

1. Provides accurate record of comprehension e.g. people either understand or they don't.

Cons:

1. Can be time consuming to code results.



Hawley, S. T., Zikmund-Fisher, B., Ubel, P., Jancovic, A., Lucas, T., & Fagerlin, A. (2008). The impact of the format of graphical presentation on health-related knowledge and treatment choices. *Patient education and counseling*, 73(3), 448-455.



Shah, P., & Hoeffner, J. (2002). Review of graph comprehension research: Implications for instruction. *Educational Psychology Review*, 14(1), 47-69.

There is a plethora of work on graph comprehension which mostly stems from the discipline of psychology. The work tends to look at familiar formats - bar and line graphs and pie charts rather than newer formats or unusual infographic styles. Shah & Hoeffner (2002) produced a useful review of graph comprehension with an emphasis on using them for learning and instruction

## AUDIENCE EVALUATION 3: RECALL TASKS

Open recall involves showing the participants a series of designs. These may be nested within larger documents or on their own. You can fix the time they are viewed or allow for self-directed viewing. The latter is recommended where your audience is diverse.

Once they have been viewed you ask them to say out loud what they remember and why they think they remember it.

Also consider what it is you want to measure about the recall:

1. Having seen the infographic
2. Correctly remembering the gist (overall meaning) of the infographic.
3. Correctly remembering actual statistics from the infographic (verbatim knowledge).

### Short Term Recall

This will involve asking participants what they remember almost immediately after they saw the designs.

This provides a quick snapshot of immediacy though doesn't guarantee that the message or the graphic will be retained in memory. In our study we performed short term recall tasks only due to the timescale of the project.

### Long Term Recall

This will involve a follow up interview after, say 7-14 days, where you ask participants again what they remember seeing. Whilst more useful than short-term recall this method is more resource intensive.



When you analyse your results ensure that you factor in 'primacy' and 'recency' effects - e.g. the infographic that is seen last or first likely to be recalled more. To minimise this effect, ensure there is a distraction before asking participants what they recall. In psychology tests where participants have been found to memorise through verbal rehearsal (e.g. saying the facts over and over), distraction tasks have involved counting down in 3's from 100 or asking them a different set of questions for at least a minute.

Pros:

1. Helps to identify what 'sticks' in people's minds.

Cons:

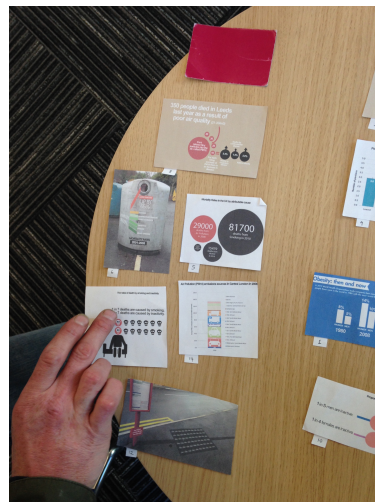
1. People often struggle to remember many details.
2. It can feel artificial.

## AUDIENCE EVALUATION 4: APPEAL TASKS

For judging overall appeal create a structured environment for participants to give their views.

For instance, to help people rate and rank designs create small versions of designs they've already seen and ask them to place them in either 'good', 'ok' or 'poor' positions on a table. Then follow this up with discussions.

You can also use focus groups to gauge broad opinions about appeal though do ask people to form individual opinions first. Go round the room to ensure you gain the views of everyone before opening it up to a group discussion.



Pros:

1. Provides rich qualitative data.
2. Allows for open and unexpected responses.



Cons:

1. People often struggle to articulate why they have particular responses to visual information.
2. It's still unclear what role appeal plays in the attention to, comprehension of and recall of infographics.

R

02 RESTRICT COLOUR

## 02 RESTRICT COLOUR

IN OUR INTERVIEWS WITH THE PUBLIC, COLOUR WAS THE SINGLE MOST DISCUSSED VISUAL QUALITY OF AN INFOGRAPHIC.

“COLOURS ON A WHITE BACKGROUND ARE MORE ATTRACTIVE”

Male, 71

“THE COLOURS STAND OUT... I WONDERED WHAT THAT WAS ABOUT”

Male, 43

“THE COLOURS IN THAT ARE BLAND...LIKE YOU'D SEE IN A JOURNAL”

Male, 31

“COLOUR ATTRACTS MY EYE”

Male, 24

THIS DOESN'T MEAN HOWEVER THAT YOU SHOULD OVERLOAD AN INFOGRAPHIC WITH MANY COLOURS. COLOUR SHOULD BE USED WITH A PURPOSE IN MIND.



Yantis, S., & Gibson, B. S. (1994). Object continuity in apparent motion and attention. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale*, 48(2), 182.

Whilst colour can enhance the appeal of information it's important to use colour also to focus attention and to ensure all the text is readable. Visual attention is determined by a number of variables including shape, colour and size (Yantis & Gibson, 1994).

Notice how colour is used sparingly in the design on the right to focus attention on the emissions from an ordinary car. Red is also used to highlight the level of air pollution that can cause disease.



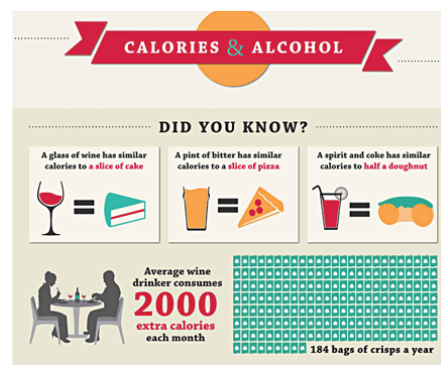
## RESTRICT YOUR COLOUR PALETTE TO BETWEEN 3 & 5 COLOURS



Travis recommends using no more than 5 colours in a single design.

Travis, D. (1991). *Effective color displays: Theory and practice* (Vol. 1991). London: Academic press.

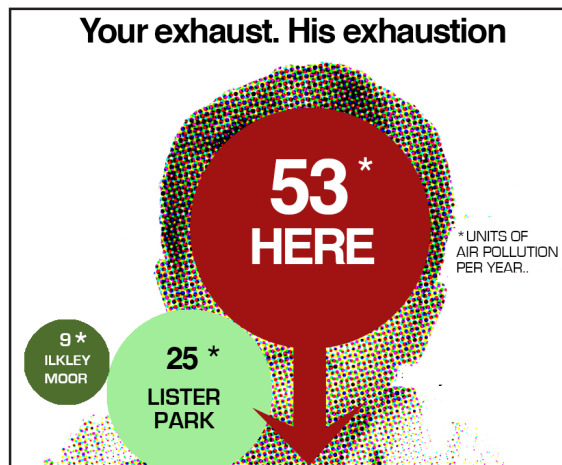
Avoid overwhelming the viewer with many colours. This may distract the eye from making sense of the whole infographic. Whilst the infographic on the right may look very colourful it actually has a very restricted colour palette. Red and turquoise are the dominant colours - these contrast against the beige background due to their high saturation (there is a lot of vivid colour in their shades). Orange is less dominant and grey is used sparingly. We have a hierarchy of position here and a hierarchy of colour.



Source: [www.drinkaware.co.uk](http://www.drinkaware.co.uk)

## CHECK COLOURS FOR LEGIBILITY

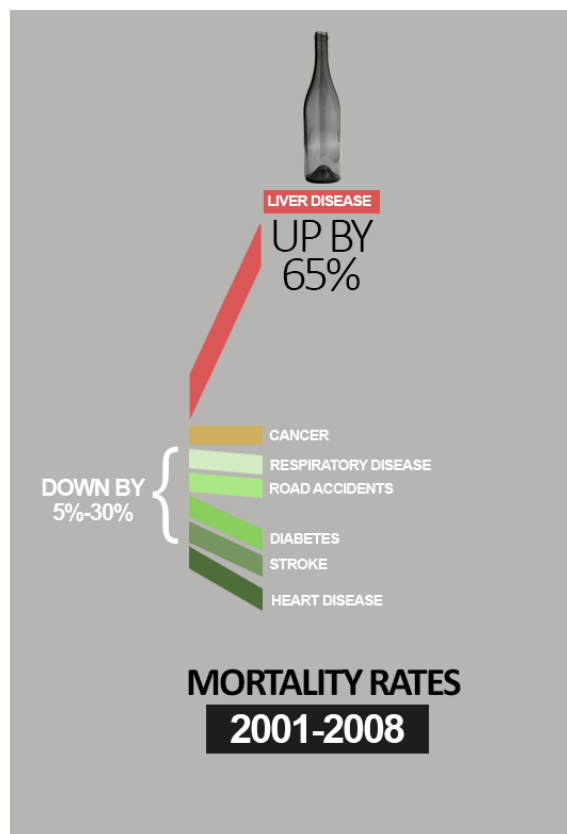
Poor use of colour can really hamper legibility. Notice how in the graphic to the right, white text on red is used for the largest circle whereas black text is used instead on the lighter shade of green. Pay as much attention to the colour that's under the text as to the text itself. Since the graphic on the right was go a large outdoor display we used large areas of colour to contrast with the coloured distractions on the street.



## CHOOSE COLOURS SENSITIVELY TO YOUR SUBJECT

In our interviews red was understood as signifying danger though this was only mentioned by a handful of the 85 participants. Though the people we interviewed didn't especially highlight the deep meaning of colour it's still important to choose colours that reflect the subject matter where appropriate. Be aware that colour associations can be culturally specific so test colour appropriateness where you're designing graphics for particular cultures.

Do, for instance, consider using colour coding to signify 'good' and 'bad'. In this infographic to the right, red is used to signify negativity whereas green indicates a positive outcome. Different values of colour can help show levels of severity. A darker green is used here to show a 'better' result.



There is much literature about the subject of colour theory and the difference colour makes in general to designs.

Ali, N., & Peebles, D. (2013). The effect of gestalt laws of perceptual organization on the comprehension of three-variable bar and line graphs. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 55(1), 183-203.

Ali & Peebles (2013) called for more colour coding to be used in graphs to help even those with higher levels of education interpret data.

Also see Kosslyn (2006) for an extensive chapter on colour in graph design.

Kosslyn, S. M. (2006). *Graph design for the eye and mind*. Oxford University Press.

“The red on it is effective as a warning”

Female, 40



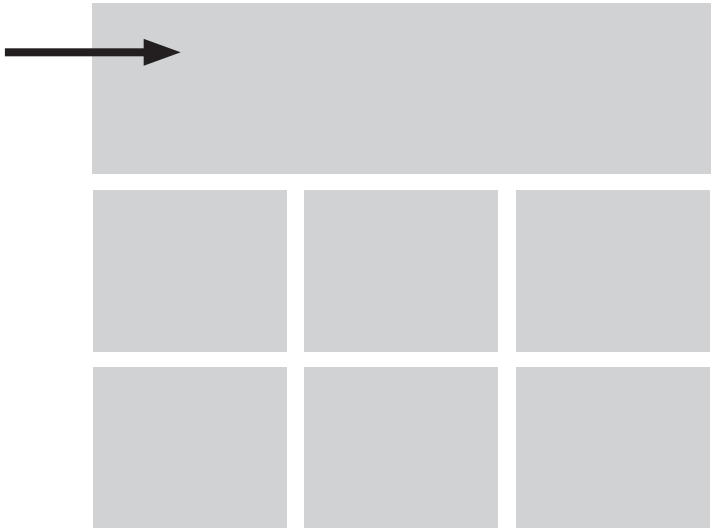
**03 ALIGN ELEMENTS**

# 03 ALIGN ELEMENTS

Alignment is very important aspect of infographic design that allows the whole composition (and its component parts) to form a harmonious whole.

A grid is a series of invisible lines that help elements to line up. All the pictures and text elements should line up with each other along a series of invisible lines. You can create a set of boxes as shown below that line up. These will act as placeholders for your content.

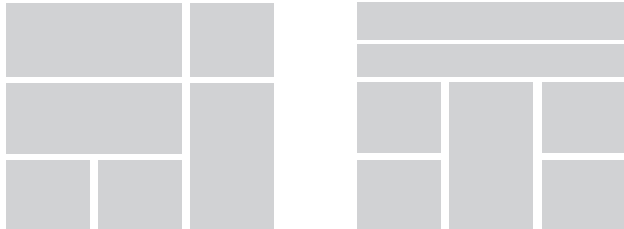
Larger blocks are for more dominant content. In this case - the title.



Notice how elements sit flush with each other vertically

Notice how elements sit flush with each other horizontally

Notice how you can make many variations based on one grid structure, combining and splitting boxes. The result though is still harmonious.



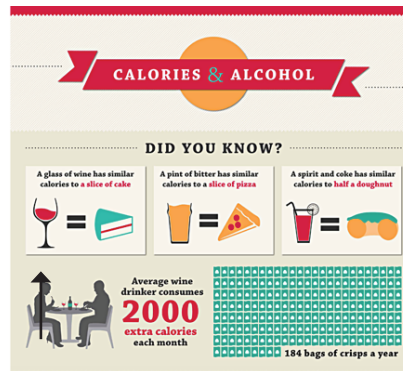
Even in a single infographic ensure that elements line up. Notice how even the '\*average distance you walk' text lines up with the graph lines above.





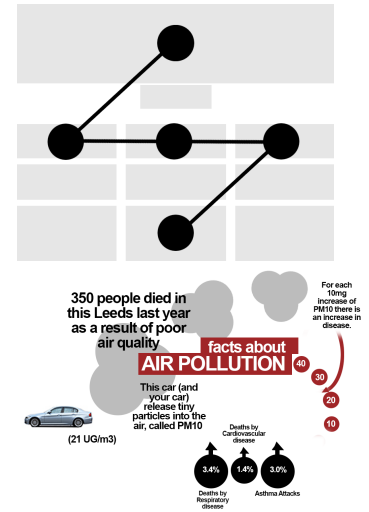
## HOW THE GRID EFFECTS OUR READING BEHAVIOUR

In our eye tracking study we examined how 42 people looked at 3 different infographic layouts. When people looked at this particular layout (shown to the right), their eyes were guided by the grid format very clearly - making fairly predictable eye movements from top-down and left-right. These movements are shown in the simplified diagram on the far-right. Scan paths were much more unpredictable and varied for designs that didn't use a clear grid. That's a problem as we need to guide the viewer towards the most important information and predict where they look first.



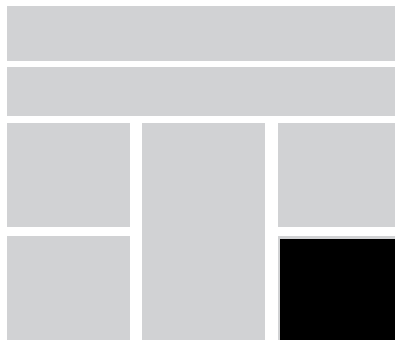
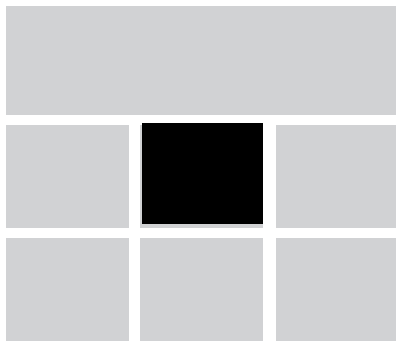
Source: [www.drinkaware.co.uk](http://www.drinkaware.co.uk)

Results of our eye tracking study show that the lowest centre segment was looked at more often than the low left or right segment. This was because the central area contained large text. Though the area to the right was more colourful, the viewers seemed to be more 'information hungry' and went to the '2000' text sooner and more frequently. As noted in the previous section, red will also have helped draw attention to the area.



Whilst the image above may have some appeal it is unclear, due to the absence of a grid, where you should look first and what you should focus on.

You also need to consider how dominant the elements in the grid segments are as this may cause the eye to break out the natural flow of the grid. (e.g. not from left to right, and top to bottom) Bright or darker colours (see left), larger graphics or larger text may pull the eye, depending also, though, on what the person is interested in.



## KEEP TEXT ALIGNMENTS CONSISTENT

Text alignment generally:

To ensure consistency keep alignments the same within one infographic. If you left align your text in one area, keep it the same in the other.

Any large amounts of text should be left aligned rather than centralised.

Only centralise very small amounts of text or the heading.

Alignments within boxes:

Notice how, on the previous page, the 'bus/car and walking' graphic features text within the graph containers that are centrally aligned within the box area. This should be consistently applied.

Readers benefit from text and images being placed closely together and to the use of visual guides (Holsanova, 2009). Keep elements together to guide the eye to meaningful areas such as the heading. (Renshaw, 2004)



Holsanova, J., Holmberg, N., & Holmqvist, K. (2009). Reading information graphics: The role of spatial contiguity and dual attentional guidance. *Applied Cognitive Psychology*, 23(9), 1215-1226.

Renshaw, J. A., Finlay, J. E., Tyfa, D., & Ward, R. D. (2004). Understanding visual influence in graph design through temporal and spatial eye movement characteristics. *Interacting with computers*, 16(3), 557-578.



# P

**04 PRIORITISE PARTS**

# 04 PRIORITISE PARTS

“IT’S GOOD BECAUSE IT’S IN THE FOREFRONT - IT FOCUSED MY EYE”

Female, 50

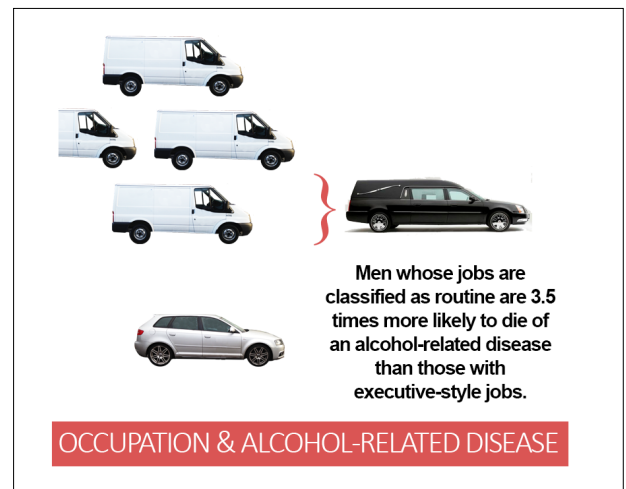
“THERE ARE TOO MANY FACTS...MY EYES ARE WANDERING ABOUT”

Male, 80

## MAKE SURE THERE’S A FOCAL POINT THAT RE-ENFORCES YOUR KEY MESSAGE

If you half-close your eyes and look at an infographic, you should only be able to see the most important elements. Your eyes should be drawn to a particular area of your design. This tells the viewer where to look first. If they don't look any further, at least they've taken in the most important message.

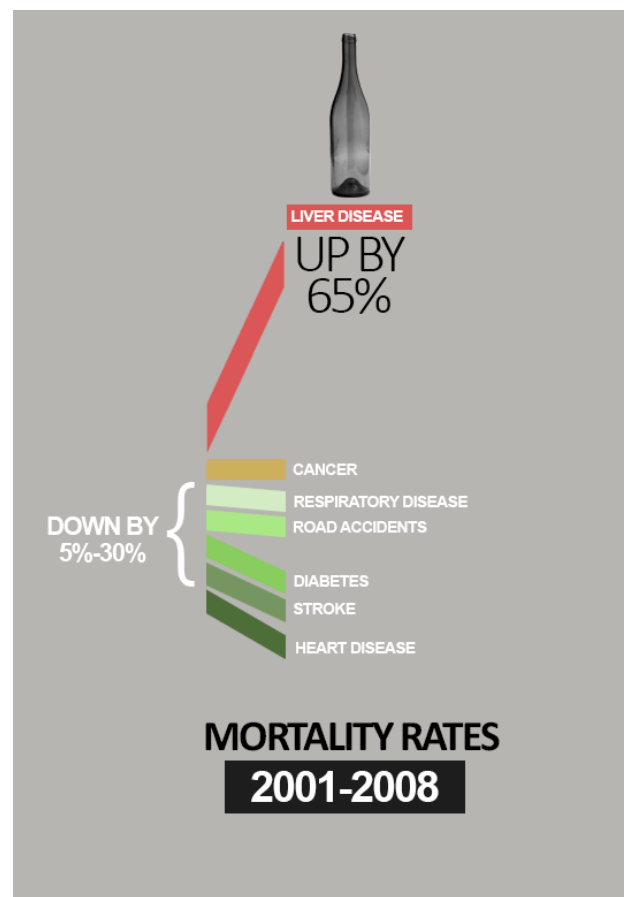
In the example on the right, if you half close your eyes you should see the red box of the title, the hearse and perhaps the red bracket, leading the vans to the hearse.



## PICK OUT KEY STATISTICS IN A LARGER FONT

People are information hungry and will scan the infographic for meaningful content. When people viewed the 3 sets of infographics in our eye tracking test they focused more on the larger text summaries than on the graphic content or the main small columns of text.

In this single infographic notice how the 'Up by 65%' is in upper case and is large. This makes it more dominant. Notice also how 'reverse type' e.g. white text (that reads '2001-2008') on a black background is also dominant in this example.



## ACKNOWLEDGE THAT OTHER ELEMENTS WILL ATTRACT ATTENTION

Infographics tend NOT to be the first thing we look at unless they are very visually dominant (Holmqvist & Wartenberg, 2005).

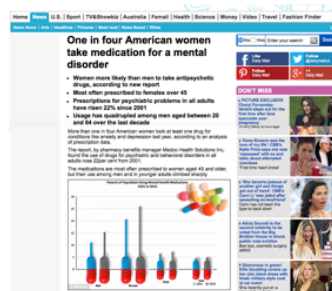
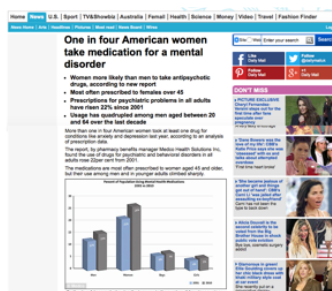


Holmqvist, K., & Wartenberg, C. (2005). The role of local design factors for newspaper reading behaviour – an eye tracking perspective. *Lund University Cognitive Studies*, 127, 1-

Despite altering the infographic design to the right significantly in terms of colour and embellishment, readers didn't look at this graphic quicker or for longer. Just because it's an infographic it doesn't mean it can compete with other potentially more interesting content, particularly photography.

In our research, looking at early fixation data in eye tracking studies (e.g. where readers look first), there is no conclusive evidence that an infographic, per se, attracts the eye instantly. What we can do though

is consider position and visual dominance to help the infographic 'stand out'.



If your infographic or chart is embedded within another page or publication ensure the key message is picked out in large text as other photographs may well compete for attention.

## ARE LONGER VIEWINGS EFFECTIVE?

People tend to look for longer at infographics than other forms of non visual information (Holmqvist & Wartenberg, 2005; Smerecnik et al, 2010) though this very much depends on the complexity of the infographic and the characteristics of the reader. The evidence doesn't show that just because you place an infographic amongst other information, it will necessarily hold their attention.

Longer viewing times were associated with readers having higher levels of interest in a subject (Merle et al, 2014) and thus it's important to target the correct audience who are likely to have a connection with the subject already.

Longer viewing time may show engagement or confusion so we need to test the infographic first to see whether people can understand them easily.

Holmqvist, K., & Wartenberg, C. (2005). The role of local design factors for newspaper reading behaviour – an eye tracking perspective. *Lund University Cognitive Studies*, 127, 1-

Smerecnik, C. M., Mesters, I., Kessels, L. T., Ruiter, R. A., De Vries, N. K., & De Vries, H. (2010). Understanding the positive effects of graphical risk information on comprehension: Measuring attention directed to written, tabular, and graphical risk information. *Risk analysis*, 30(9), 1387-1398.

Merle, P. F., Callison, C., & Cummins, R. G. (2014). How Arithmetic Aptitude Impacts Attention, Memory, and Evaluation of Static Versus Dynamic Infographics in Online News: An Eye-Tracking Study. *Electronic News*, 1931243114557595.



# HI

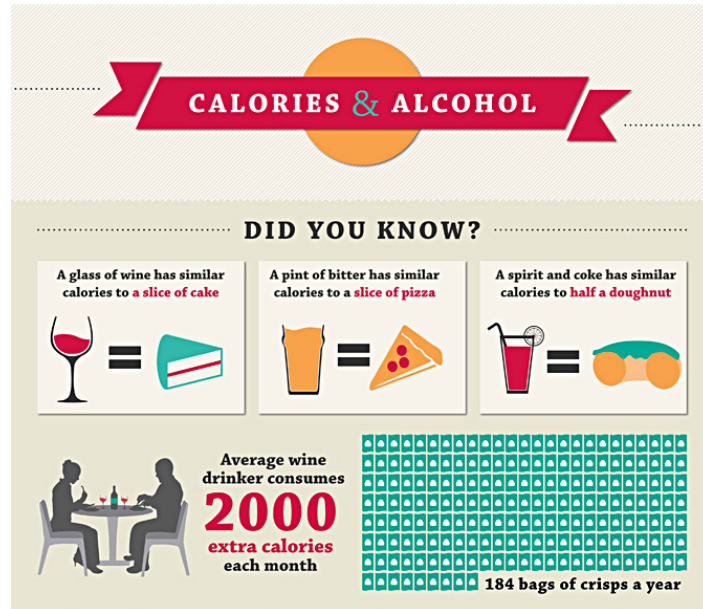
**05 HIGHLIGHT THE HEADING**

# 05 HIGHLIGHT THE HEADING

“HEADLINE – IT’S GOT TO HAVE A GOOD HEADLINE... TO TELL US ‘SO WHAT’ ”

Male, 52

The main heading is an important element of your infographic. In our eye tracking study, unsurprisingly, most people began reading with the heading. It sets the scene and allows the reader to quickly discern whether the information is of interest to them or not. Since it is usually placed at the top of the page, this obviously plays a role in the order it is viewed.



Source: [www.drinkaware.co.uk](http://www.drinkaware.co.uk)

For a multiple display infographic the heading should contain the topic of the infographic. For a single display infographic (e.g. just one fact) it may instead say the main message (e.g. what was found).

## ‘DESIGN’ THE HEADING

“I JUST READ THE TITLE AND IT WAS AN INSTANT TURN-OFF”

Female, 45

Headings should be high in contrast and large in scale. They should be one of the more dominant elements in the design. Consider placing the heading on a decorative element so that it is raised away from the background. Note how in the example above the heading is placed on a red ribbon on top of an orange circle. This also allows for more colour contrast as well as visual interest.

## CONSIDER THE HEADING CONTENT

Consider how appropriate positive/neutral framing is for your audience and avoid exaggeration or scare-mongering.

The Subject Approach	<p><b>“Obesity in Infants”</b></p> <p><b>“Obesity in America”</b></p>
The Message Approach	<p><b>“Globally 1 in 10 children are obese”</b></p> <p><b>“Obesity and Overweight Increasing Worldwide”</b></p>
The Question Approach	<p><b>“What is the current state of obesity in America?”</b></p>
The Fear Approach	<p><b>“Obesity: An Epidemic in the U.S.”</b></p> <p><b>“The Obesity Crisis”</b></p> <p><b>“Worldwide Obesity: A frightening look at the facts”</b></p> <p><b>“Obesity: A ticking timebomb”</b></p>
The Hopeful Approach	<p><b>“Obesity: Complex but conquerable”</b></p>
The ‘Call’ Approach	<p><b>“Be Healthy, Not heavy”</b></p>

The headings above are all taken from obesity infographics available on-line. You may wish to discuss the heading with your team or with your designer as there are many different approaches to take.

Consider evaluating the headline with your target audience before use.



**06 INVEST IN IMAGERY (WISELY)**

# 06 INVEST IN IMAGERY (WISELY)

There is an enormous range of pictures used in public health infographics and they tend to be used to re-enforce the message, to alert the reader to the subject it depicts and to make the infographic more visually interesting.

After examining picture use in 50 on-line public health infographics the types (shown on the right) were identified.

“I like pictures. They show you, don't they...I look at pictures more”

Female, 44

“[pictures] give the image straight away of what they're talking about”

Male, 59




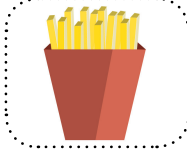






The 10 picture types shown here should be used with caution.

Not all infographics should use all types as this will in all likelihood overwhelm the reader. Identify instead which of the types are appropriate for your audience and the purpose of the infographic.

Where possible try to ensure that pictures enhance rather than distract from the data you're representing.

Choose pictures types predominantly by the function/s you want the infographic to perform.

## The 10 'Pictures' of Public Health Infographics

Name	Visual Example	Explanation	Potential Function
1. People - static		People at risk or people affected either positively or negatively by their health.	To identify who is affected, quantify risks & prevalence.
2. People - active		People performing health-related behaviours e.g. eating or running.	To identify what the subject. To dissuade or motivate.
3. Subject		Symbols that represents the broad subject of the infographic, in this case, bike riding.	To identify the subject. To decorate.
4. Trigger		Specific objects that trigger health problems e.g. fast food packages or a sofa to symbolise inactivity.	To educate/ remind the reader about possible causes.
5. Biological		Labelled bodies or body parts affected, often presented in diagram form.	To educate the reader about what happens to the body.
6. Equivalencies		The equivalence of say how many calories you burn during exercise.	To make abstract numbers more relatable.
7. Recommended Action		Recommendations of behavioural change - e.g. exercising for 30 minutes a day.	To educate the reader about action to take.
8. Outcome		These represent what health behaviours might lead to, e.g. death.	To motivate or dissuade.
9. Context/Tone		No direct visual relationship to health though provides a wider context or tone to the infographic.	To decorate. To provide context. To provide a tone.
10. Decorative		Used as placeholders for content. They include frames, scrolls and circles that highlight information.	To decorate. To aid layout.



## CHECK THAT YOUR IMAGERY IS COMMUNICATING CLEARLY

DESPITE THE FACT THAT THE PEOPLE WE INTERVIEWED PREFERRED INFOGRAPHICS WITH IMAGES (NOT JUST CHARTS) THERE IS MIXED EVIDENCE TO SHOW THAT THEY HELP WITH COMPREHENSION.

### SYMBOLISM SHOULD NEVER BE RELIED UPON

Out of 85 people in our interviews, only 2 people mentioned symbolic use of imagery. High level interpretation is the exception rather than the rule. Metaphorical or symbolic images must not be solely relied upon as a crucial element of the design.



1 in 5 men are inactive



1 in 4 women are inactive

“The shoes are different shoes – shows a wider range of people”

Female, 63

“Because it looks like a bin...it's like, throwing your life away”

Female, 55

The only 2 quotes by participants ‘reading into’ the images without prompting.



## EXCESSIVE IMAGES OR DETAILS CAN SLOW DOWN COMPREHENSION AND EFFECT ACCURACY

If you require speedy comprehension (such as in a medical environment or when an immediate decision is needed to be made) then plainer infographics will be more effective. Embellished infographics though have a wider appeal. (Per Mollerup, 2015)



Mollerup P, (2015) Data Design, Bloomsbury, UK

### ADDING IMAGERY CAN AID RECALL

Bateman et al (2010) found that by using drawn pictures within and around the data, long term memory of the graphs was increased when compared with using very plain graphs.



Bateman, S, Mandryk, R. L., Gutwin, C., Genest, A., McDine, D., & Brooks, C. (2010, April). Useful junk?: the effects of visual embellishment on comprehension and memorability of charts. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 2573-2582). ACM.

### BEWARE OF DISTURBING IMAGERY

Participants had mixed views about the use of potentially disturbing imagery such as skulls, needles or blood. Evaluate the use of these carefully before use.

## CHOOSING IMAGE STYLES

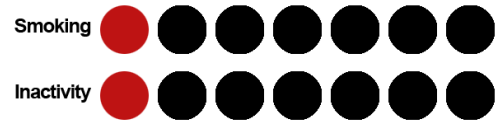
### USING SIMPLE SHAPES

Simple, colourful shapes can be effective for highlighting information or even making the data more bespoke. They are also useful when you require a more neutral tone to the work. Another advantage is that they are relatively easy to generate. They generally though lack personality and don't directly reference the subject matter.

"I wouldn't look at any of them - they're just dots and lines"

Female, 44

1 in 7 deaths are caused by smoking.  
1 in 7 deaths are caused by inactivity.



### USING PICTOGRAMS

Pictograms carry a more formal and objective tone than, say, cartoons. They are usually made of simple shapes and lack detail (so they are good for general representations of populations). They are generally easy to source, though are perhaps overly familiar and lack personality.



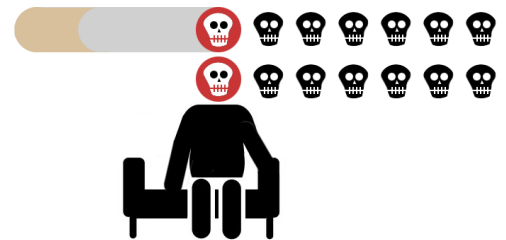
"THE PICTURE DRAWS YOU IN STRAIGHT AWAY"

Male, 46

"THIS LOOKS A BIT SIMPLISTIC"

Female, 35

1 in 7 deaths are caused by smoking.  
1 in 7 deaths are caused by inactivity.



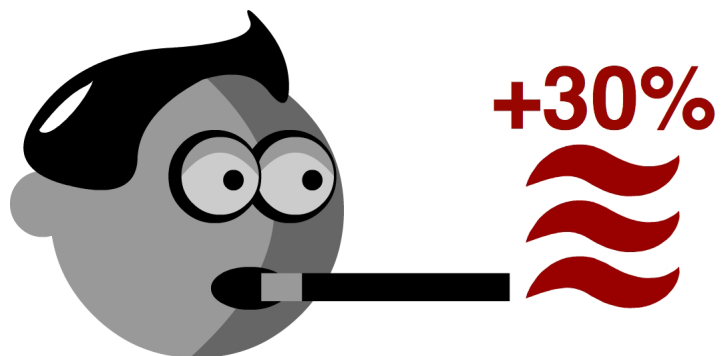
### USING DRAWN ILLUSTRATIONS

"It looks like a comic too much. It looks like it's targetting teenagers"

Female, 45

There is a plethora of infographics that use drawn illustrations that resemble cartoon figures. Whilst they may be appropriate for young audiences and light hearted subject matter, be careful with their use in a health context.

In our focus groups drawn illustration was generally preferred for positive statistics about the benefits of exercise, rather than, say, the link between the negative risks of inactivity and smoking.



## USING PHOTOGRAPHY

You can use photography to reflect the subject matter of the infographic. This is particularly useful when the subject relates to local issues (and local images can be inserted). In general it is also seen as a strength in terms of reflecting reality more closely than drawings.

“It connects with me...it’s a local photo – eye catching. It says immediately what it is”

Male, 66

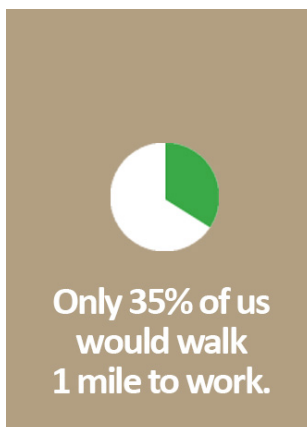
“Photos attract your attention more – you go with the visual aids – take it in more.”

Female, 30

## INTEGRATING DATA WITH PHOTOGRAPHY CAN CREATE A MORE MEMORABLE INFOGRAPHIC (IF THE PHOTOGRAPH HAS APPEAL)

When 85 participants had to recall the facts or graphics they’d seen (during a self-timed viewing exercise) there wasn’t a strong connection between image style and whether it was recalled in short term memory except in the integrated photography approach shown to the right. For 3 out of the 4 graphics with this approach there was a definite increase in recall. This may be because they are quite different to other infographics they might have seen. The long term effects of these on the public will need on-going evaluation. The increased colour and texture as well as realism may effect how these images are recalled.

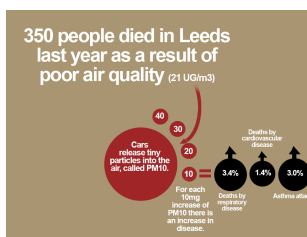
The integrated photography message was less memorable however when the participants found the photography generally unappealing. Generally then it’s important to carefully consider the overall appeal of your graphic, including the amount of colour and texture within the work.



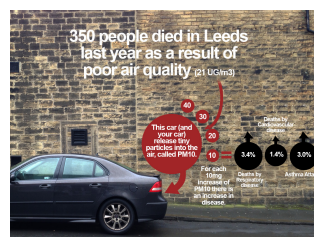
1 out of 43 (2%) participants could recall this message.



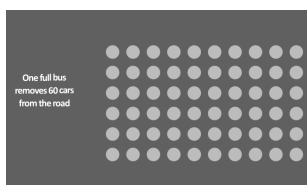
15 out of 42 (36%) participants could recall this message.



5 out of 43 (12%) participants could recall this message.



10 out of 42 (24%) participants could recall this message.



19 out of 42 (45%) participants could recall this message.



32 out of 43 (74%) participants could recall this message.

## CONSIDERATIONS WHEN USING PHOTOGRAPHY

When asked about their preference for photography most of the participants interviewed responded positively to photographic-based infographics. Here are a mixture of their views that capture both their support for the format and their concerns.

<p>“It doesn’t look like Maths”</p>	<p>“I look at them and take notice”</p>	<p>“Gives you a visual context before you read it”</p>	<p>“People might think it’s some kind of offer”</p>
<p>“It makes numbers easier to take in”</p>	<p>“It’s more like real life”</p>	<p>“It’s trying to shock you more”</p>	<p>“It might take the focus away from the point”</p>
<p>“It adds colour”</p>	<p>“It makes you think about it more”</p>	<p>If you are considering using photography first address the issues on the right hand side when discussing which photographs to use.</p> <p>Never lose sight of the information you’re trying to portray and ensure that it’s clear that the infographic as a whole relates to a health issue.</p>	
	<p>“You believe more in a photo than a drawing”</p>	<p>Accompanying text needs to be carefully included and avoid using upsetting or emotive images where possible.</p>	
			<p>“It could be misleading, e.g. pizza is the cause”</p> <p>“It might be upsetting”</p>



## STREET INFOGRAPHICS: USING IMAGERY IN THE ENVIRONMENT

As well as featuring imagery in leaflets, newspapers and on-line you could also consider larger-scale campaigns where the public health data refer to specific locations.

Street infographics were presented in photographic mock-up form to the 85 participants in the interviews and these related to a range of public health issues including air quality, active travel and exercise.

More than 90% of people made positive responses to the concept of situating data in local spaces. Concerns raised related to the need for simplicity, not to feel bombarded and to ensure durability by only short-term usage. Location of the graphics was of key concern for the participants ensuring that we weren't 'preaching to the converted'. Participants, through their suggestions, evidenced engagement with the idea as well as their approval.

“I think it’s a really good idea...definitely. It has more visual impact. It becomes more real”

Male, 35

“It makes you wonder”

Female, 44

“I think it’s a good idea. Not everyone reads leaflets/newspapers”

Female, 35





**07 CHOOSE CHARTS CAREFULLY**

# 07 CHOOSE CHARTS CAREFULLY

In terms of preference, the 85 participants in our interviews much preferred simple image based comparisons to standard bar charts or graphs. One particular standard bar chart was classed as 'poor' for appeal by 74% of participants.

“Bar charts are boring  
- you’ve got to look for  
longer”

Male, 46

“Graphs don’t  
do anything  
for me”

Male, 28

“Charts are ok if  
you’re really into  
graphs and charts.  
They can be  
overwhelming”

Female, 33

“Charts...I don’t  
understand them  
properly”

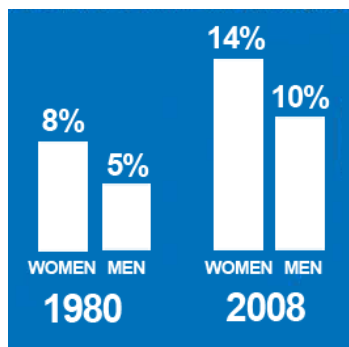
Female, 33

“Bar charts are  
so boring”

Female, 24

## BAR CHARTS: KEEP THEM SIMPLE

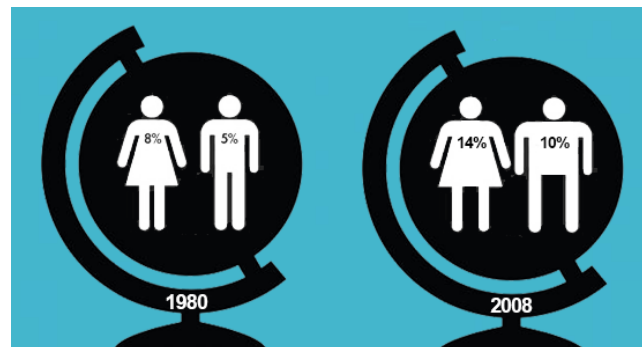
Simple Charts with one or two variables worked well, particularly if made more compelling through the use of relevant images.



“I like seeing the  
change of rates”

Female, 26

When people were asked to rate either the bar version or the picture version shown above more than twice the number of people rated the picture version highly than the bar version. Similarly more than three times the number of people rated the bar version as poor.



“Obesity – it’s like a graph...you  
look at a graph. At work I look at  
them - the colours stand out.  
I wonder what that was about”

Male, 43

“The difference between big and  
small is clear”

Male, 50

“I enjoyed the comparison -  
before and after”

Male, 40

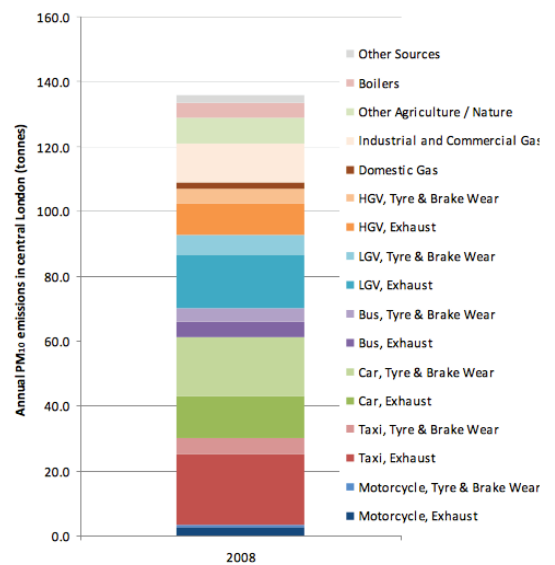
## PROVIDE INTERPRETATIONS & AVOID REPRESENTING MULTIPLE VARIABLES

Stacked bar charts mostly caused confusion and were generally seen as too complex and unnecessary. They may be used with a highly literate audience but should be avoided when speaking to a broader audience.

In our qualitative study, people much preferred simpler sets of data and didn't enjoy 'having to think'.

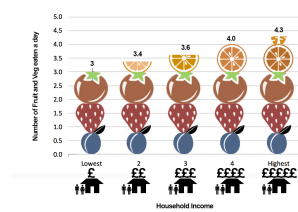
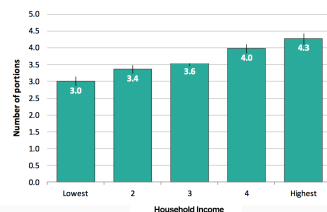
"That's the worst one... means nothing to nobody. It's too complicated - you've got to be a nuclear scientist to understand that"

Male, 59



## ADDING COLOUR AND SIMPLE TEXTURES OR SHAPES CAN HELP A SIMPLE BAR CHART IN TERMS OF RECALL AND APPEAL

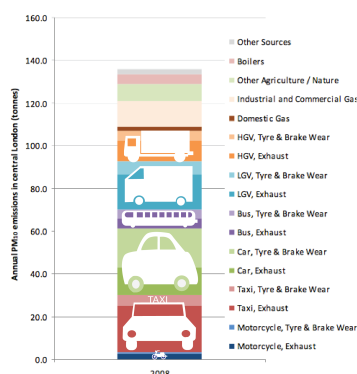
Adding restrained shapes to this bar chart resulted in three times as many people remembering the graph and the gist of the data. The embellished version also received more than twice as many high ratings for appeal than the plain version.



## SHOW CAUTION ADDING EMBELLISHMENTS TO COMPLEX CHARTS

Be careful though about adding shapes to already complex charts that require more interpretation. By adding drawings to the stacked bar chart on the right, the chart was rated even lower for appeal than when plain.

The higher the amounts of data, generally the lower the number of embellishments should be needed.





## PIE CHARTS

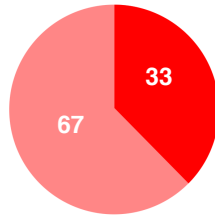


Galesic, M., & Garcia-Retamero, R. (2011). Graph Literacy A Cross-Cultural Comparison. Medical Decision Making, 31(3), 444-457

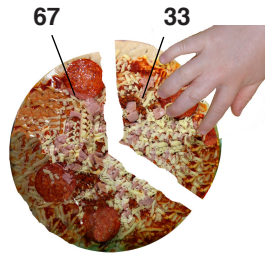
Pie charts seem an effective way of communicating proportion to a broad audience, regardless of whether they use photographic embellishment or are plain. They should also be accompanied by text that relays the main message or proportion. Some people still struggle to read percentages from a pie chart (Galesic & Garcia-Retamero, 2011)

“I prefer pie charts to graphs”

Female, 70



OBESITY IN AMERICA  
33% of children are obese or overweight



OBESITY IN AMERICA  
33% of children are obese or overweight

**ALWAYS LABEL THE SEGMENTS OF THE PIE CHART AS IT'S DIFFICULT TO DISCERN AN EXACT NUMBER BY ONLY LOOKING AT AN ANGLE**

Pie Charts are generally good for part/whole judgements but not for accurate representation of exact numbers. In a large sample (n.2414) test by Hawley et al (2008) it was found that pie charts performed the least well for accurate verbatim knowledge in comparison with 5 other formats (table, pictograph, bar, sparkplug and clock). However they did perform the best for 'gist knowledge' (for both low and high numeracy participants).



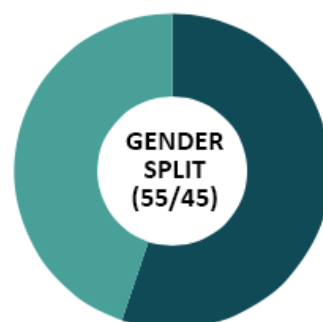
Hawley, S. T., Zikmund-Fisher, B., Ubel, P., Jancovic, A., Lucas, T., & Fagerlin, A. (2008). The impact of the format of graphical presentation on health-related knowledge and treatment choices. Patient education and counseling, 73(3), 448-455.

**AVOID OBSCURING THE CENTRE OF THE PIE CHART. DONUT CHARTS ARE LESS ACCURATE TO READ (THOUGH CAN HAVE APPEAL)**

Since we read pie charts from their angles, it's important that the centre, where the angles meet is clear. Donut charts remove the centre, making it difficult to compare angles. (Per Mollerup, 2015)



Mollerup P. (2015) Data Design, Bloomsbury, UK.



Men (55%) Women (45%)

## PICTURE TABLES/ICON ARRAYS

People can recognize frequencies (e.g. 1 in 10) fairly successfully with part-to-whole sequential picture tables/ icon arrays, such as the collection of figures shown to the right. (See also the work by John Paling in the area of risk communication)



Paling, J. (2003). Strategies to help patients understand risks. *BMJ: British Medical Journal*, 327(7417), 745.

Use strong contrasting colours and position the quantity you want to highlight on the left. For example this picture table should represent 4 out of 10 people in countries where we read left to right NOT 6 out of 10.



Put the highlighted figures/objects on the left. This means 4 out of 10.



Ancker, J. S., Senathirajah, Y., Kukafka, R., & Starren, J. B. (2006). Design features of graphs in health risk communication: a systematic review. *Journal of the American Medical Informatics Association*, 13(6), 608-618.

Avoid mixing up the icons or randomly positioning icons. (Ancker, 2006)

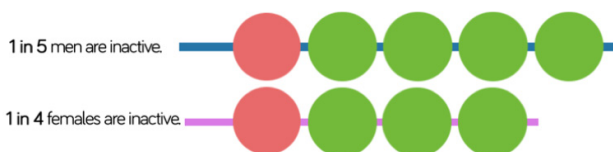


## AVOID COMPARING DIFFERENT DENOMINATORS - E.G. 1 IN 4 VS 1 IN 5

The question "Which of the following numbers represents the biggest risk of getting a disease? 1 in 100, 1 in 1000, or 1 in 10?" was answered incorrectly by 25% of U.S. participants and 28% of German participants" (Galesic & Garcia-Retamero, 2011). The mistake is made by only looking at the biggest number out of either the numerator or denominator.



Galesic, M., & Garcia-Retamero, R. (2011). Graph Literacy A Cross-Cultural Comparison. *Medical Decision Making*, 31(3), 444-457



1 in 5 men are inactive

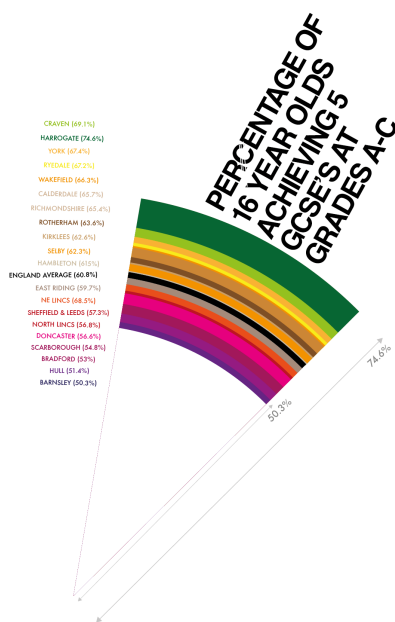


1 in 4 women are inactive



Even infographics don't appear to help here in our tests. In these examples there are more 'positive images' for men (more green circles, or more outdoor shoes). When asked 'Who is more inactive, men or women?' only 46% of people who saw the circle design and 59% of people who saw the shoe design answered correctly.

## UNUSUAL GRAPH FORMATS: USE WITH CAUTION AND EVALUATE



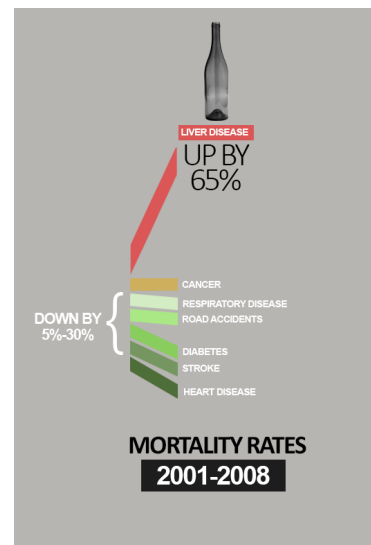
Whilst it may be tempting to try different formats of graph, such as the circular bar graph above, be aware that for a general audience, this may well not give any information at all.

During focus group sessions the general view was that people found the radial format confusing and they simply read the numbers in the accompanying text.

Goldberg & Helfman (2010) also showed how circular scanning was less effective than usual horizontal and vertical directions.



Goldberg, J. H., & Helfman, J. I. (2010, April). Comparing information graphics: a critical look at eye tracking. In Proceedings of the 3rd BELIV'10 Workshop: BEyond time and errors: novel evaluation methods for Information Visualization (pp. 71-78). ACM.



“I didn’t understand that one”

Female, 64

“It has to be studied”

Male, 32

Attempting to say, show rises or falls via a bespoke slopegraph wasn’t always effective for a general audience. Whilst some graphs may look visually compelling, first check that they are understandable by your audience.

“It looks beautiful but it doesn’t help...took me a while to get it”

Female, 41

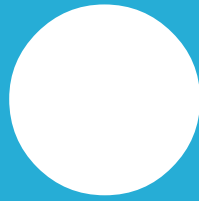
Li, H., & Moacdieh, N. (2014, September). Is “chart junk” useful? An extended examination of visual embellishment. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting (Vol. 58, No. 1, pp. 1516-1520). SAGE Publications.

Renshaw, J. A., Finlay, J. E., Tyfa, D., & Ward, R. D. (2004). Understanding visual influence in graph design through temporal and spatial eye movement characteristics. *Interacting with computers*, 16(3), 557-578.

## AGAIN, BE CAREFUL ABOUT OVER EMBELLISHING DATA-RICH CHARTS

Readers may focus on different areas, depending on the presentation style of the data. It’s been found that readers pay more attention to the data areas when plain graphs (rather than embellished graphs) are used (Li and Moacdieh, 2014). They warn against using large areas of embellishment as it may take attention away from the meaningful areas of the infographic. If multi-variable bar graphs are being used it’s best to leave these plain.

Renshaw (2004) found also that readers paid more attention to legends in plain graphs whereas they spent more time looking at data areas in 3D graphs. Ideally place the legend around the graph, rather than separate the two areas.



**PRACTICALITIES**

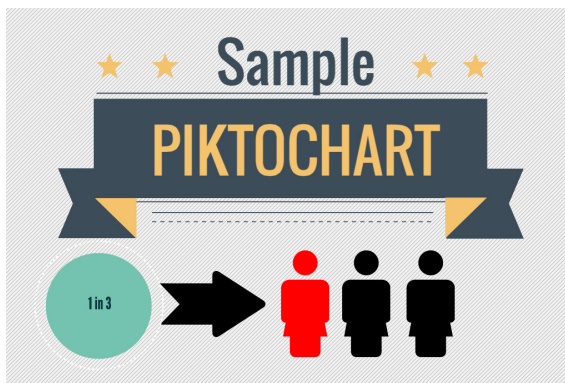
# SOFTWARE ADVICE

## On-line chart generators

There are a myriad of on-line tools that allow you to quickly create charts and graphs. Some of these tools also provide access to pictograms that you can use freely.

### Piktochart.com

[Piktochart.com](http://Piktochart.com) is a fully customisable website useful for the quick generation of infographics with a wide range of draggable features and sample graphics. This is a particularly good option for longer scrollable infographics.



Other on-line infographic tools or services include:

- <https://venngage.com>
- <https://infogr.am>
- <http://visual.ly>

## Software Packages

Most graphic designers will use the Adobe Creative Suite to produce bespoke infographics. Software they use include:

- Adobe Illustrator (for producing drawn illustrations and pictograms)
- Adobe Indesign (for text and laying out multiple display infographics)
- Adobe Photoshop (for preparing and manipulating photograph-based infographics)

For up-to-date advice on these programs consult:

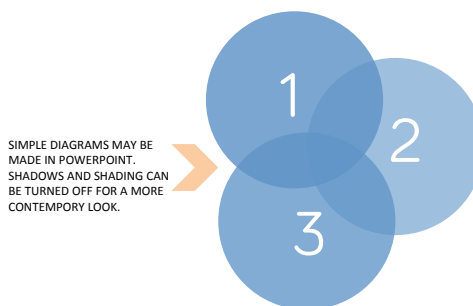
<http://www.adobe.com>.

## Making the most of software

More commonly available software in the workplace such as Microsoft Excel or Microsoft Powerpoint can be used to create simple infographics.

### Powerpoint

Simple shapes can be dragged and manipulated in Powerpoint allowing you to create simple representations that can be exported in PDF format. By using the Shape Palette together with the Quick Style menu, it's possible to create graphics as shown below. You can also import your own photography or sourced pictograms. The clip art within software such as Powerpoint tends to be very limited in potential use and is generally not recommended.



### Excel

Obviously Excel can be used for generating a wide range of graphs and charts for use in reports. These though can also be adjusted to suit a more general audience. Picture fills can be used to add more interest to a simple chart though consider the words of warning within this guide before embellishing every bar.

For more information about picture fills visit:

[https://www.youtube.com/watch?v=8um7jaOw\\_vA](https://www.youtube.com/watch?v=8um7jaOw_vA)

Consider looking at the simpler graph capabilities within excel such as sparklines and do-nut charts. Don't forget to double click on the chart it generates to adjust the styling to suit the overall graphic you're constructing.

# SOURCES OF INSPIRATION & READING

## On-line Sources/Inspiration

It's important to be familiar with infographics that your audience may be encountering during their day, such as in newspapers or on-line. Share examples of good practice within your team by collecting them on Pinterest or a similar site.

Be careful about simply commissioning a piece of work that resembles an example seen on-line. Ensure that the intended message and tone drive the key design decisions.

For inspiration about infographics we've compiled a list of URLs below but it's also important to keep your own set of websites and examples.

<http://visual.ly/get-inspired>  
<http://www.informationisbeautiful.net>  
<http://www.visualisinghealth.com>  
<http://www.coolinfographics.com>  
<http://www.dailyinfographic.com>

## Recommended Books

Whilst there are many books available about infographic design we would recommend essential reading as follows:

### INFOGRAPHICS

Cairo, A. (2012). *The Functional Art: An introduction to information graphics and visualization*. New Riders.  
 Lankow, J, Ritchie, J, & Crooks, R. (2012). *Infographics: The power of visual storytelling*. John Wiley & Sons.

### CHART DESIGN

Few, S. (2004). *Show me the numbers*. Analytics Press.  
 Mollerup, P. (2015) *Data Design*, Bloomsbury Visual Arts.  
 Tufte, E. R., & Graves-Morris, P. R. (1983). *The visual display of quantitative information* (Vol. 2, No. 9). Cheshire, CT: Graphics press.

## Academic Papers featured in the text

Ancker, J. S., Senathirajah, Y., Kukafka, R., & Starren, J. B. (2006). Design features of graphs in health risk communication: a systematic review. *Journal of the American Medical Informatics Association*, 13(6), 608-618.

Ali, N., & Peebles, D. (2013). The effect of gestalt laws of perceptual organization on the comprehension of three-variable bar and line graphs. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 55(1), 183-203.

Bateman, S., Mandryk, R. L., Gutwin, C., Genest, A., McDine, D., & Brooks, C. (2010, April). Useful junk?: the effects of visual embellishment on comprehension and memorability of charts. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2573-2582). ACM.

Galesic, M., & Garcia-Retamero, R. (2011). Graph Literacy A Cross-Cultural Comparison. *Medical Decision Making*, 31(3), 444-457

Goldberg, J. H., & Helfman, J. I. (2010, April). Comparing information graphics: a critical look at eye tracking. In *Proceedings of the 3rd BELIV'10 Workshop: Beyond time and errors: novel evaluation methods for Information Visualization* (pp. 71-78). ACM.

Hawley, S. T., Zikmund-Fisher, B., Ubel, P., Jancovic, A., Lucas, T., & Fagerlin, A. (2008). The impact of the format of graphical presentation on health-related knowledge and treatment choices. *Patient education and counseling*, 73(3), 448-455.

Holmqvist, K., & Wartenberg, C. (2005). *The role of local design factors for newspaper reading behaviour—an eye tracking perspective*. Lund University Cognitive Studies, 127, 1-

Kosslyn, S. M. (2006). *Graph design for the eye and mind*. Oxford University Press.

Lankow, J, Ritchie, J, & Crooks, R. (2012). *Infographics: The power of visual storytelling*. John Wiley & Sons.

Li, H., & Moacdieh, N. (2014, September). Is "chart junk" useful? An extended examination of visual embellishment. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 58, No. 1, pp. 1516-1520). SAGE Publications.

Merle, P. F., Callison, C., & Cummins, R. G. (2014). How Arithmetic Aptitude Impacts Attention, Memory, and Evaluation of Static Versus Dynamic Infographics in Online News An Eye-Tracking Study. *Electronic News*, 1931243114557595.

Mollerup P, (2015) *Data Design*, Bloomsbury, UK

Paling, J. (2003). Strategies to help patients understand risks. *BMJ: British Medical Journal*, 327(7417), 745.

Renshaw, J. A., Finlay, J. E., Tyfa, D., & Ward, R. D. (2004). Understanding visual influence in graph design through temporal and spatial eye movement characteristics. *Interacting with computers*, 16(3), 557-578.

Shah, P., & Hoeffner, J. (2002). Review of graph comprehension research: Implications for instruction. *Educational Psychology Review*, 14(1), 47-69.

Smerecnik, C. M., Mesters, I., Kessels, L. T., Ruiters, R. A., De Vries, N. K., & De Vries, H. (2010). Understanding the positive effects of graphical risk information on comprehension: Measuring attention directed to written, tabular, and graphical risk information. *Risk analysis*, 30(9), 1387-1398.

Travis, D. (1991). *Effective color displays: Theory and practice* (Vol. 1991). London: Academic press.

Yantis, S., & Gibson, B. S. (1994). Object continuity in apparent motion and attention. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale*, 48(2), 182

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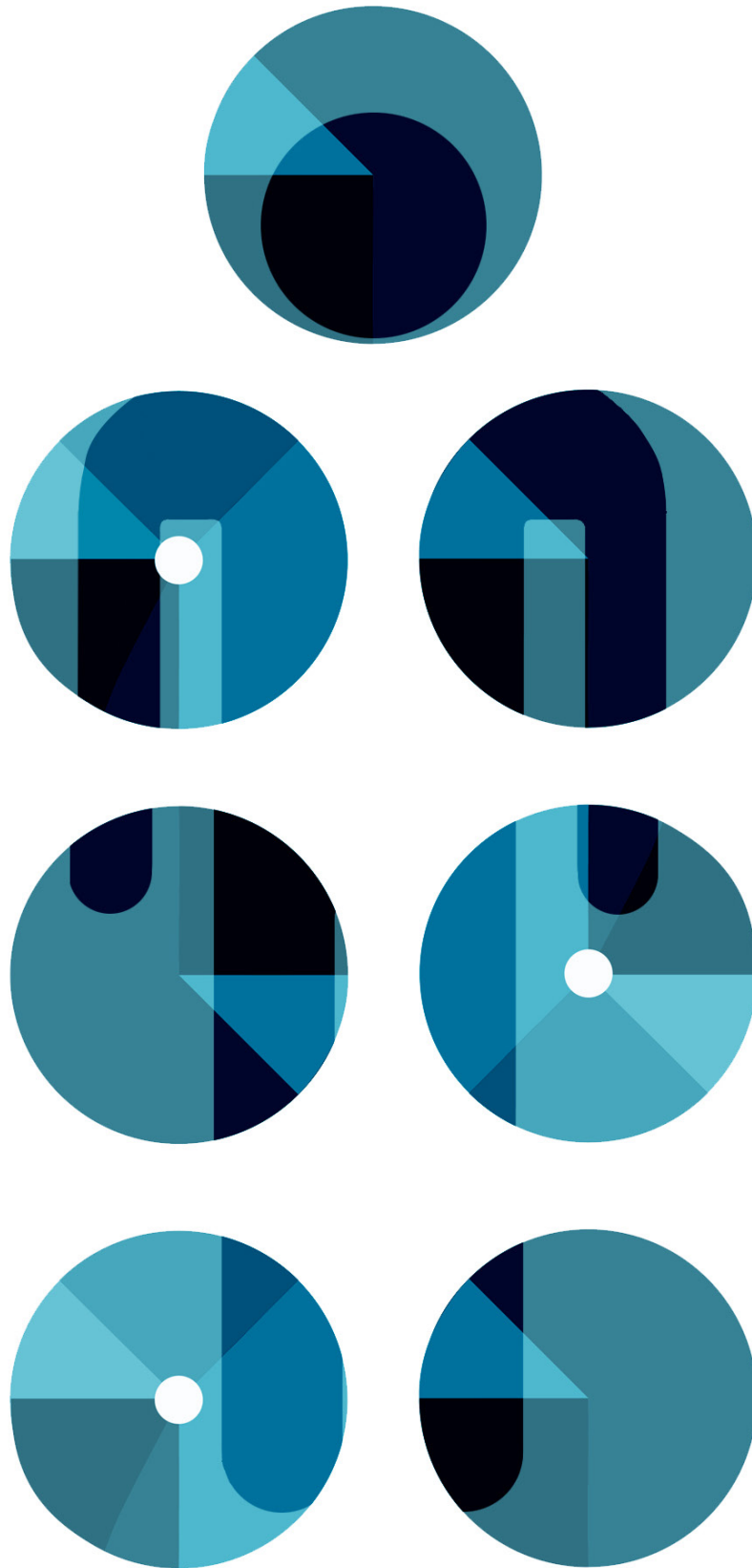
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Thanks also to drinkaware.co.uk for permission to use their infographic.

For free electronic copies of this booklet please visit [www.visualisinghealth.com](http://www.visualisinghealth.com)





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