

# VISUALIZING HEALTH



**When it comes to our bodies, data abounds.** We all have a blood pressure, weight, cholesterol levels, A1c, BMI, and more. We have risks, too. We might have or be at risk for cancer, or heart disease, or have a higher risk of experiencing a side effect of a medication or treatment than someone else.

In theory, this data can help us make better decisions about our health. Should I take this pill? Will it help me more than it hurts me? How can I reduce my risk? And so on.

But for individuals, it's not always easy to understand what the numbers are telling us. And for those communicating the information – doctors, hospitals, researchers, public health professionals — it's not always clear what sort of presentation will make the most sense to the most people.

That problem is the inspiration behind Visualizing Health, a project of the Robert Wood Johnson Foundation and the University of Michigan Center for Health Communications Research. This site contains TK examples of tested visualizations – that is, graphic displays of health information that we've evaluated through research among the general public. Our objective was to create a gallery of beautiful and easy-to-make-sense-of graphs, charts, and images that effectively communicate risk information. Health data that makes sense.

These visualizations are distributed via a Creative Commons license, which allows anybody – academics, healthcare organizations, even for-profit businesses — to adapt them for their own objectives. Please use them – and tell us how you're using them.

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A “wizard” tool to help you learn more about a risk you want to communicate

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A gallery of the images we tested

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A sample risk calculator that shows off some of the best design concepts

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A real-world story to help you understand how our images might help you

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**We started with about a dozen different**, but common kinds of risk communication problems – scenarios where an individual might be faced with health data. We call these “use cases.” Among them:

- Tradeoffs between medication or treatment options
- Relating biomarkers (such as BMI or cholesterol levels) to risk
- Health risk assessment output
- Population risks: disparities
- Population risks: emergent disease (“Should I worry about that measles outbreak?”)
- Understanding multiple side effects
- Understanding unique side effects
- Motivating a risk-reducing action
- Understanding tradeoffs that change over time over time
- Small risks, and understanding how to reduce small risks
- Explaining what “average years saved” means for an individual person
- Arranging icons

We developed these into specific scenarios and sent them out to four teams of data designers who proposed several concepts for each use case. Our researchers evaluated these visualizations for accuracy, but the style and approach was left to the artists.

We then began testing the visualizations to see which ones made the most sense to ordinary individuals – not health professionals. We used three tools to test our images.



### Google Consumer Surveys

is a new service for collecting data online. It can be a very quick (days, not weeks) and inexpensive for getting small amounts of data on specific questions. If you only need to ask one or two questions, you can get that data for a fraction of the cost of other online surveys.



### Survey Sampling International

is an online survey panel that includes millions of people who are willing to take surveys. Qualtrics is an online survey tool that enables you quickly develop online surveys. We programmed and posted a survey in Qualtrics, and then used SSI to recruit people who have particular characteristics. Compared to GCS, it takes a little longer to get data, but we get more data because SSI participants take longer surveys.



### Amazon Mechanical Turk

MTurk has people (“Workers”) who agree to be part of MTurk and do small jobs (HITs, “Human Intelligence Tasks”) for others who need it done (“Requesters”). In return, they get paid.

The fact that MTurk participants treat surveys like jobs is both good and bad. It means they do their best to answer our questions. But it is not a true proxy for how people might react in real life.



**Each survey instrument** provided results that indicated how well these different audiences were able to comprehend the information contained in the visualizations. Our researchers compared across each survey tool to establish how each image performed in the tests. Those images that appeared to resonate most strongly across the different surveys are the “winners,” which are the images archived in our gallery. Next to each image, you’ll find a link to a summary of our testing.

We also adapted some extra images based on the winning designs, so you can see how these concepts might look in different contexts.

**Visualizing Health is a project of the Robert Wood Johnson Foundation** and the University of Michigan Center for Health Communications Research. It was conceived by the Foundation's Entrepreneur in Residence, Thomas Goetz, in collaboration with RWJF Program Officer Andrea Ducas.

At the University of Michigan, the overall project principal investigator was Victor Strecher, PhD. Research activities were directed by lead investigator Brian J. Zikmund-Fisher PhD, with input from a multi-disciplinary research team that included:

- Angela Fagerlin PhD – co-investigator
- Larry An MD – co-investigator
- Ken Resnicow PhD – co-investigator
- Nicole Exe MPH – project manager (research)
- Holly Derry MPH – survey design
- Knoll Larkin MPH – survey design, programming & analysis

The design effort was led by Tim Leong, with visualizations by the Italian-based firm La Tigre, the Spanish-based firm Lamosca, Luke Shuman, Lauren Manning, Walter Bauman, and Jan Avendano.

The website was designed by the University of Michigan Center for Health Communications Research:

- Larry An - director
- Ed Saunders - deputy director
- Viji Ramaswami - project manager
- Ian Moore - designer
- Mike Nowak - software engineer
- Dennis O'Reilly - software engineer
- Holly Derry - behavioral scientist



Goetz

Ducas

Strecher

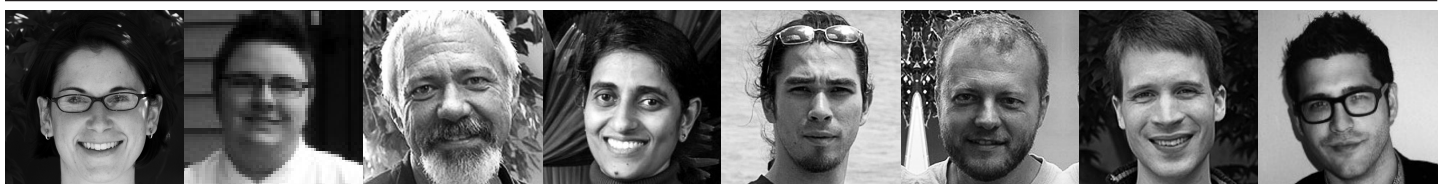
Zikmund-  
Fisher

Fagerlin

An

Resnicow

Exe



Derry

Larkin

Saunders

Ramaswami

Moore

Nowak

O'Reilly

Leong



## Our Approach: Goal-Congruent Risk Visualizations

Communicating health risk information is complicated. People need to be able to understand and respond to multiple types of risk information, ranging from their precisely calculated, estimated risk of cancer or another disease to indirect measures of risk like blood pressure values. Once they have that information, people also have many potential goals: They may need that data to help them to recognize that a risk exists, to judge whether the level of risk is acceptable or not, or to make a decision among risky options.

A key tenet of our approach is the humble belief that displays or visualizations cannot achieve all goals equally well. A display that is optimized for helping patients choose between options is not going to be as effective or as efficient at helping people to recognize the existence of risk or whether their health status is acceptable or not. Different goals means that we need to have different requirements for our visualizations based upon each specific task.

We asked the graphic designers to develop images for 16 common kinds of risk communication problems (or “use cases”) – scenarios where an individual might be faced with health data:

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**Tables of side effect risks.** Many health information displays use tables to compare multiple alternatives on an even longer list of dimensions (risks, benefits, costs, etc.) The goal of the images for this use case is to use visual cues to make it easier to make such comparisons across multiple options.

**Translating test results into risk.** Biomarkers (things like blood pressure and cholesterol) predict risk. However, while high blood pressure (BP) is related to risk, the relationship is not linear. The visuals for this use case are designed to help a person who has an elevated BP level (e.g., at a doctor’s visit) recognize (a) that their risk is elevated AND (b) that further increases in BP would be really bad.

**Visualizing health scores.** The results of health risk assessments (HRA) are often returned to patients using some form of summary score. The goal of this image was to make an abstract (and arbitrary) HRA score have more intuitive meaning.

**Racial disparities in rates of disease.** News stories often try to clarify disparities in disease risk across populations. For example, when a disease is more common in this group vs. that group. Images for this use case convey not only that one group's risk is more but also just how much more.

**Putting outbreaks of disease into context.** Images for this use case communicate the case counts of an outbreak of disease (here, measles) in a way suitable for a news story. The challenge is to present information about the relevant population in a way that draws attention to the risk as important but also reminds people of its (current) rarity.

**Icons to show severity of side effects.** We asked designers to develop a set of icons that could be embedded within larger tables of risk information to draw attention to differences in severity among the set of risks shown.

**Icons to show likelihood of side effects.** The goal of this set of icons is to create visual cues for variations in risk likelihood that will be more intuitive than simple numbers yet small enough to be replicated repeatedly in summary tables.

**Tables of side effect risks with icons.** This use case is an example of a summary table that uses both severity icons and likelihood icons to show information about multiple treatment side effects in a systematic way.

**Visual displays of side effect risks.** Images show the relative likelihood and severity of multiple side effects in non-tabular ways, using color, size, shape, etc to represent the attributes of the side effects. Consumers can quickly get the “gist” of what might happen to them if they took a medication

**Personally tailored data about side effect risks.** Images for this use case represent the relative likelihood and severity of multiple side effects in a table structure. They organize this information to ensure that viewers pay attention to very rare but very severe events. They also represents whether risk numbers are based on general population samples or are tailored by characteristics such as age, gender or race.

**Risk calculator: More than a number.** These images present a risk estimate to a patient. Its primary goal is to help patients categorize their risk (i.e., to make sure that patients know when they are at “high” risk or not). The images have to work with a behind-the-scenes program that gives the consumer a calculated risk estimate based on questions they answer.

**The benefits of risk reduction.** These graphics help patients compare their current risk without screening tests to their reduced risk with screening tests. In particular, it aims to help patients understand the absolute size of the possible risk reduction.

**Showing how side effects change over time.** It is very hard to show patients how risks vary over time and how those time patterns themselves differ between options. These images illustrate this problem using the case of prostate cancer treatment. They visually explain how likely a patient is to experience each of 2 common side effects with each of 2 different treatment options over multiple time points.



**Visualizing very small risks.** Sometimes, we need to help people visualize just how rare very rare events are. A common example occurs in prenatal genetic testing. If a couple has no other risk factors, the baseline risk of genetic diseases such as Down Syndrome is often much smaller than even 1 in 1000 (0.1%). Visually showing this ratio is challenging.

**Years of life saved by taking a drug.** The benefit of treatments to prolong life can be described in two main ways: 1) how many months or years they add to an average patient's life, or 2) how many patients benefit. Many times, a few people benefit a lot but most don't benefit at all. This image tries to show how the average benefit relates to how many patients benefit.

**The benefits of positive behavior change.** This visual tries to show risk reduction in a way that reinforces positive benefits of work that has already been done by the patient.

**The benefits of risk reduction.** This image presents a risk estimate to a patient, and more importantly, it also shows them how much that risk could be reduced. It uses an icon array display, which research has shown is a particularly effective type of graphic at showing risk but which needed new thinking about how to show risk reduction.



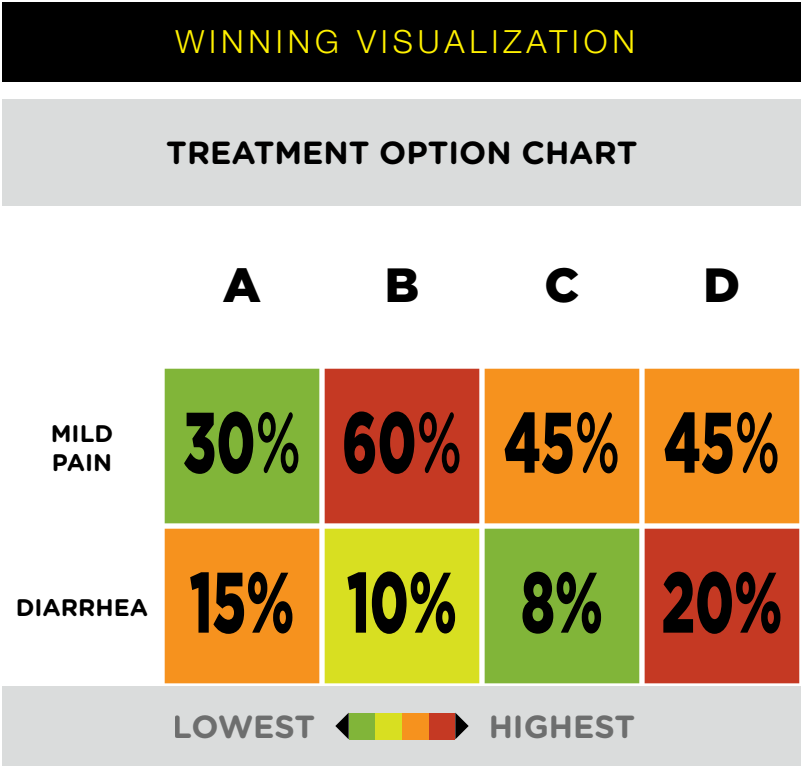


## USE CASE

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### WHAT WE TRIED TO DO:

Many health information displays use tables to compare multiple alternatives on an even longer list of dimensions (risks, benefits, costs, etc.) The goal of this image is to use visual cues to make it easier to make such comparisons across multiple options.



This simple table supplements the individual risk numbers with a color coding system designed to highlight which treatments are more vs. less likely to result within each side effect row. It also includes a very subtle bar graph feature within each cell (the height of the darker color is proportionate to the risk). The large numbers should facilitate numeric recall.

TESTING ANALYSIS: People recalled risk numbers more accurately for this graphic than for other graphics. We recommend this graphic.

Good For	Risk Tradeoffs, Differences In Likelihood
Amount Of Detail	Verbatim Recall, Gist Understanding
Health Conditions	Side Effects, Cancer, Prostate Cancer, Treatment Choice
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Bar Graph, Area Graph, Tables



## DERIVATIVE VARIATIONS

## ANTIDEPRESSANTS

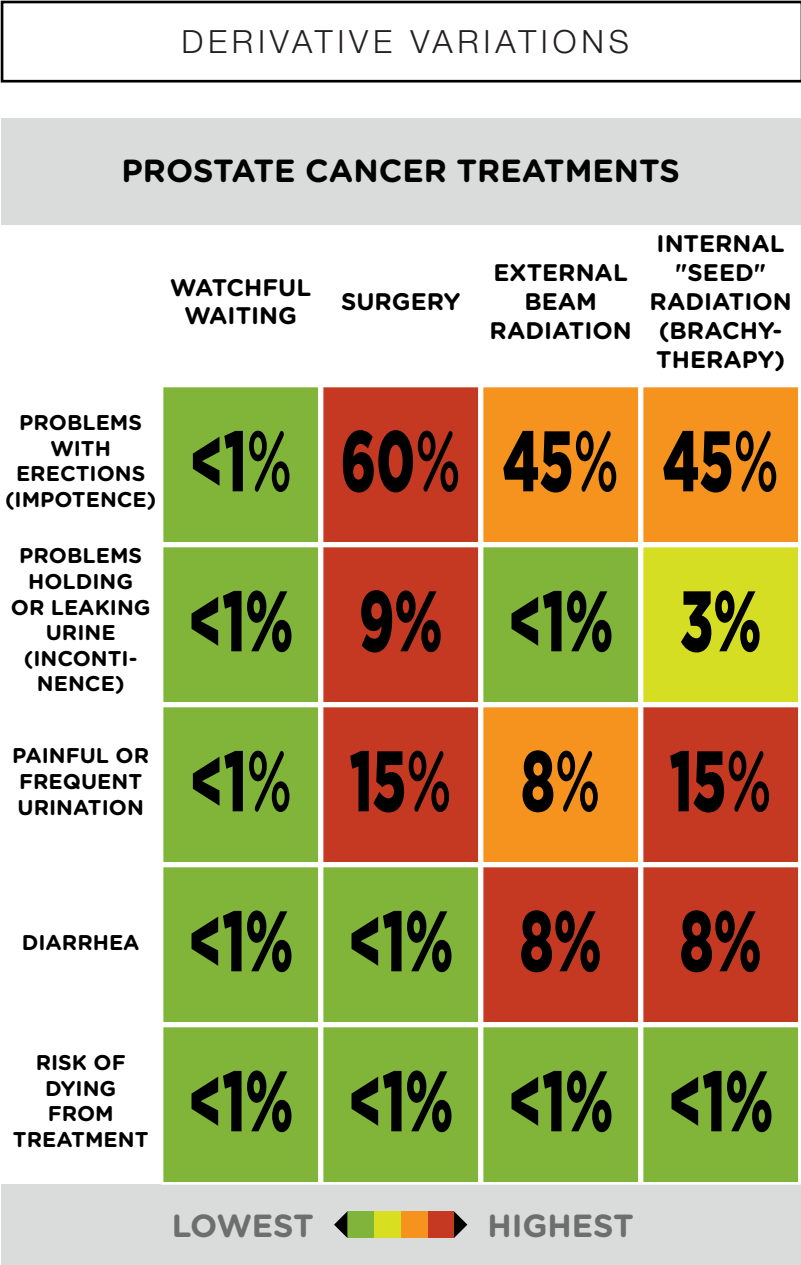
	CYMBALTA	PROZAC	ZOLOFT
NAUSEA	23%	22%	25%
DRY MOUTH	14%	9%	25%
CONSTIPATION	9%	5%	6%
DECREASED APPETITE	7%	10%	6%
DIZZINESS	9%	9%	12%
DIFFICULTY STAYING AWAKE	10%	12%	13%
DIFFICULTY FALLING ASLEEP	9%	19%	21%
HEADACHE	14%	21%	25%
ABNORMAL VISION	3%	2%	3%
SEXUAL PROBLEMS	4%	4%	6%

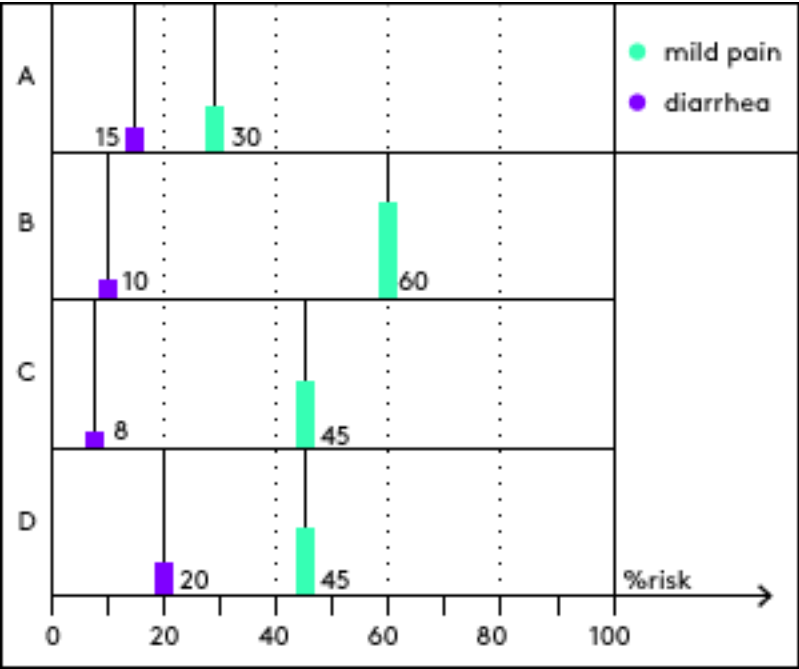
LOWEST HIGHEST

## BREAST CANCER ADJUVANT THERAPY

	AROMTASE INHIBITOR (FEMARA)	TAMOXIFEN	TRASTUZUMAB (HERCEPTIN)
ARTHRALGIA (JOINT PAIN)	16%	15%	6%
DIARRHEA	8%	4%	25%
HEADACHE	8%	7%	26%
INSOMNIA	7%	4%	14%
NAUSEA	17%	17%	33%
VOMITING	7%	8%	23%

LOWEST HIGHEST

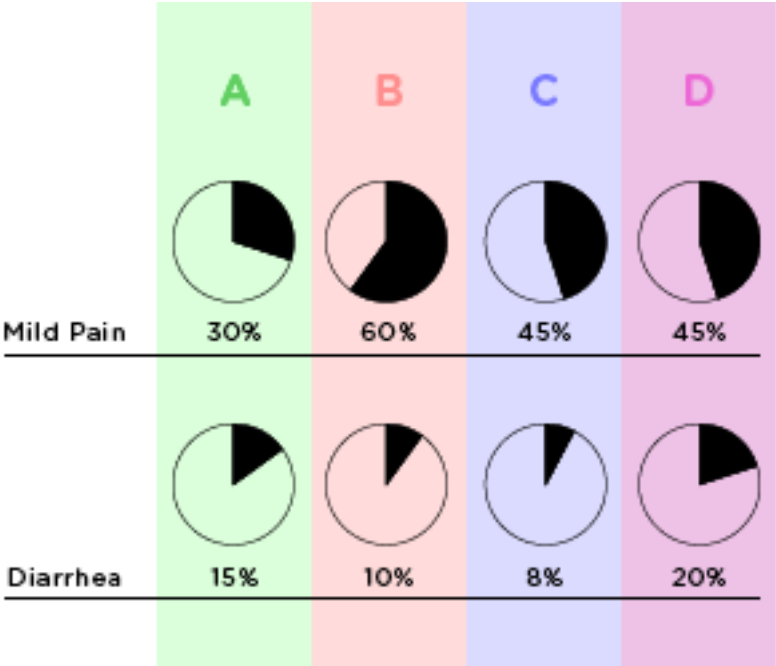




This novel graph format uses 3 cues to each side effect risk: Position in the larger horizontal bar space, height of the miniature bars, and the risk number next to each bar. This gives the reader multiple cues to use for making risk comparisons.

**TESTING ANALYSIS:** This graphic made the difference in treatments feel larger than for other graphics. People were also less able to report a single number from the graph, as compared to other graphics. As a result, we do NOT recommend this graphic.

Good For	Risk Tradeoffs, Differences In Likelihood
Amount Of Detail	Verbatim Recall, Gist Understanding
Health Conditions	Side Effects, Cancer, Prostate Cancer, Treatment Choice
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Bar Graph, Line Graph, Tables, X-Y Graph

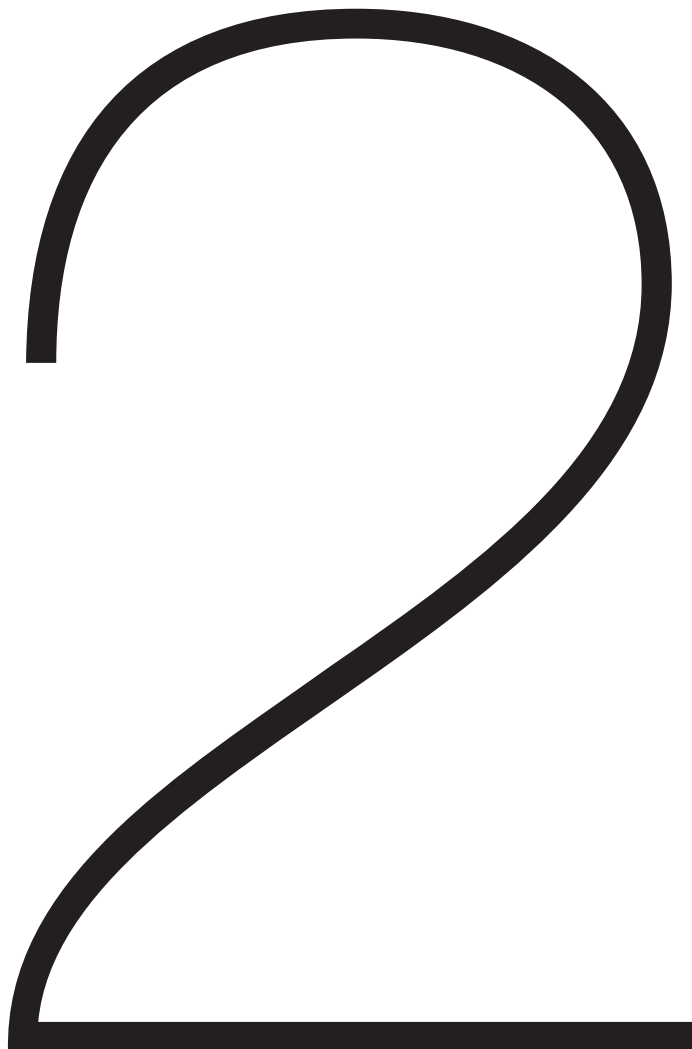


This table combines pie charts and numbers to provide multiple cues for likelihood and facilitate cross-option comparisons. The pie charts provide a strong cue for gist understanding of relative size.

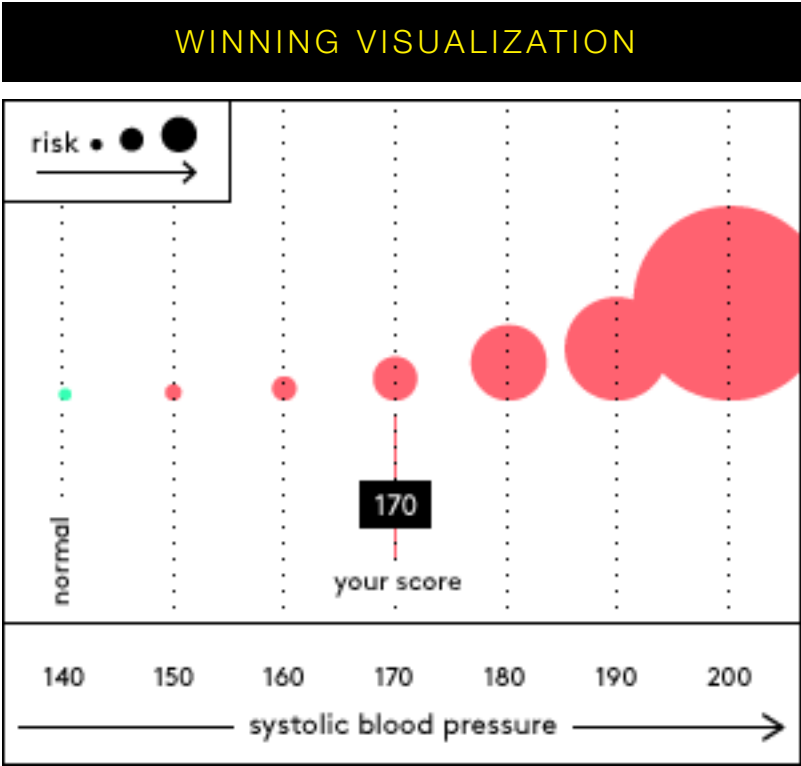
<b>Good For</b>	Risk Tradeoffs, Differences In Likelihood
<b>Amount Of Detail</b>	Verbatim Recall, Gist Understanding
<b>Health Conditions</b>	Side Effects, Cancer, Prostate Cancer, Treatment Choice
<b>Data I Have</b>	Risk Estimate
<b>Graphic Type</b>	Color Gradient, Pie Chart, Tables



## USE CASE

**WHAT WE TRIED TO DO:**

Biomarkers of risk, things like blood pressure and cholesterol, are factors that predict risk. However, while high blood pressure (BP) is related to risk, the relationship is not linear. This visual is designed to help a person who receives an elevated BP level (e.g., at a doctor's visit) recognize (a) that their risk is elevated AND (b) that further increases in BP would be really bad.



This variant of a bar graph uses circle size / area to represent elevations in risk as blood pressure increases. Because the circles are aligned at the base, the circle edges create an upwardly curving exponential shape which helps evoke a sense of increasing risk. The overlapping circles at the higher levels convey an additional gist sense of being “large” that may help viewers recognize that further elevations in blood pressure result in particularly large levels of risk.

**TESTING ANALYSIS:** When compared to other, similar graphics, people who viewed this graphic were more likely to perceive and classify their blood pressure risk as slightly above normal vs. way above normal. Please note that this may be due to the particular algorithm used for circle size rather than the format itself. Our recommendation is therefore unclear. We believe the choice of graphic should depend on whether the goal is to maximize motivation to act vs. calibration of risk perception response to an elevated (but not extremely elevated) BP level.

Good For	Classifying Risks, Raise Or Lower Concern
Amount Of Detail	Gist Understanding
Health Conditions	Cardiovascular Disease, Hypertension
Data I Have	Risk Estimate, Test Result
Graphic Type	X-Y Graph, Area Graph, Color Gradient





This graph uses a combination of element size and color to convey the exponentially increasing risk associated with above normal blood pressure levels. Note the use of just a sliver of an obviously much larger circle to the right of the graph. This is a powerful cue that further increases in SBP result in even larger degrees of risk.

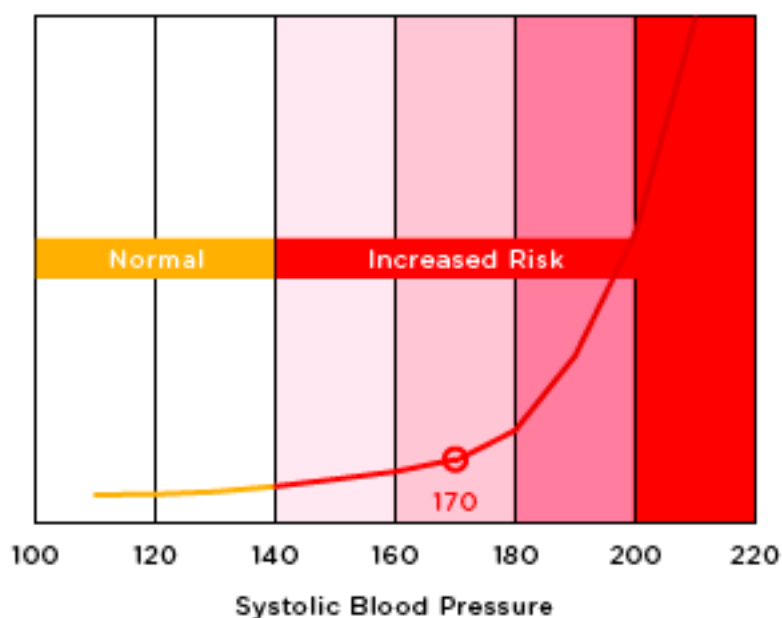
**Good For** Classifying Risks, Raise Or Lower Concern

**Amount Of Detail** Gist Understanding

**Health Conditions** Cardiovascular Disease, Hypertension

**Data I Have** Risk Estimate, Test Result

**Graphic Type** X-Y Graph, Area Graph, Color Gradient



This is a color-enhanced version of a classic line graph showing the exponential relationship between blood pressure and risk. Note in particular that the top levels of risk are colored so darkly that it is difficult to see the line. Red means danger in our society, so that visual cue is a powerful signal that particularly high levels of systolic blood pressure are particularly dangerous.

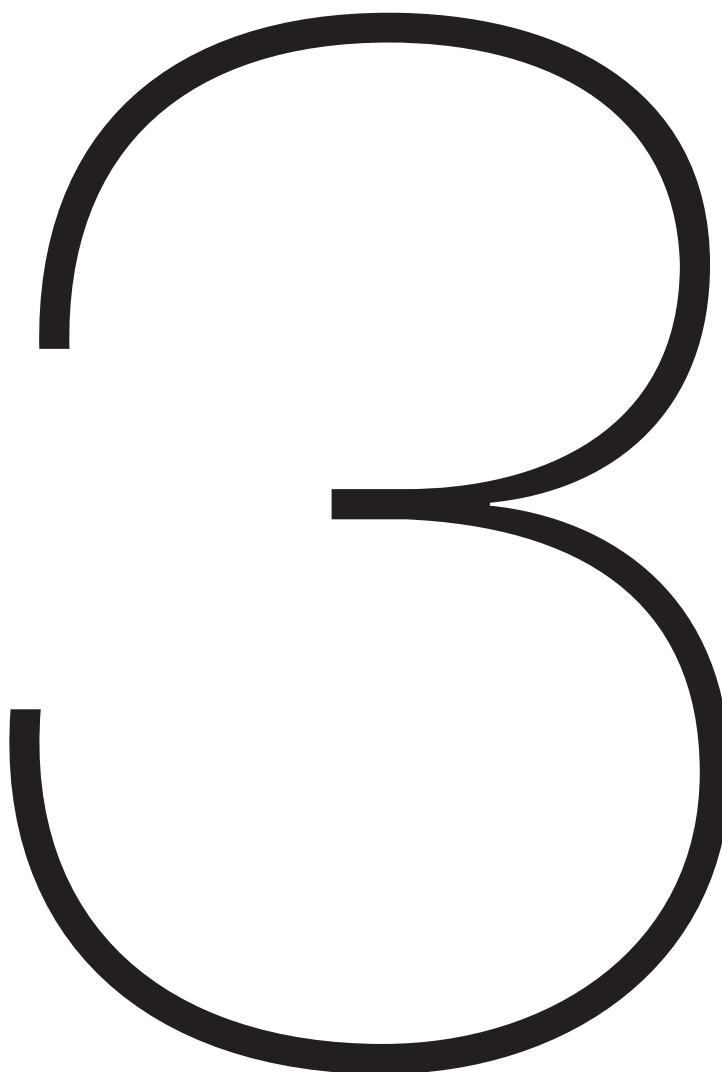
**GOOD FOR** CLASSIFYING RISKS, RAISE OR LOWER CONCERN

**AMOUNT OF DETAIL** GIST UNDERSTANDING

**HEALTH CONDITIONS** CARDIOVASCULAR DISEASE, HYPERTENSION

**DATA I HAVE** RISK ESTIMATE, TEST RESULT

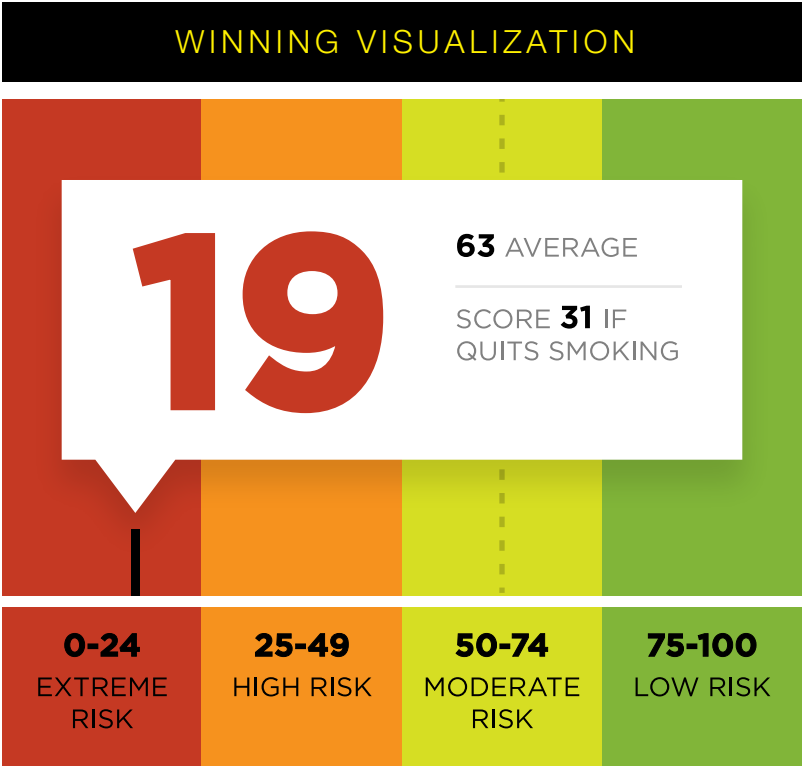
**GRAPHIC TYPE** X-Y GRAPH, LINE GRAPH, COLOR GRADIENT



## USE CASE

**WHAT WE TRIED TO DO:**

The results of health risk assessments (HRA) are often returned to patients using some form of summary score. The goal of this image was to make an abstract (and arbitrary) HRA score have more intuitive meaning.

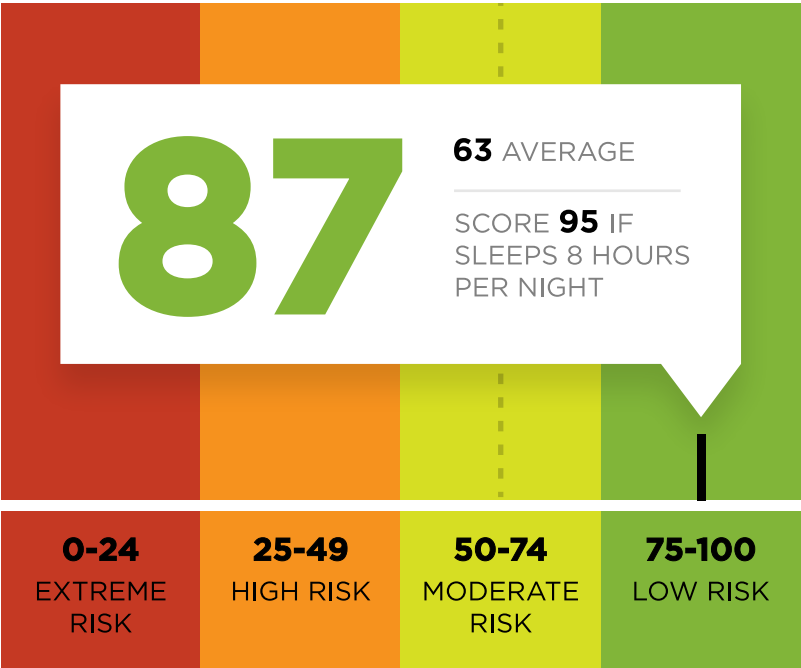
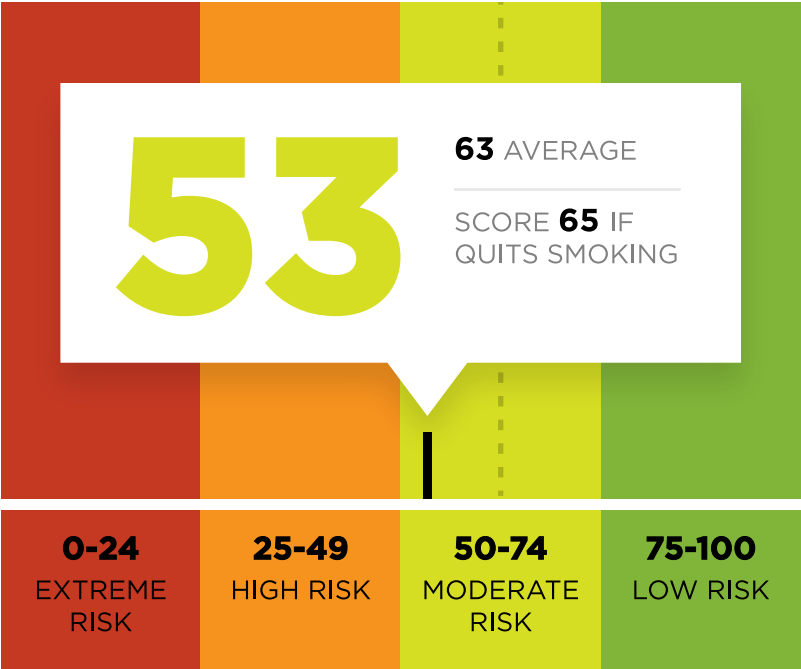


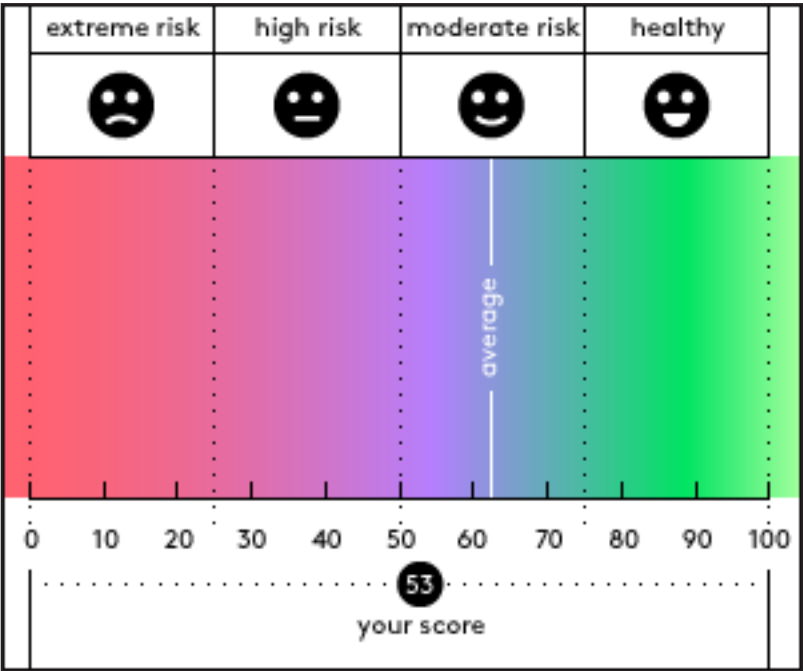
This graph uses a very simple 4-category color scheme / gradient to make sure that people get a clear message about how good or poor their health risk assessment score is. Yet, the primary message is the number itself, which is placed centrally and colored to correspond to its risk category. Note also that two key reference standards (average score and score if this person quit smoking) are provided to improve evaluation of the number.

**TESTING ANALYSIS:** With this graphic, people were most accurate in reporting which risk categories they fell into. This graphic also resulted in the lowest perceived difference that quitting smoking would make to the person’s health, but the perceived difference is still quite large and seems the most accurate among this set of graphics. We recommend this graphic.

Good For	Classifying Risks, Raise Or Lower Concern, Awareness Of Risk
Amount Of Detail	Gist Understanding
Health Conditions	Overweight, Smoking
Data I Have	Test Result
Graphic Type	Color Gradient, Line Graph

DERIVATIVE VARIATIONS

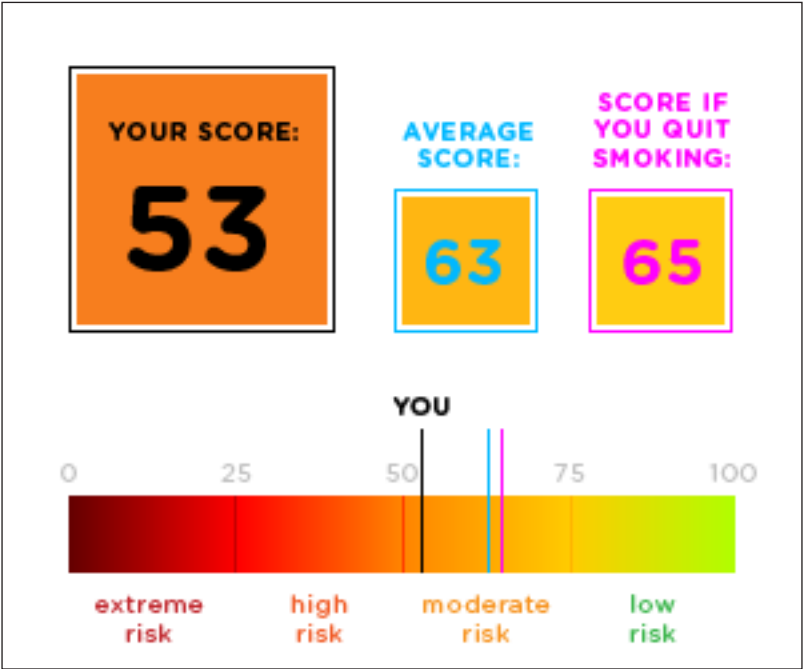




This graphic relies primarily on a color gradient to make the health risk assessment score have an intuitive / emotional meaning (in other words, to make clear whether it is good vs. poor). The verbal labels above are complemented by the face icons to reinforce an emotional meaning to each category.

**TESTING ANALYSIS:** This image appears to inflate people’s sense of how healthy this person is. We do NOT recommend this image.

Good For	Classifying Risks, Raise Or Lower Concern, Awareness Of Risk
Amount Of Detail	Gist Understanding
Health Conditions	Overweight, Smoking
Data I Have	Test Result
Graphic Type	Color Gradient, X-Y Graph, Icons

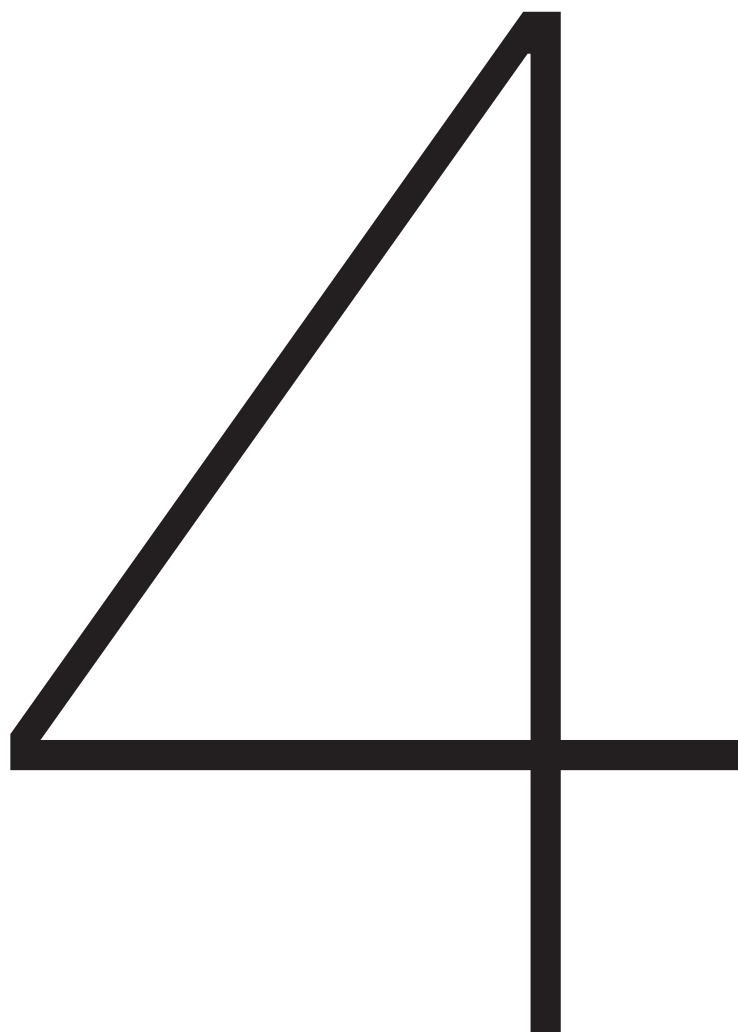


This number line graphic is supplemented with a continuous color gradient to reinforce the good vs. bad character of different score levels. Note that two key reference standards (average score and score if this person quit smoking) are provided to improve evaluation of the number. One weakness of the design is that the only thing linking the numbers (provided on top) and the number line below is the color of the border / text / line, a fairly subtle cue.

Good For	Classifying Risks, Raise Or Lower Concern, Awareness Of Risk
Amount Of Detail	Gist Understanding
Health Conditions	Overweight, Smoking
Data I Have	Test Result
Graphic Type	Color Gradient, Line Graph



USE CASE

**WHAT WE TRIED TO DO:**

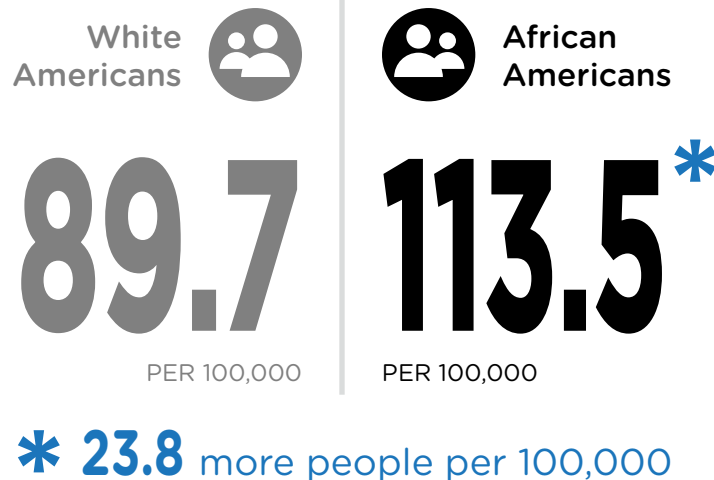
News stories often try to clarify disparities in disease risk across populations. E.g., the disease is more common in this group vs. that group. This display tries to convey not only that one group's risk is more but also just how much more.





## WINNING VISUALIZATION

## RATES OF COLORECTAL CANCER



This simple, infographic-style presentation highlights the difference in rates between two racial groups. Key features include (a) clear statement of the denominator and (b) the way that it presents the absolute difference in risk using easily understandable “more people” language. This latter step is particularly important to help people with lower numeracy skills make sense of such data. The darker color number/text is unfortunately an ambiguous cue here. It is highlighting the larger risk or simply indicating the darker skin coloration of African-Americans. It is unclear how color cues would best be used for representing disparities.

**TESTING ANALYSIS:** This graphic raised perceptions of population-level risk disparities. It also resulted in lower gist accuracy regarding which group is at higher risk. Depending on the goals of your communication, you can decide whether the increase in risk perceptions is worth the potential distortion of knowledge.

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**Good For** Differences In Likelihood, Raise Or Lower Concern

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**Amount Of Detail** Gist Understanding

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**Health Conditions** Cancer, Colon Cancer

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**Data I Have** Risk Disparity, Population Risks

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**Graphic Type** Tables

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DERIVATIVE VARIATIONS

RATES OF DIABETES

White  
Americans



71

PER 1000



Native  
Americans

175\*

PER 1000

\* 104 more people per 1000

RATES OF STROKE

White  
Americans



25

PER 1000



African  
Americans

39\*

PER 1000

\* 14 more people per 1000

DERIVATIVE VARIATIONS

RATES OF MELANOMA

White  
Americans



20

PER 1000

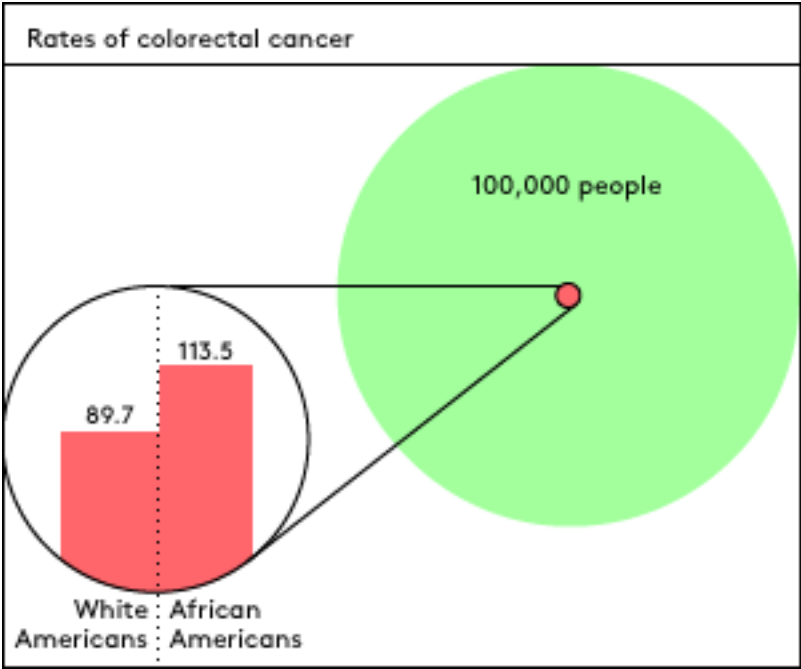


African  
Americans

1\*

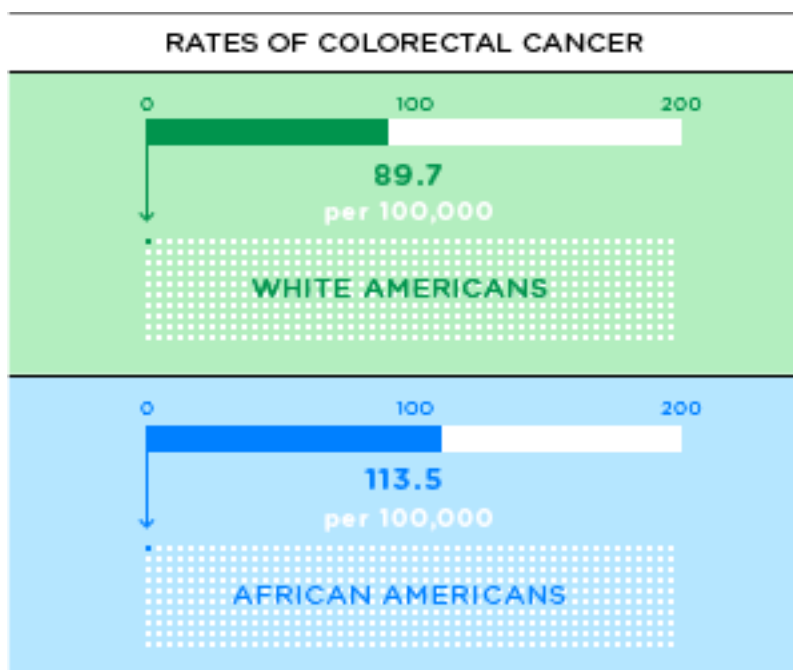
PER 1000

\* 19 less people per 1000



This graphic is a combination of two visual concepts. The red dot and green circle highlight the low colorectal cancer rates in general, while the bar graph embedded in the callout allows a focused presentation of the disparity in cancer rates. Some weaknesses of this format are unclear reference points for the bar graph (where is the 0 level?) and ambiguity regarding what exactly the red dot within the green circle signifies (89.7 vs. 113.5).

Good For	Differences In Likelihood, Raise Or Lower Concern
Amount Of Detail	Gist Understanding
Health Conditions	Cancer, Colon Cancer
Data I Have	Risk Disparity, Population Risks
Graphic Type	Icons, Area Graph, Bar Graph, Callout, Color Gradient



This graphic combines two standard graph types in a novel way. The icon array of dots on the bottom represents the full population of 100,000 people. (Each dot represents 200 people.) One of those dots is expanded out into the line graph along the top of each section. This allows the disparity in disease rates to be highlighted while simultaneously clarifying how small the overall risk is.

**Good For** Differences In Likelihood, Raise Or Lower Concern

**Amount Of Detail** Gist Understanding

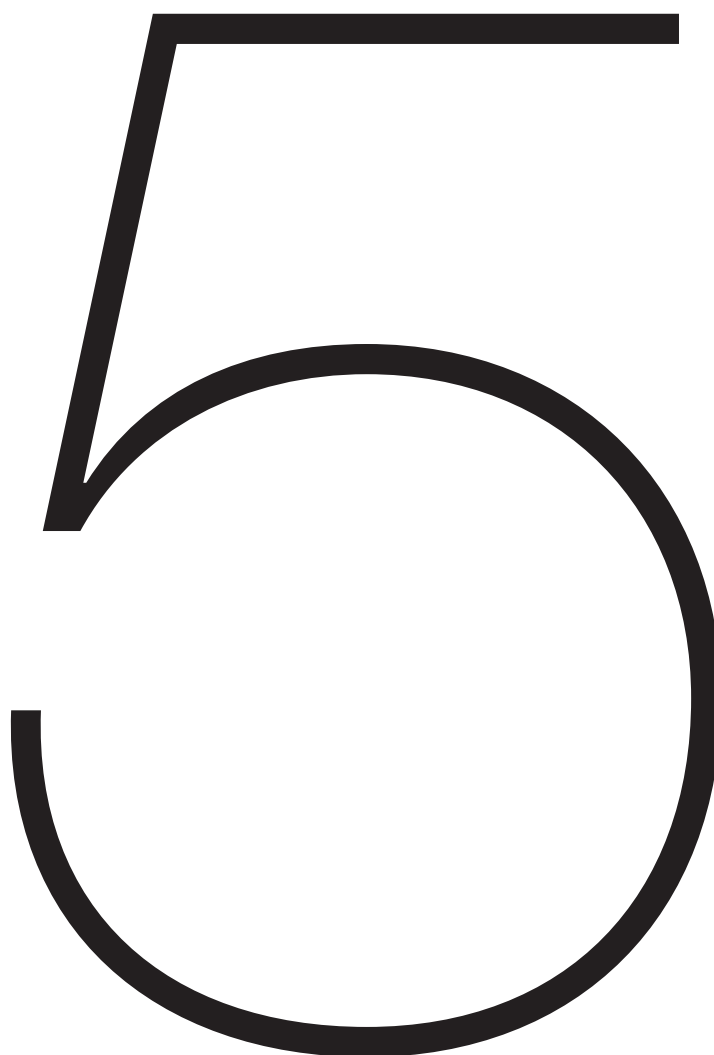
**Health Conditions** Cancer, Colon Cancer

**Data I Have** Risk Disparity, Population Risks

**Graphic Type** Bar Graph, Callout, Icon Array



## USE CASE

**WHAT WE TRIED TO DO:**

This image communicates the case counts of an outbreak of disease (here, measles) in a way suitable for a news story. The challenge is to present information about the relevant population in a way that draws attention to the risk as important but also reminds people of its (current) rarity.

## WINNING VISUALIZATION

## CASES OF MEASLES IN THE LAST YEAR

58

58 cases occurred  
in just two **Brooklyn, NY**  
neighborhoods

Population:  
**250,000**

200

There were 200  
total cases  
in the **United States**

Population:  
**317,000,000**

This info-graphic focuses attention on the difference in case rates between Brooklyn and the US as a whole. Its power comes in the subtle cues to remind people of how big the differences in population are: (a) use of labels such as “just two Brooklyn, NY neighborhoods” and “200 total cases” and (b) the mirrored positioning of the denominator numbers. Ideally, a reader sees 58 and 200 and gets a sense of their ratio, then sees 250,000 and 317,000,000 and realizes that the latter is a much larger ratio.

**TESTING ANALYSIS:** This image increased how significant the difference seemed to people as well as how big the differences felt to them, as compared to the other images it was tested against. We give this image a modest recommendation.

**Good For** Awareness Of Risk, Differences In Likelihood, Raise Or Lower Concern

**Amount Of Detail** Gist Understanding

**Health Conditions** Measles

**Data I Have** Case Counts, Population Risks

**Graphic Type** Tables



## DERIVATIVE VARIATIONS

## DEATHS FROM H1N1 AND SPANISH FLU

14,000

There were 14,000  
deaths from **H1N1**  
from **2009-2010**

World Population:  
**6,800,000,000**

100,000,000

There were 100,000,000  
deaths from **Spanish Flu**  
from **1918-1919**

World Population:  
**1,800,000,000**

## CASES OF WEST NILE IN THE LAST YEAR

1,868

There were 1,868 cases  
in **Texas**

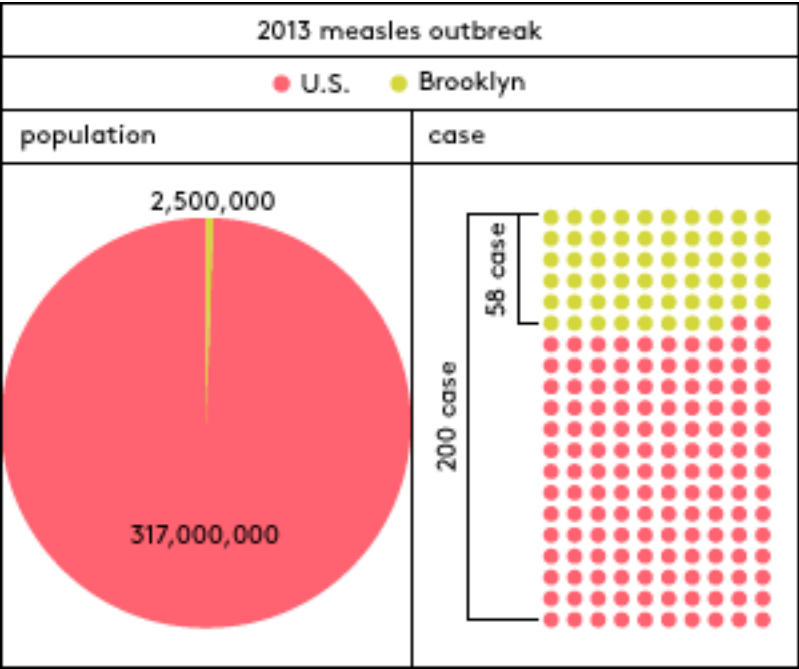
Population:  
**26,000,000**

5,674

There were 5,674 cases  
in the **United States**

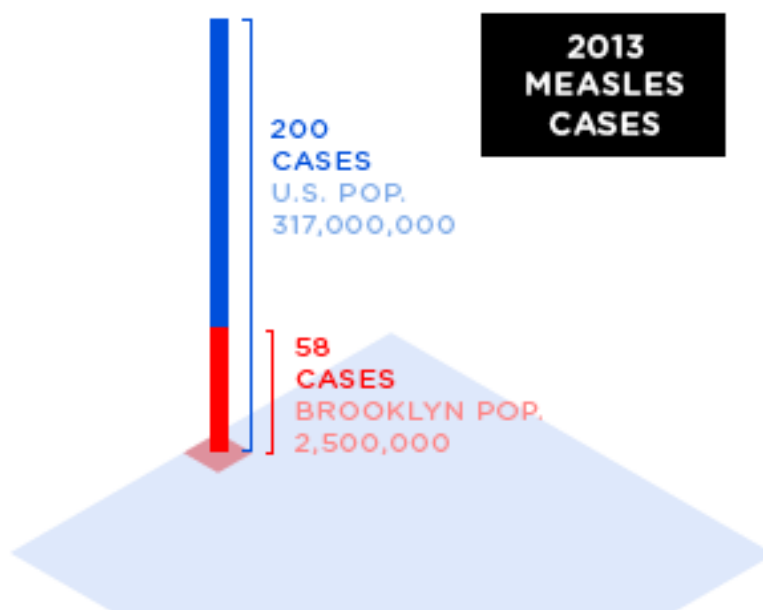
World Population:  
**317,000,000**





This display merges a pie chart showing how small Brooklyn is compared to the US as a whole and an icon array showing the proportion of measles cases in each group. The icon array is made more interpretable by the addition of the lines that clarify how many total dots there are and how many are actual measles cases.

Good For	Awareness Of Risk, Differences In Likelihood, Raise Or Lower Concern
Amount Of Detail	Gist Understanding
Health Conditions	Measles
Data I Have	Case Counts, Population Risks
Graphic Type	Pie Cahrt, Icon Array, Tables



This abstract graphic uses the vertical bar to show cases of measles and the shaded areas on the bottom to represent the total population (i.e. the risk denominator). Ideally, readers should get the gist that the difference in cases is not nearly as large as the difference in populations.

---

**Good For** Awareness Of Risk, Differences In Likelihood, Raise Or Lower Concern

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**Amount Of Detail** Gist Understanding

---

**Health Conditions** Measles

---

**Data I Have** Case Counts, Population Risks

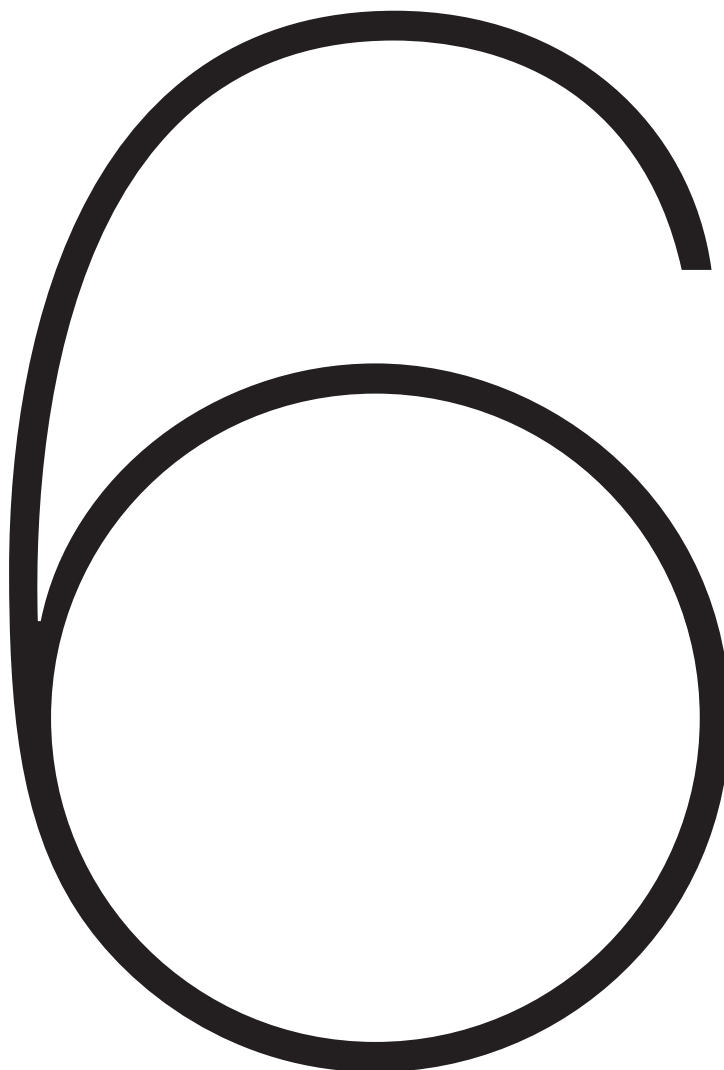
---

**Graphic Type** Bar Graph

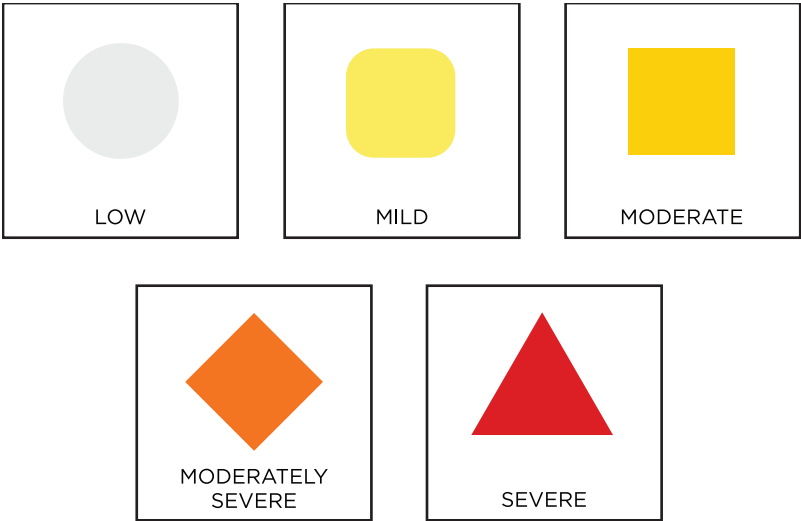
---



## USE CASE

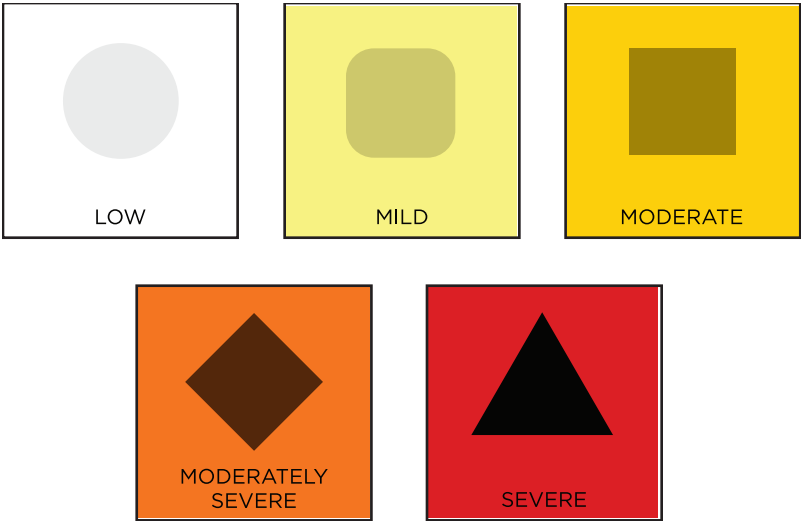
**WHAT WE TRIED TO DO:**

This set of icons is designed to be embedded within larger tables of risk information to draw attention to differences in severity among the set of risks shown.



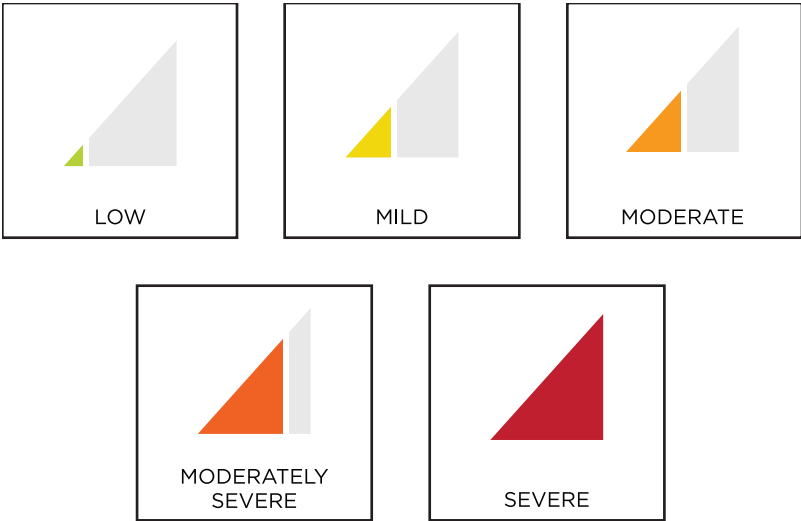
This set of icons uses label, color, and the more subtle visual cue of angular sharpness to convey increasing degrees of severity.

Good For	Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Treatment Choice, Side Effects
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Icons



This set of icons adds the stronger color cue of a colored background to the shape cues in Shuman’s other set of severity icons.

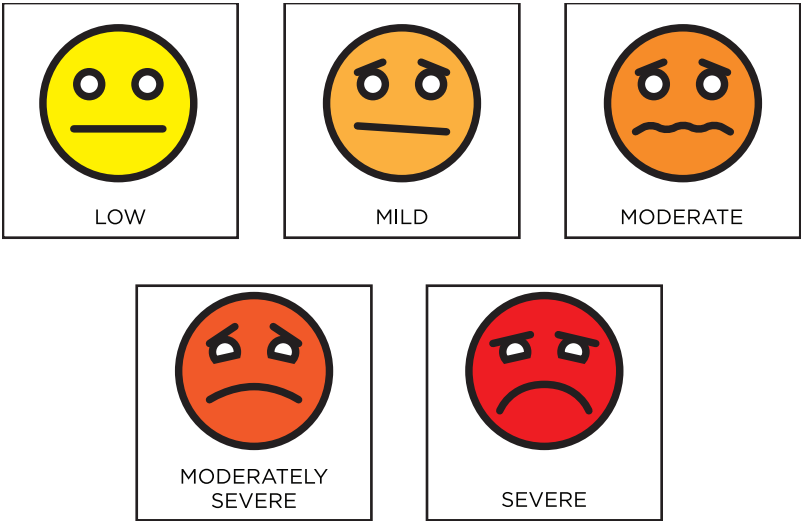
Good For	Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Treatment Choice, Side Effects
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Icons



These severity icons use a total of 5 different visual cues to show increased severity: color, vertical height, horizontal width, area, and label. They also build on an established cognitive schema: the “signal strength bars” we often encounter with cell phones.

**TESTING ANALYSIS:** These icons tested particularly well in helping people recognize which of two side effects is most severe.

Good For	Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Treatment Choice, Side Effects
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Icons



These icons use faces and color cues to tie an emotional response to levels of risk severity. A similar approach is often used with children to assess degree of pain on a 0-10 scale.

Good For	Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Treatment Choice, Side Effects
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Icons

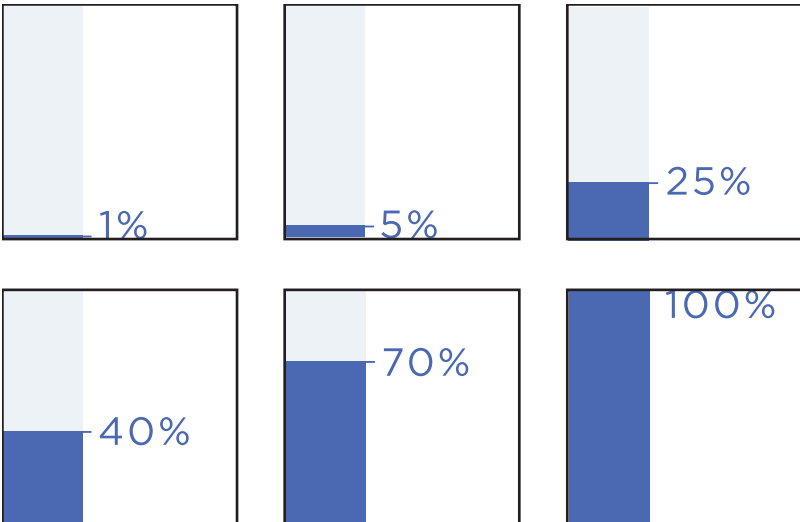


## USE CASE

**WHAT WE TRIED TO DO:**

The goal of this set of icons is to create visual cues for variations in risk likelihood that will be more intuitive than simple numbers yet small enough to be replicated repeatedly in summary tables.

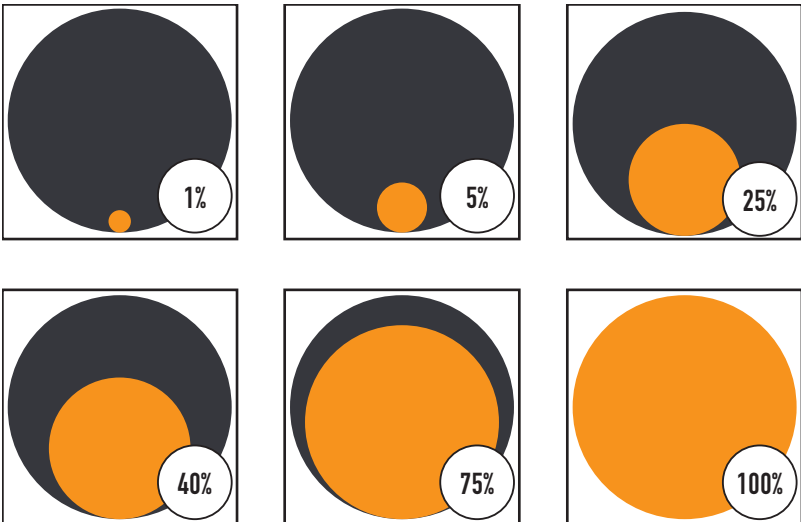




This set of bar graph icons may look simple, but note they use 3 distinct cues to show level of likelihood: number, height of bar, and vertical positioning of the number itself.

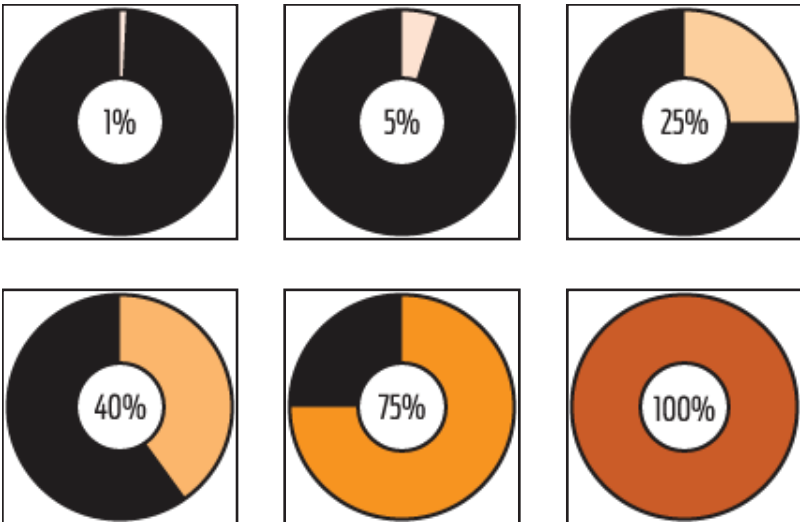
**TESTING ANALYSIS:** These bar chart-style icons for indicating risk likelihood performed particularly well for helping people recognize the most likely side effect.

Good For	Classifying Risks, Differences in Likelihood
Amount Of Detail	Gist Understanding, Verbatim Recall
Health Conditions	Side Effects, Treatment Choice
Data I Have	Risk Estimate
Graphic Type	Icons



This innovative design uses the size of the orange bubble to convey the size of the likelihood with the black bubble showing the total 100% space. A weakness, however, is that the primary cue is area which is harder for people to interpret– the height of the circle is not actually proportionate to the level of likelihood.

Good For	Classifying Risks, Differences in Likelihood
Amount Of Detail	Gist Understanding, Verbatim Recall
Health Conditions	Side Effects, Treatment Choice
Data I Have	Risk Estimate
Graphic Type	Icons



These icons combine a classic pie chart with a clearly presented percentage.


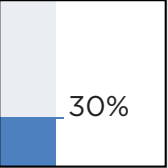

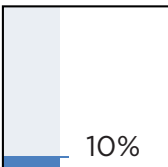

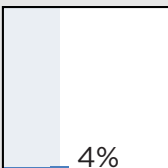

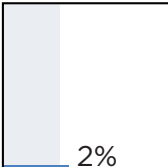

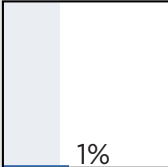

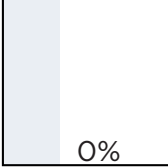
Good For	Classifying Risks, Differences in Likelihood
Amount Of Detail	Gist Understanding, Verbatim Recall
Health Conditions	Side Effects, Treatment Choice
Data I Have	Risk Estimate
Graphic Type	Icons, Color Gradient



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**WHAT WE TRIED TO DO:**










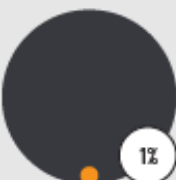


This summary table (suitable for use in decision aids or medication packaging) uses both severity icons and likelihood icons to highlight variations in likelihood and severity within a set of side effects. It uses icons that our early rounds of testing found to be most helpful. This table was subsequently tested against other visual approaches to communicating side effect risks.

Side Effects	Severity of Side Effects	Likelihood of Side Effects
Nausea	<div> LOW</div>	<div> 30%</div>
Stomach/ Gut Bleeding	<div> MODERATELY SEVERE</div>	<div> 10%</div>
Swelling of Hands or Feet	<div> LOW</div>	<div> 4%</div>
Tinnitus (Ringing in Ears)	<div> MILD</div>	<div> 2%</div>
Liver Problems	<div> MODERATE</div>	<div> 1%</div>
Severe Skin Disorder	<div> SEVERE</div>	<div> 0%</div>

This table uses icons with fairly simple designs to focus viewers’ attention to particular dimensions. In particular, the severity icons use color, vertical height, horizontal width, area, and label (5 cues!) simultaneously to show increased severity. The bar icons use bar height, number, and vertical position of the number to all signal likelihood. The icons make it easy to quickly scan the tables and identify particularly common or particularly severe risks worthy of additional consideration.

**TESTING ANALYSIS:** In comparative tests between tabular and non-tabular formats, this type of table particularly helped viewers understand how different side effect risks vary in their severity. It also performed slightly better than other formats in helping people recognize the most likely side effect.

<b>Good For</b>	Classifying Risks, Differences in Likelihood
<b>Amount Of Detail</b>	Gist Understanding, Verbatim Recall
<b>Health Conditions</b>	Side Effects, Treatment Choice
<b>Data I Have</b>	Risk Estimate
<b>Graphic Type</b>	Icons, Color Gradient, Tables

Side Effects	Severity of Side Effects	Likelihood of Side Effects
Nausea	 LOW	 30%
Stomach/ Gut Bleeding	 MODERATELY SEVERE	 10%
Swelling of Hands or Feet	 LOW	 4%
Tinnitus (Ringing in Ears)	 MILD	 2%
Liver Problems	 MODERATE	 1%
Severe Skin Disorder	 SEVERE	 0%

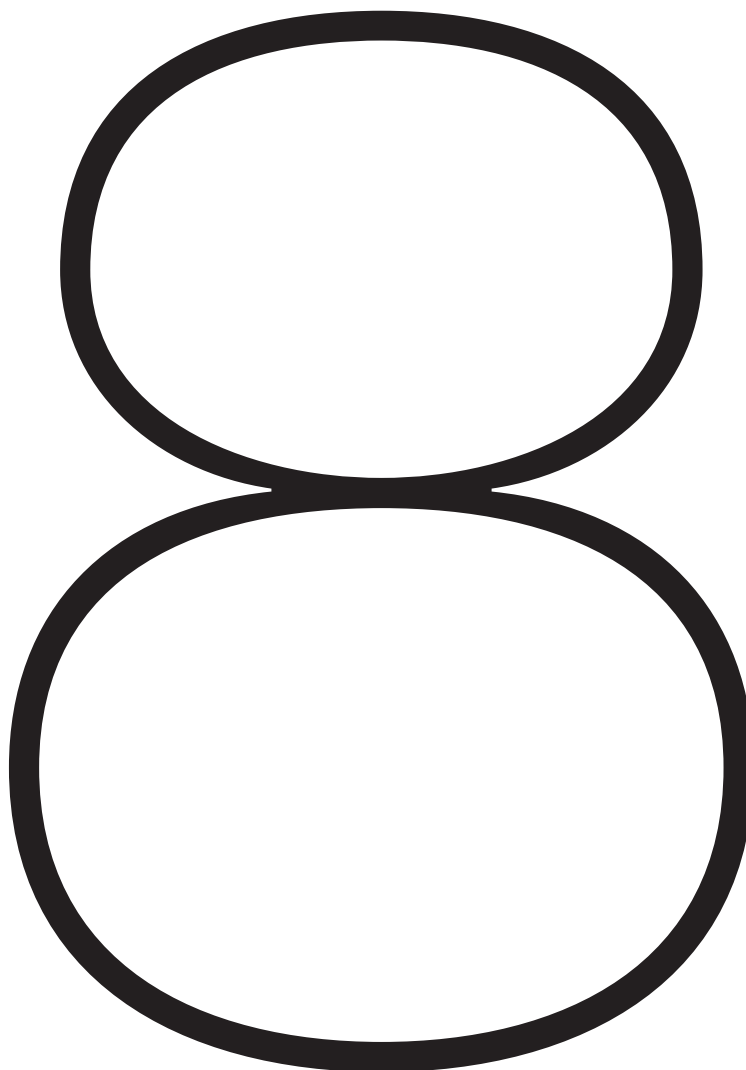
This table uses icons with fairly simple designs to focus viewers’ attention to particular dimensions. In particular, the severity icons use color, vertical height, horizontal width, area, and label (5 cues!) simultaneously to show increased severity. The bubble icons in Table B use circle area and numbers in a visually interesting way. The icons make it easy to quickly scan the tables and identify particularly common or particularly severe risks worthy of additional consideration.

**TESTING ANALYSIS:** In comparative tests between tabular and non-tabular formats, this type of table particularly helped viewers understand how different side effect risks vary in their severity. However, it did not perform as well as tables with a different icon for risk likelihood in helping people recognize the most likely side effect.

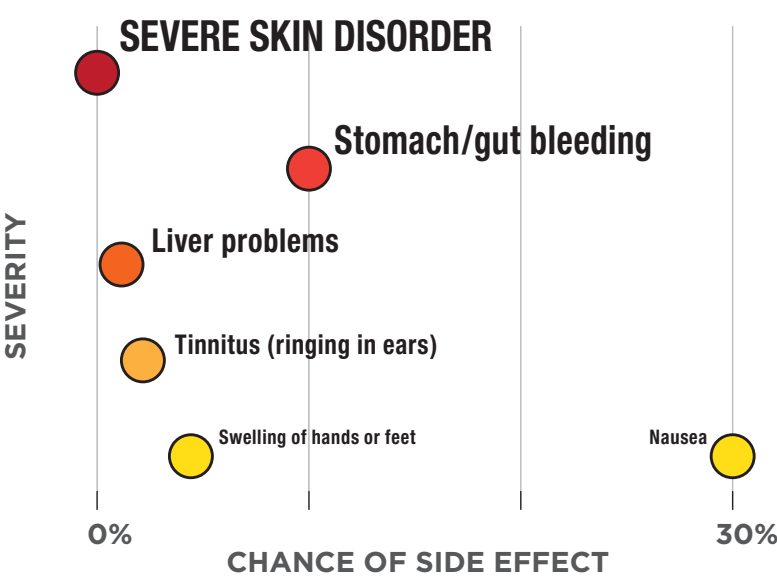
<b>Good For</b>	Classifying Risks, Differences in Likelihood
<b>Amount Of Detail</b>	Gist Understanding, Verbatim Recall
<b>Health Conditions</b>	Side Effects, Treatment Choice
<b>Data I Have</b>	Risk Estimate
<b>Graphic Type</b>	Icons, Tables



## USE CASE

**WHAT WE TRIED TO DO:**

This image shows the relative likelihood and severity of multiple side effects in non-tabular ways, using color, size, shape, etc to represent the attributes of the side effects so that consumers can quickly get the “gist” of what might happen to them if they took a medication.



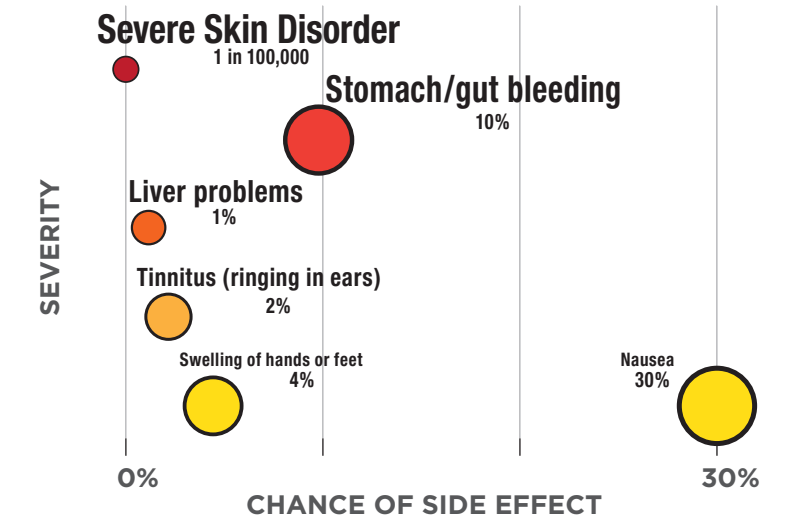
This graphic shows severity using 3 cues (vertical position, color, and font size/caps) and likelihood using 1 cue (horizontal position).

**TESTING ANALYSIS:** This image performed better on severity questions than other designs that had less clear cues for severity. However it performed less well in terms of communicating risk likelihood. This type of X-Y display also performed less well than the alternate approach of using tables with embedded icons (e.g, here).

Good For	Raise Or Lower Concern, Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Side Effects, Treatment Choice, Medication
Data I Have	Risk Estimate
Graphic Type	Color Gradient, X-Y Graph



MODIFIED VARIATION



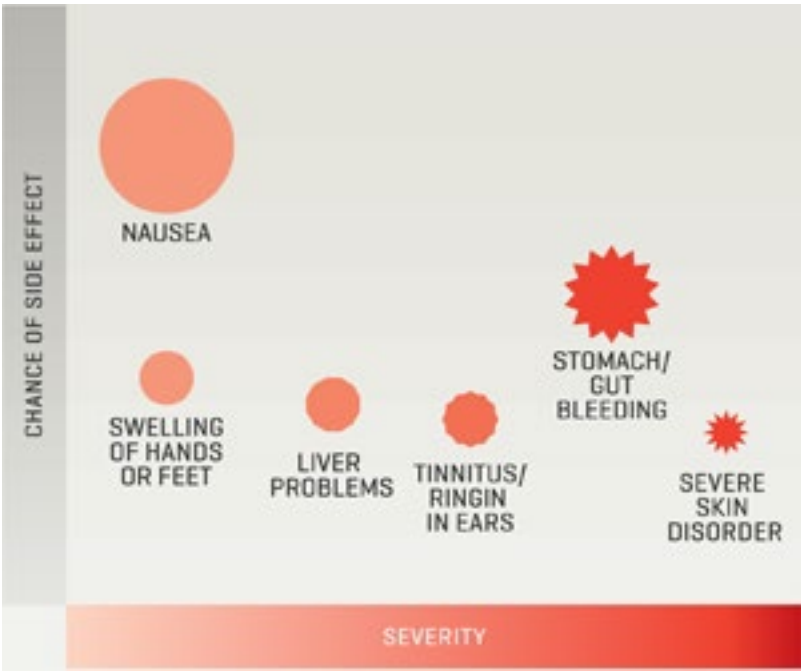
This 2 dimensional graphic is a hybrid of two original designs that each had positive and negative elements (per our testing). It uses multiple cues to represent both likelihood and severity.

- Severity is shown by vertical position, circle color and font size.
- Likelihood is shown by horizontal position, circle color and size, and risk number.

The strength and weakness of this graphic is its compactness. There is a lot of information in a small space, which may be helpful or confusing depending on context.

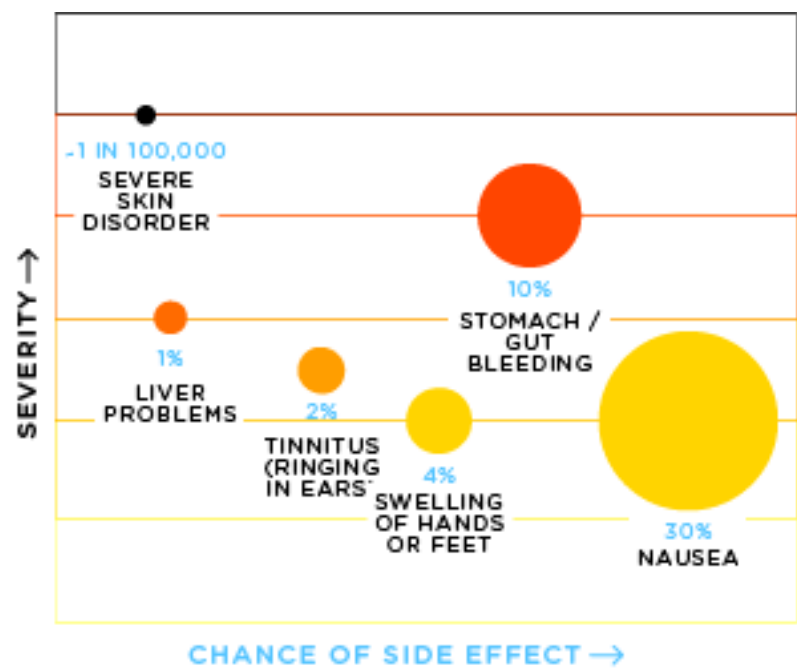
**TESTING ANALYSIS:** This type of X-Y display also performed less well than the alternate approach of using tables with embedded icons (e.g, here).

Good For	Raise Or Lower Concern, Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Side Effects, Treatment Choice
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Area Graph, X-Y Graph



This graphic shows severity using 3 cues (horizontal position, color, and icon shape – spik-iness) and likelihood using 2 cues (vertical position and size of icon). A weakness of this graphic is that the likelihood scale is not well defined (where is 0%?), making it impossible to identify the exact chance of each risk.

Good For	Raise Or Lower Concern, Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Side Effects, Treatment Choice, Medication
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Line Graph, Icons, Area Graph, X-Y Graph

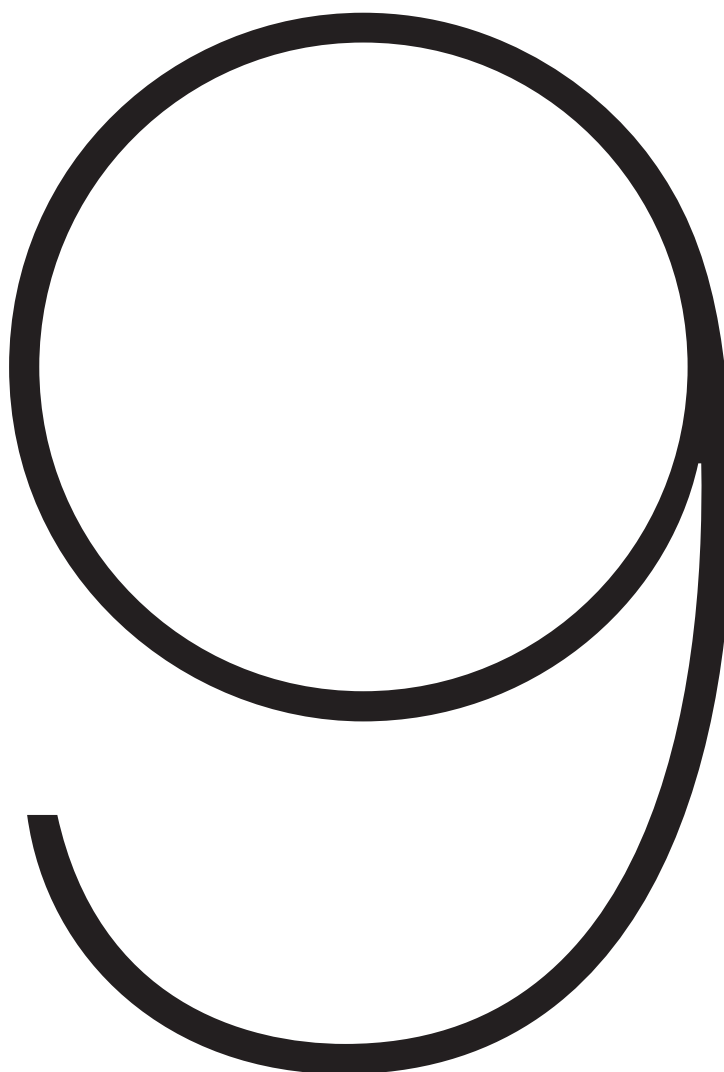


This graphic shows severity using 2 cues (vertical position and color) and likelihood using 3 cues (horizontal position, size of circle, and number). A weakness is that the horizontal position is not proportionate to actual differences in likelihood. For example, the horizontal spacing between a 1% and a 2% risk is larger than the difference between the 10% risk and the 30% risk.

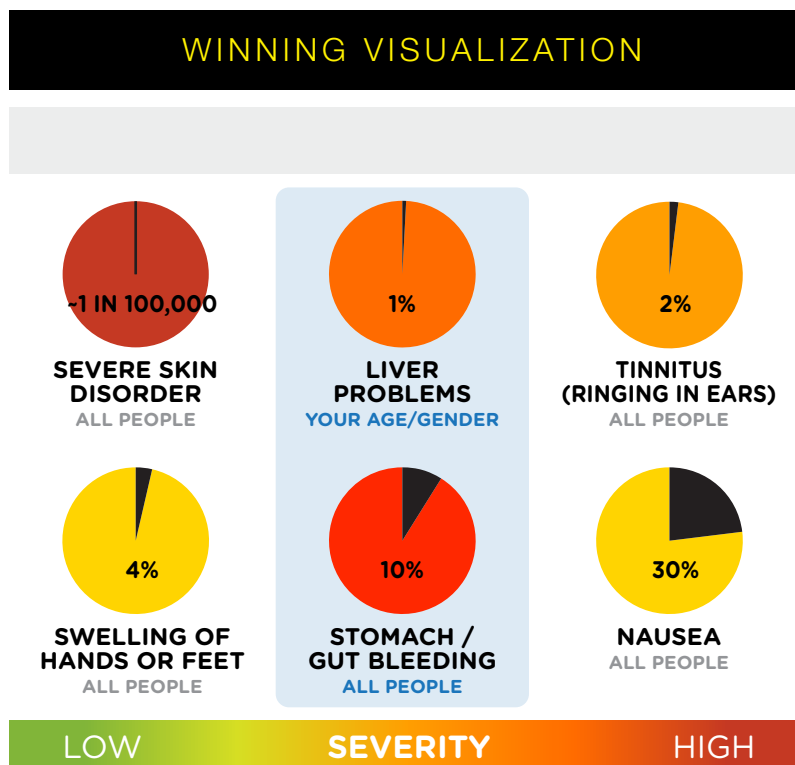
**TESTING ANALYSIS:** With this image, people are better able to accurately report their risk of certain side effects than with other images of this type. However, they are less able to accurately report the severity of those risks. This type of X-Y display also performed less well than the alternate approach of using tables with embedded icons (e.g, here).

Good For	Raise Or Lower Concern, Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Side Effects, Treatment Choice, Medication
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Line Graph, Icons, Area Graph, X-Y Graph

## USE CASE

**WHAT WE TRIED TO DO:**

This display represents the relative likelihood and severity of multiple side effects in a tabular structure. It also organizes this information to ensure that viewers pay attention to very rare but very severe events and represents whether risk numbers are based on general population samples or are tailored by characteristics such as age, gender or race.



This hybrid graphic uses a matrix of pie charts to organize information about side effect risks while allowing for easy focusing on individual risks. Severity is shown by color, while likelihood is shown by number and pie wedge size. In addition, risks are ordered in the matrix (left to right, top to bottom) in order of increasing likelihood. Personalization of the information is subtly shown via the blue outlines and text for the two risks in the middle.

**TESTING ANALYSIS:** Based on our testing, this graphic helped explain basic risk numbers but did not draw people's attention to the risks that are based on more personalized data. However, in follow-up testing this type of table performed less well than tables with embedded icons (e.g, here).

**Good For** Raise Or Lower Concern, Classifying Risks

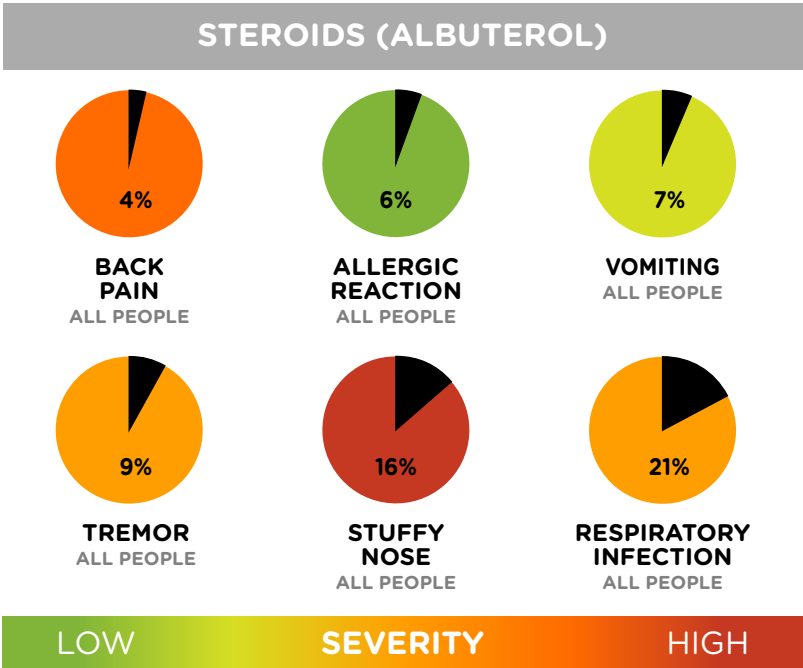
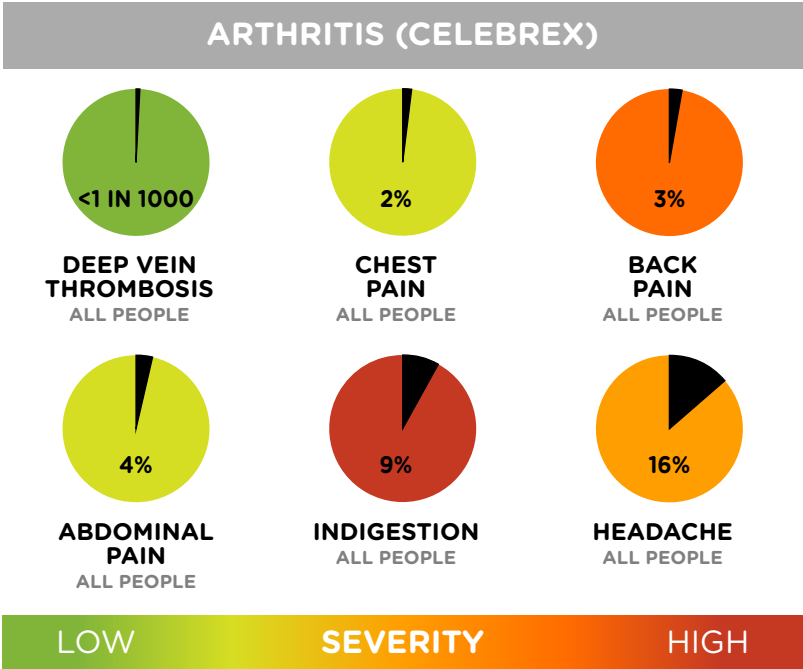
**Amount Of Detail** Gist Understanding

**Health Conditions** Side Effects, Treatment Choice, Medication

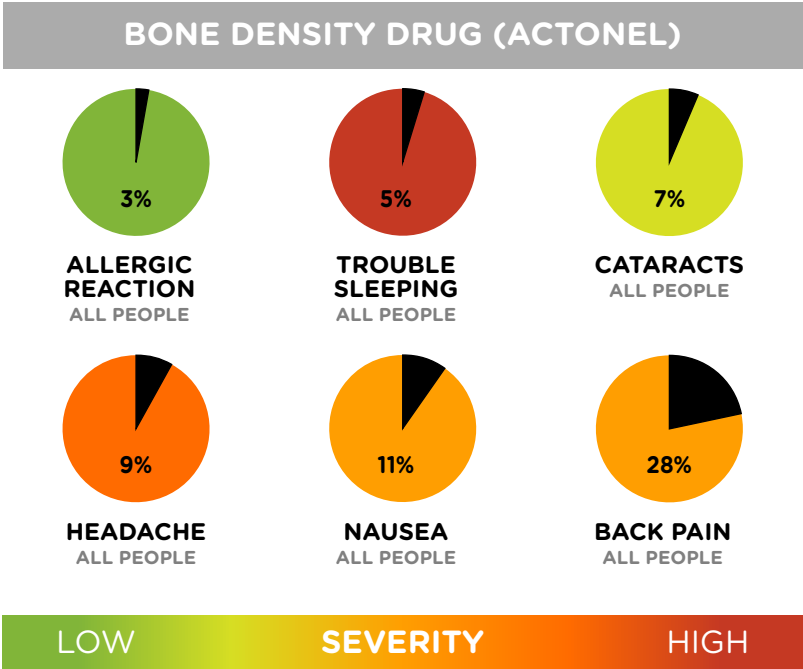
**Data I Have** Risk Estimate

**Graphic Type** Color Gradient, Pie Chart, Tables

DERIVATIVE VARIATIONS



DERIVATIVE VARIATIONS



SIDE EFFECT	CHANCE OF SIDE EFFECT	BASED ON
Nausea	30%	All people
Stomach/gut bleeding	10%	People your AGE and GENDER
Swelling of hands or feet	4%	All people
Tinnitus (ringing in ears)	2%	All people
Liver problems	1%	People your AGE
Severe Skin Disorders	0.001%	All people

This simple table uses color coding to imply (but not explicitly state) differences in severity. The bright blue arrows provide a strong cue that the information about those two side effect risks are based on more specific data than the remaining information.

TESTING ANALYSIS: This graphic drew people’s attention to the personalized information (it had a much stronger cue than other images). On the other hand, it was weaker on overall understanding of risk. Also, in follow-up testing this type of table performed less well than tables with embedded icons (e.g, here).

Good For	Raise Or Lower Concern, Classifying Risks
Amount Of Detail	Gist Understanding
Health Conditions	Side Effects, Treatment Choice, Medication
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Pie Chart, Tables



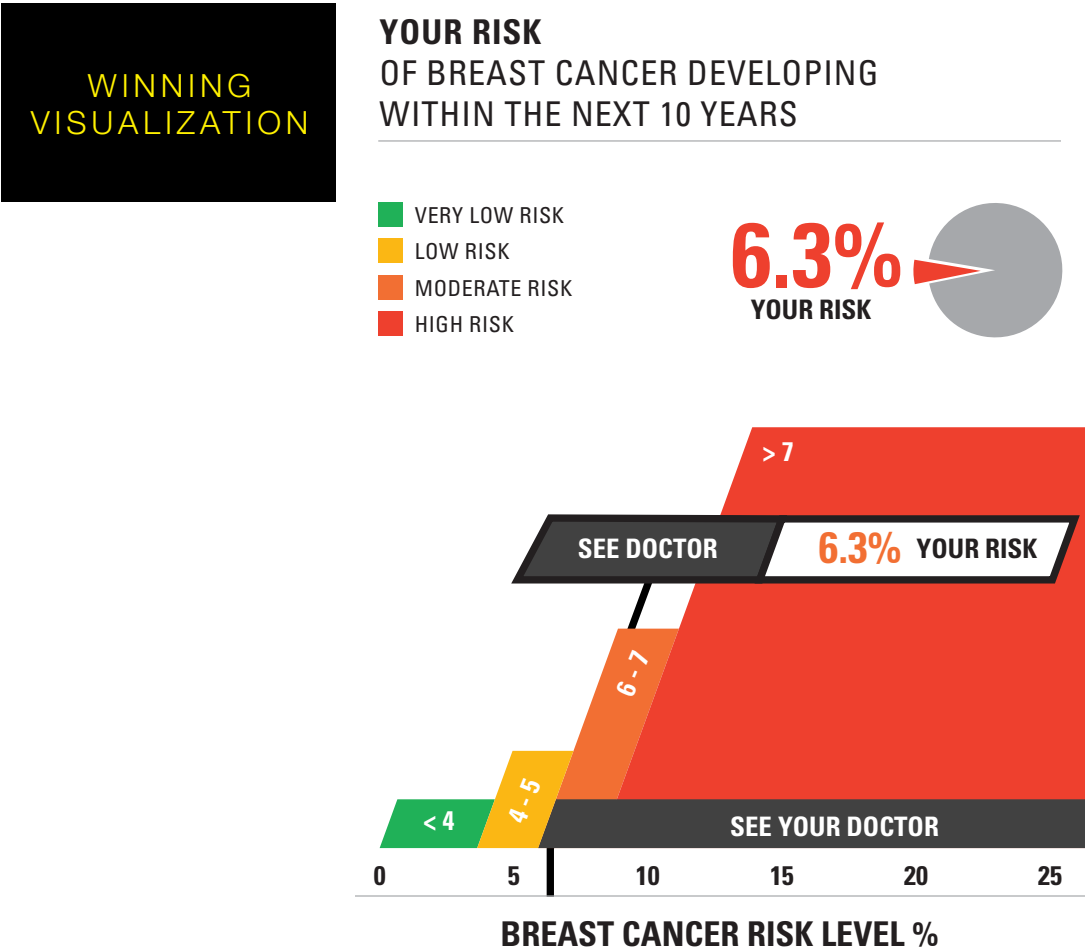


USE CASE

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**WHAT WE TRIED TO DO:**

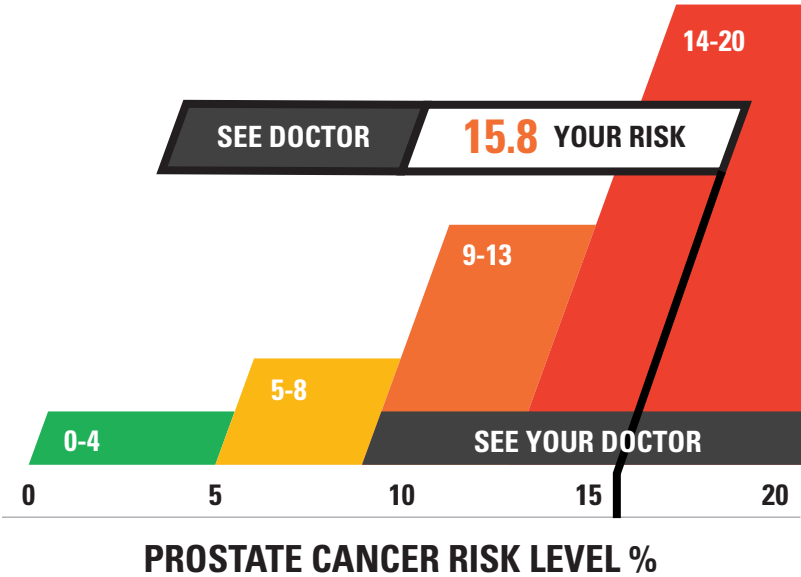
This image presents a risk estimate to a patient. Its primary goal is to help patients categorize their risk (i.e., to make sure that patients know when they are at “high” risk or not).



DERIVATIVE VARIATIONS

YOUR RISK  
OF PROSTATE CANCER DEVELOPING  
WITHIN THE NEXT 10 YEARS

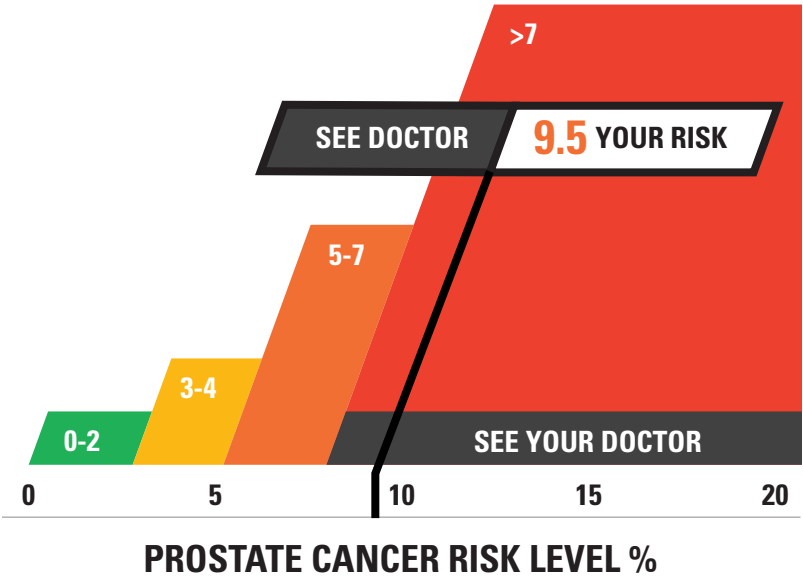
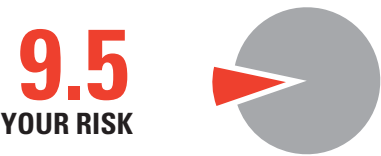
- VERY LOW RISK
- LOW RISK
- MODERATE RISK
- HIGH RISK



DERIVATIVE VARIATIONS

YOUR RISK  
OF DEVELOPING SKIN CANCER (MELANOMA)  
WITHIN THE NEXT 10 YEARS

- VERY LOW RISK
- LOW RISK
- MODERATE RISK
- HIGH RISK

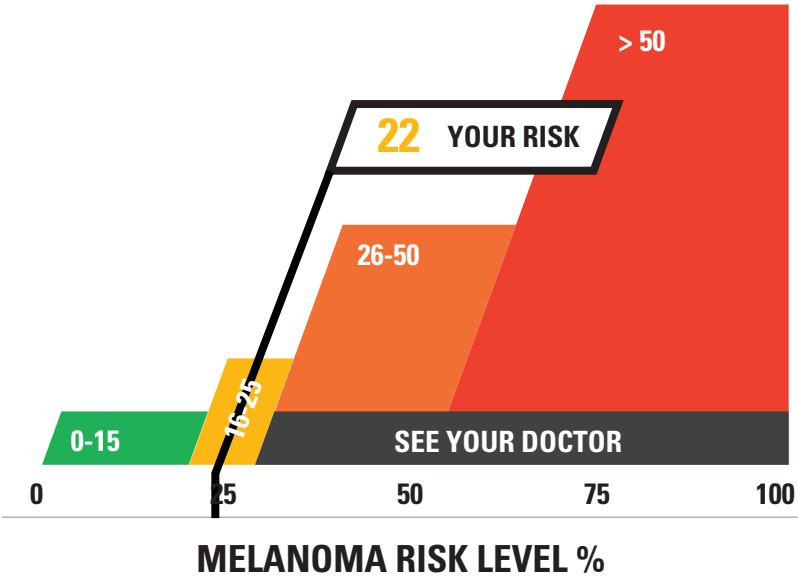


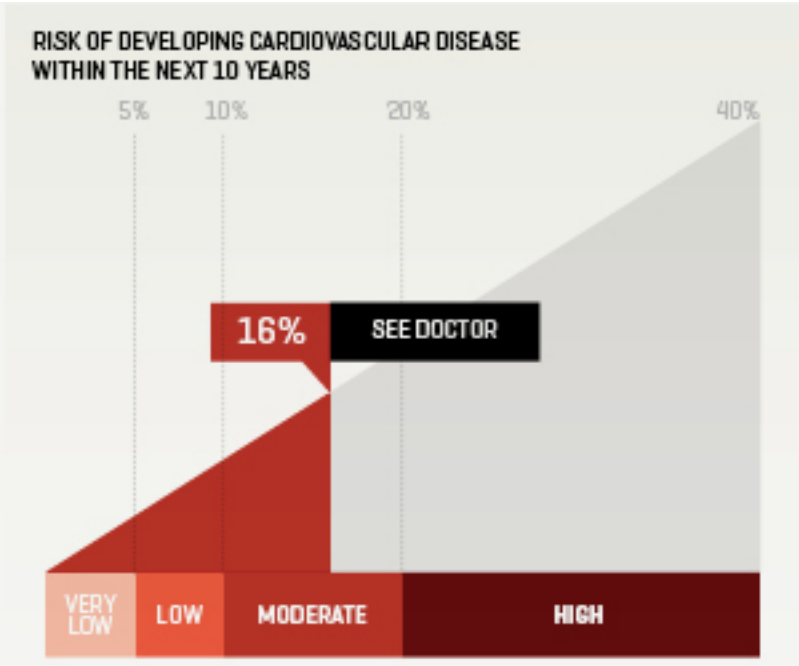
DERIVATIVE VARIATIONS

YOUR RISK  
OF HAVING A STROKE  
WITHIN THE NEXT 10 YEARS

- VERY LOW RISK
- LOW RISK
- MODERATE RISK
- HIGH RISK

22  
YOUR RISK

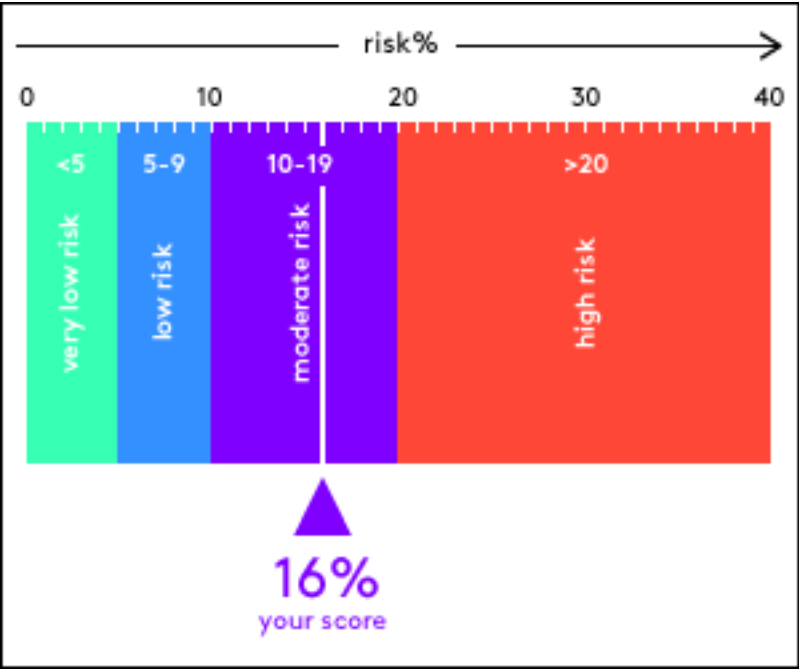




This graphic uses a triangle design to translate a simple number line into a 2-dimensional shape, thereby providing height and area cues in addition to horizontal position. It also features a strong callout flag that presents the patient’s risk numerically right in the middle of the display and provides an instruction (“see doctor”) whenever the risk level is in the “moderate” or “high” categories.

**TESTING ANALYSIS:** This image resulted in significantly higher accuracy in our testing (compared to other designs) but was not as good at helping people classify risks. Given that the primary goal of many risk calculators is to ensure accurate risk classification, our recommendation would NOT be to use this design as is but instead to use a graphic like IR10A but to add a stronger visual flag denoting the patient’s risk in the middle of the graphic (as this image does).

Good For	Raise Or Lower Concern, Classifying Risk
Amount Of Detail	Verbatim Recall, Gist Understanding
Health Conditions	Cardiovascular Disease
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Line Graph, Area Graph, X-Y Graph



This simple number line graphic uses color categories and labels to provide cues regarding the increasing risk with higher patient scores.

Good For	Raise Or Lower Concern, Classifying Risk
Amount Of Detail	Verbatim Recall, Gist Understanding
Health Conditions	Cardiovascular Disease
Data I Have	Risk Estimate
Graphic Type	Color Gradient, Line Graph, X-Y Graph



## USE CASE

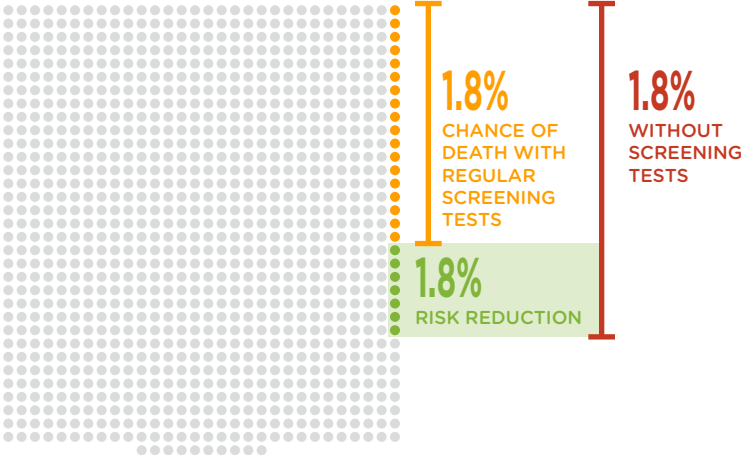
**WHAT WE TRIED TO DO:**

This display tries to help patients compare their current risk without screening tests versus their reduced risk if they have screening tests. In particular, it aims to help patients understand the absolute size of the possible risk reduction.



WINNING VISUALIZATION

COLON CANCER RISK %



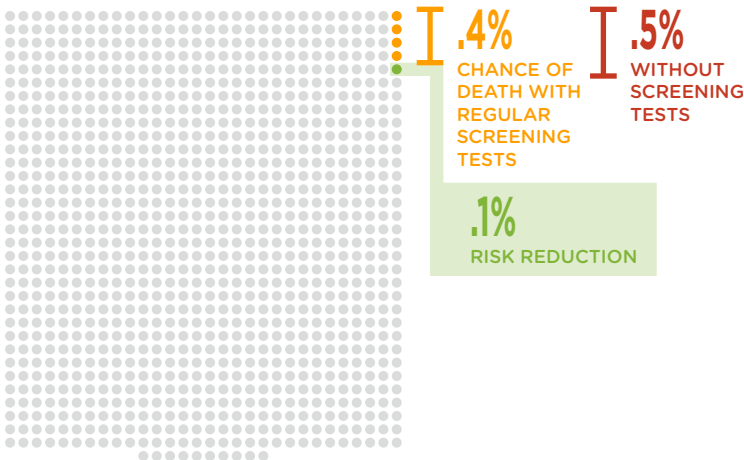
This dot matrix display uses 1,000 dots to represent the probability space (each dot = 0.1%). As a result, it is easy to count the dots to see each of the 7 people out of 1,000 (0.7%) whose risk is reduced because of cancer screening tests. Note that this display works well for small risks that are larger than 0.1% but would have problems visually grouping and labeling risks larger than 3%.

**TESTING ANALYSIS:** In our testing, this image helped people more accurately report the risk with screening tests and the risk difference for screening vs non-screening. It performed equally well on risk perceptions as other accurate graphics do. We recommend this image.

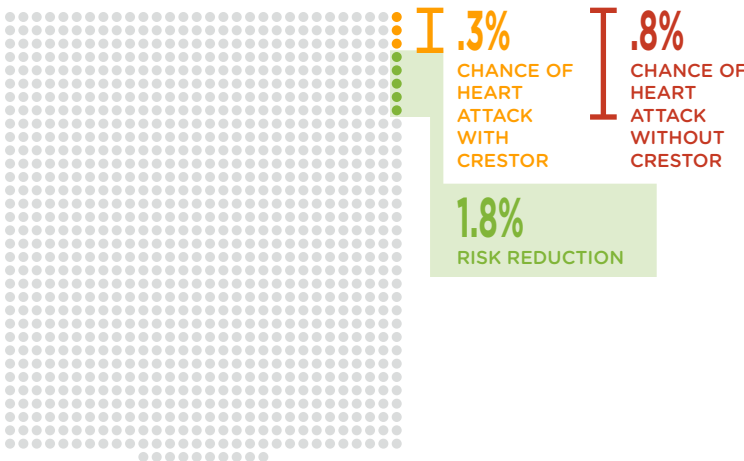
<b>Good For</b>	Raise Or Lower Concern, Differences In Likelihood
<b>Amount Of Detail</b>	Verbatim Recall, Gist Understanding
<b>Health Conditions</b>	Cancer, Colon Cancer
<b>Data I Have</b>	Risk Estimate
<b>Graphic Type</b>	Icon Array, Color Gradient, Callout

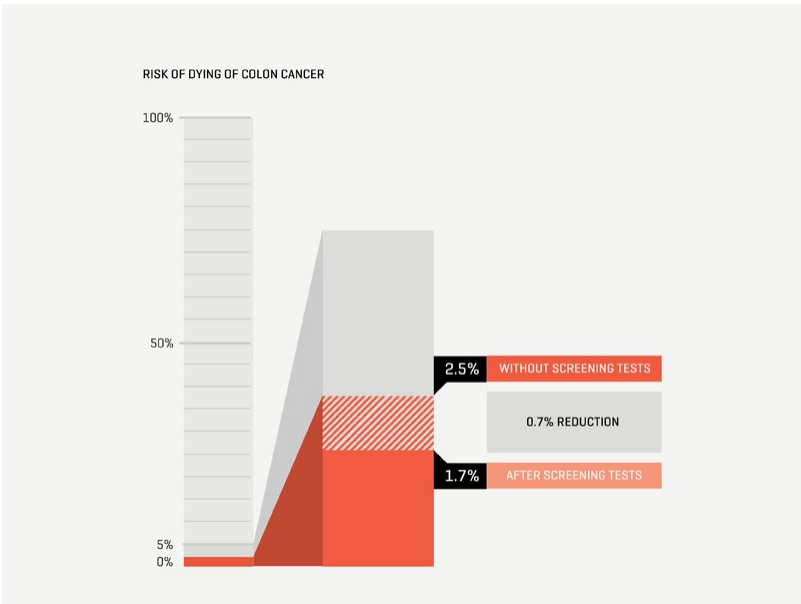
DERIVATIVE VARIATIONS

BREAST CANCER RISK %



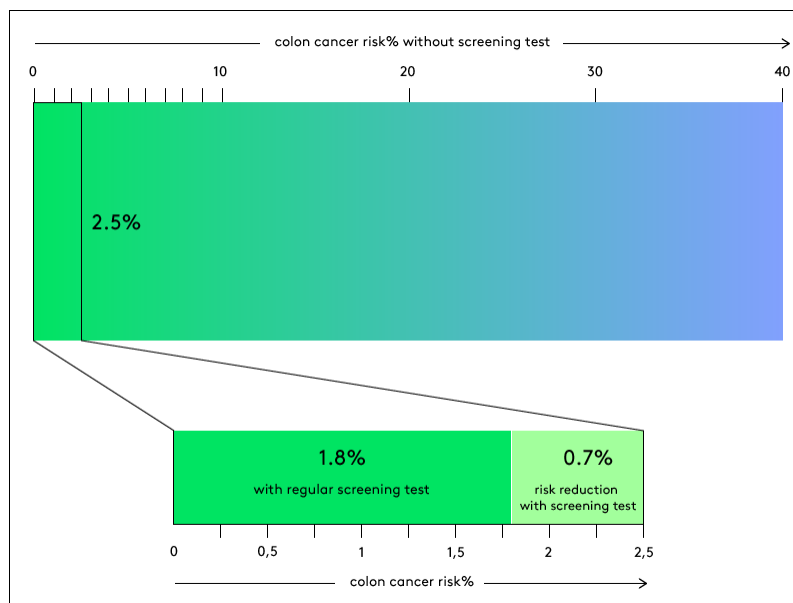
HEART ATTACK RISK %





This adaptation of a vertical bar graph uses a callout to clarify the risk reduction while still showing that all of these risks are quite small (the vast majority of people do not die of colon cancer). Note that an unintentional typographic error labels the risk after screening tests as 1.7% instead of the correct 1.8%.

Good For	Raise Or Lower Concern, Differences In Likelihood
Amount Of Detail	Verbatim Recall, Gist Understanding
Health Conditions	Cancer, Colon Cancer
Data I Have	Risk Estimate
Graphic Type	Line Graph, Color Gradient, Callout



This graphic uses a number line with a color gradient. The total risk without cancer screening tests (2.5%) is expanded to show the proportion of that risk that could be reduced with regular screening tests. Note that the overall number line only goes from 0%-40%, thereby distorting (contrary to recommendations) the perception of the level of overall risk. Note that the expanded section is limited to exactly the patient's baseline risk. This allows it to establish a new "reference class" so that the two sections divide the (no-testing) risk into its two components.

**TESTING ANALYSIS:** this image has the strongest effect of perceptions but performs particularly poorly on accuracy so is not an image we would recommend.

---

**Good For** Raise Or Lower Concern, Differences In Likelihood

---

**Amount Of Detail** Verbatim Recall, Gist Understanding

---

**Health Conditions** Cancer, Colon Cancer

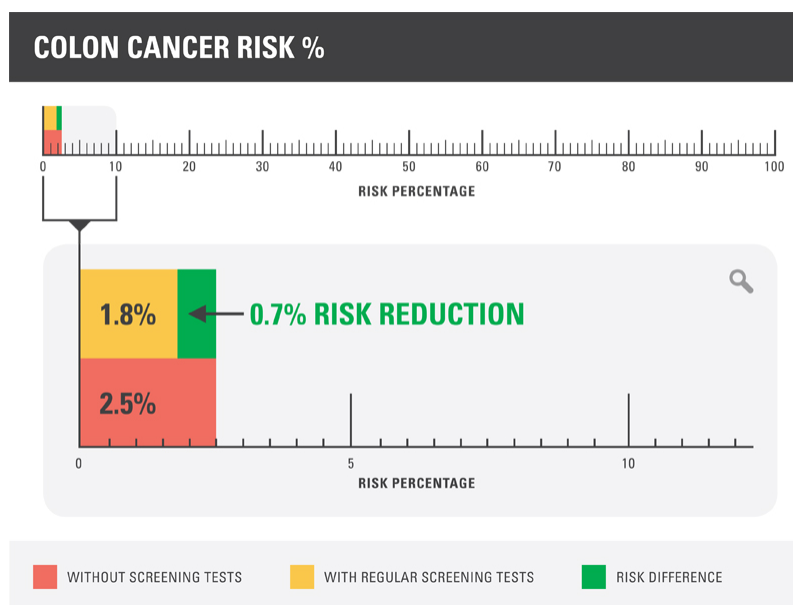
---

**Data I Have** Risk Estimate

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**Graphic Type** Line Graph, Color Gradient, Callout

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This number line graphic uses a magnified callout (representing the first 15% of the full 0-100%) to clarify the difference that regular screening tests achieve in cancer risk. Note that the colored bars are fully replicated (on a smaller scale) in the full number line. This helps people see the full part-to-whole relationship between cancer events and the population as a whole.

**Good For** Raise Or Lower Concern, Differences In Likelihood

**Amount Of Detail** Verbatim Recall, Gist Understanding

**Health Conditions** Cancer, Colon Cancer

**Data I Have** Risk Estimate

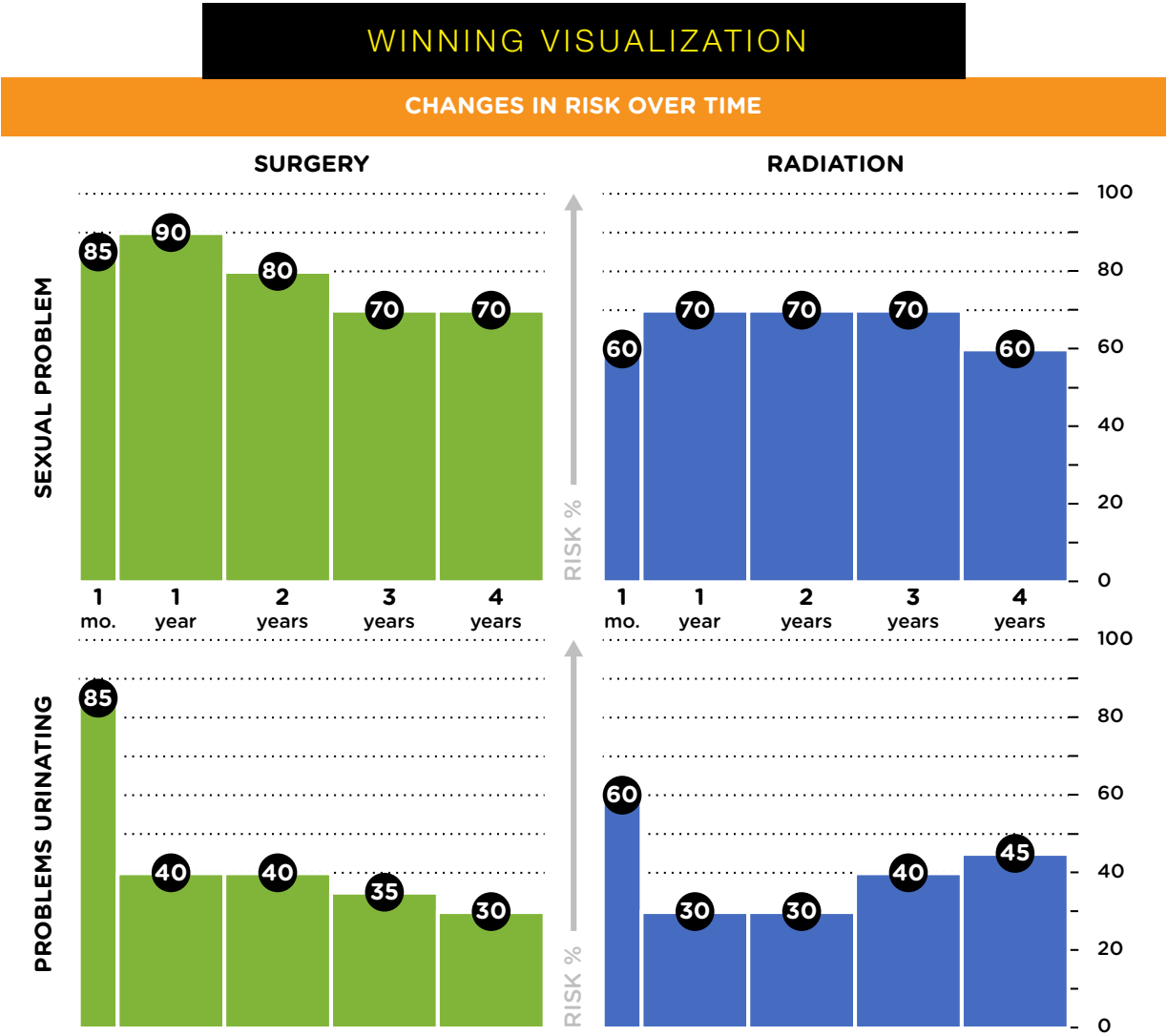
**Graphic Type** Line Graph, Color Gradient, Callout



## USE CASE

**WHAT WE TRIED TO DO:**

It is very hard to show patients how risks vary over time and how those time patterns themselves differ between options. This image illustrates this problem using the case of prostate cancer treatment. It tries to visually explain how likely a patient is to experience each of 2 common side effects with each of 2 different treatment options over multiple timepoints.



This image uses a matrix of bar charts to present a lot of information at once. The vertical position corresponds to problem type, while horizontal position and bar color indicates treatment type. Note also the numerical display of each risk number at the top of the corresponding bar. This helps viewers to read the exact level of risk without having to refer over to the (relatively small) axis labels on the right side of the graphic.

**TESTING ANALYSIS:** This image consistently outperformed other images on a variety of gist knowledge questions. As a result, we recommend this approach for risk communication tasks of this type.

**Good For** Risk Tradeoffs, Differences In Likelihood

**Amount Of Detail** Gist Understanding

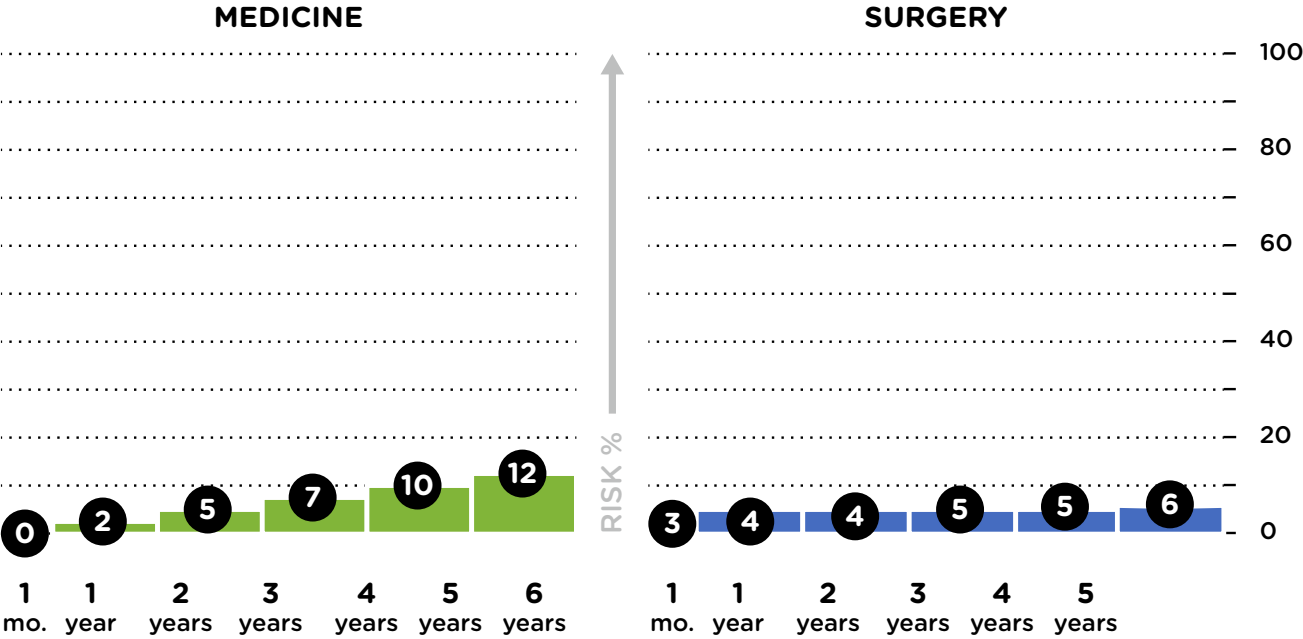
**Health Conditions** Side Effects, Cancer, Prostate Cancer, Treatment Choice

**Data I Have** Risk Estimate, Risk Over Time

**Graphic Type** Bar Graph

DERIVATIVE VARIATIONS

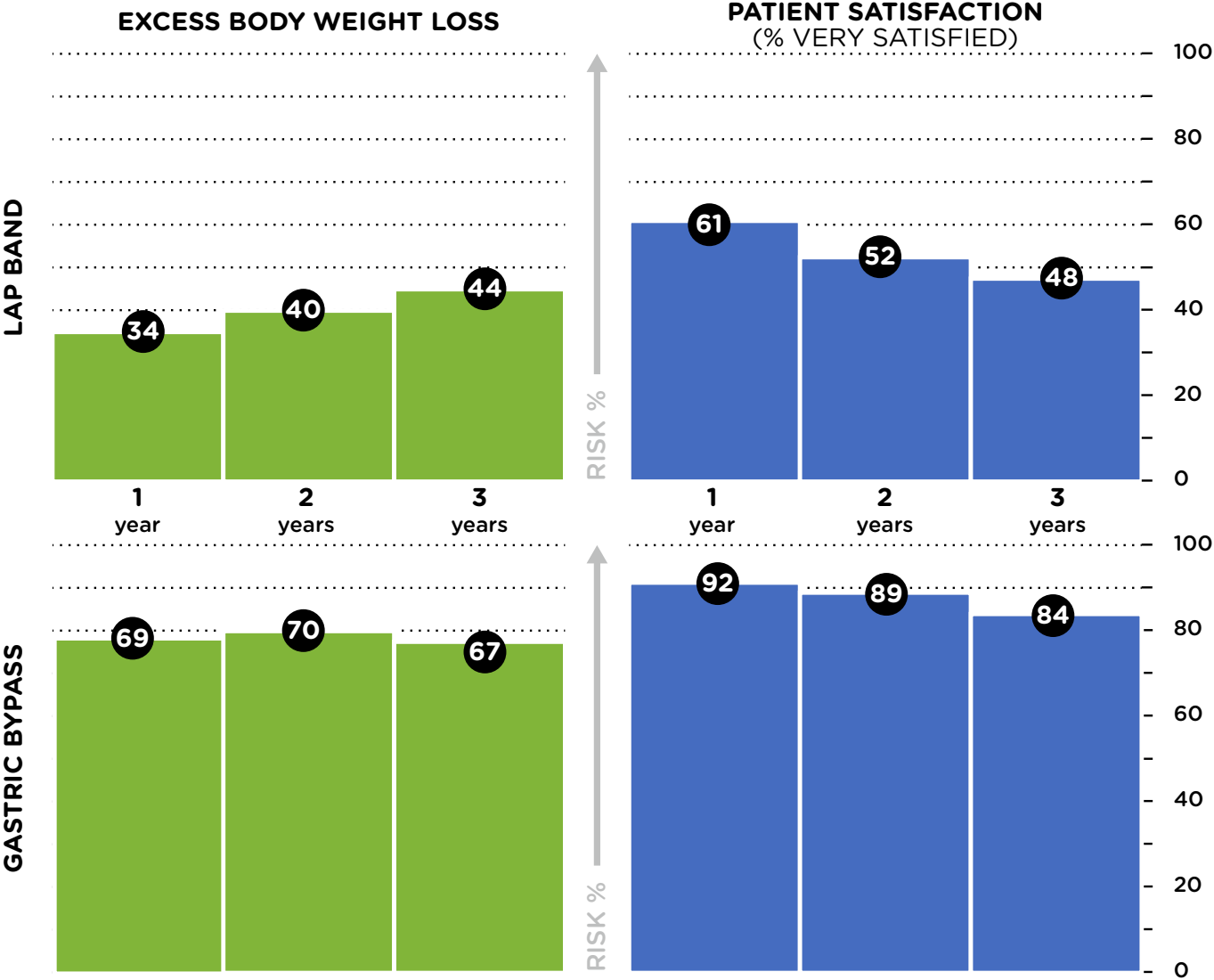
RISK OF DEATH OR STROKE AFTER CAROTID ARTERY DISEASE TREATMENT



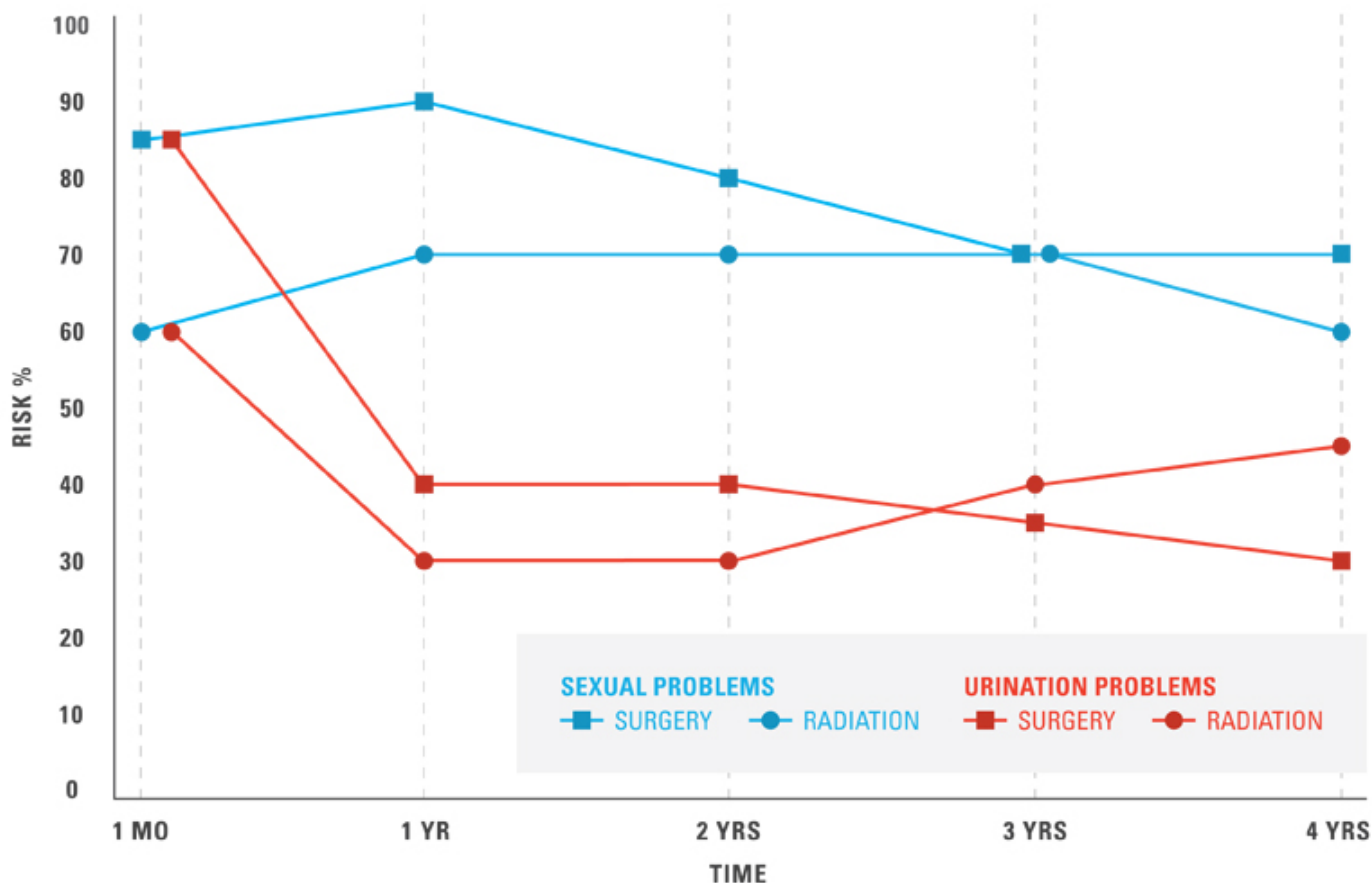


DERIVATIVE VARIATIONS

BARIATRIC SURGERY



## CHANGES IN RISK OVER TIME: SHORT VS. LONG-TERM



This is a straightforward multiple line graphic showing risk levels over time. It uses color cues to focus attention on the risks of different types of problems (urinary vs. sexual). It also uses fairly subtle point icons to distinguish which risks correspond to surgery versus radiation.

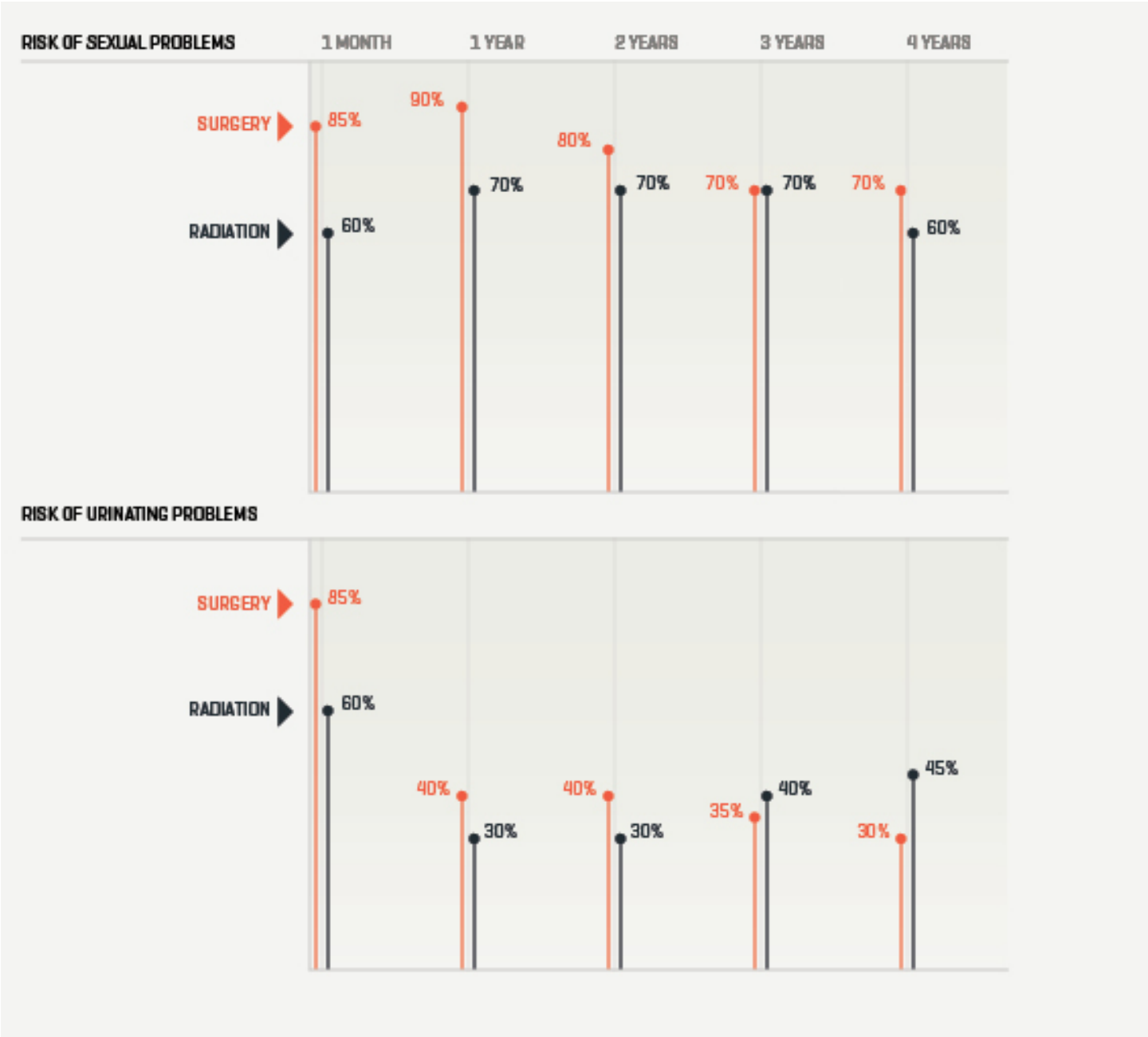
**Good For** Risk Tradeoffs, Differences In Likelihood

**Amount Of Detail** Gist Understanding

**Health Conditions** Side Effects, Cancer, Prostate Cancer, Treatment Choice

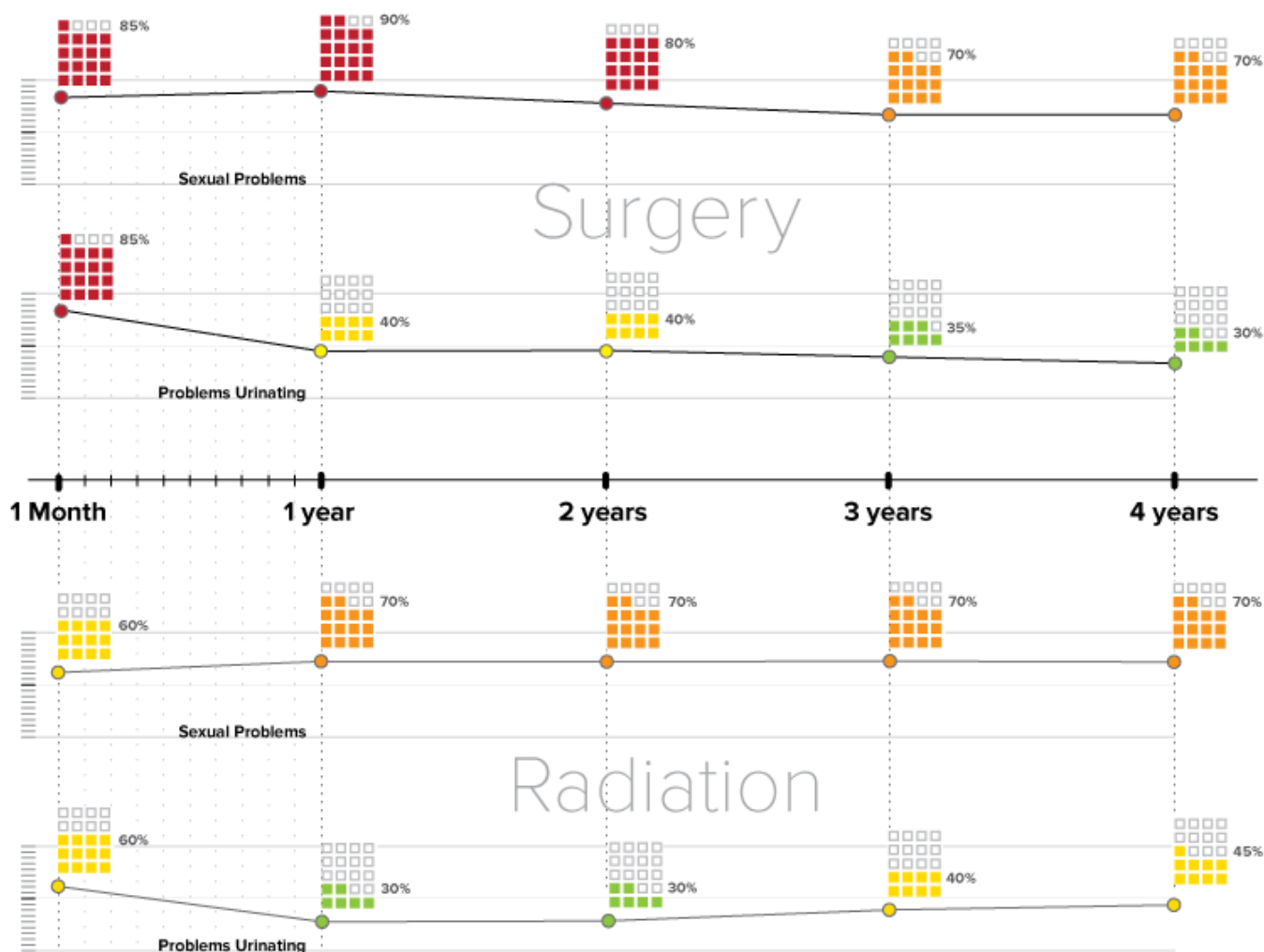
**Data I Have** Risk Estimate, Risk Over Time

**Graphic Type** X-Y Graph, Line Graph



This innovative “popsicle graph” is in fact a modified bar chart. The height of each line represents the degree of risk. The paired graphics separate each risk (sexual problems on top, urinating problems below) while color indicates the treatment type.

Good For	Risk Tradeoffs, Differences In Likelihood
Amount Of Detail	Gist Understanding
Health Conditions	Side Effects, Cancer, Prostate Cancer, Treatment Choice
Data I Have	Risk Estimate, Risk Over Time
Graphic Type	X-Y Graph, Bar Graph



This graphic combines line graphics (each shown in a small amount of vertical space) to show how each risk varies over time with micro-sized icon arrays that can help to clarify the exact proportion of patients (out of 100) who would be expected to experience that problem at that point in time. Note also that the icon array blocks are color coded to show higher vs. lower risks, which should help viewers make gist comparisons (e.g., orange is worse than green) and have better gist memory of risks as high or low.

**Good For** Risk Tradeoffs, Differences In Likelihood

**Amount Of Detail** Gist Understanding

**Health Conditions** Side Effects, Cancer, Prostate Cancer, Treatment Choice

**Data I Have** Risk Estimate, Risk Over Time

**Graphic Type** X-Y Graph, Color Gradient, Icon Array, Line Graph, Tables



# 13

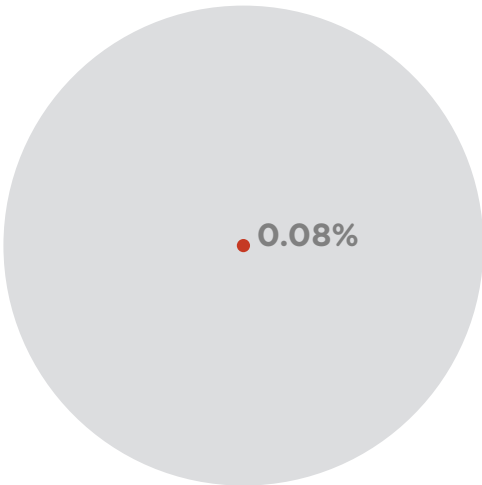
## USE CASE

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### WHAT WE TRIED TO DO:

Some risk communication situations require helping people to visualize just how rare very rare events are. A common example occurs in prenatal genetic testing. If a couple has no other risk factors, the baseline risk of genetic diseases such as Down Syndrome is often much smaller than even 1 in 1000 (0.1%). Visually showing this ratio is challenging.

WINNING VISUALIZATION



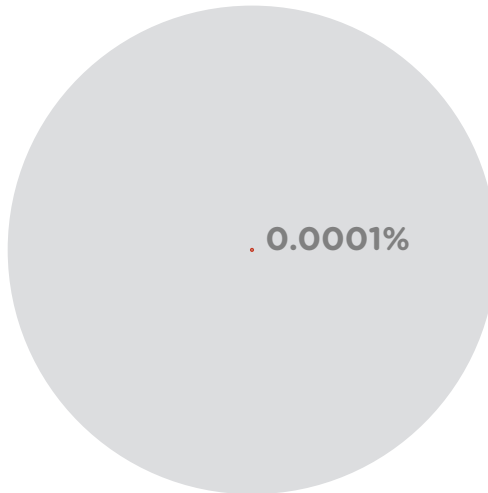
• YOUR RISK OF DOWN SYNDROME

This simple graphic reinforces the smallness of the risk by comparing the dot and the much larger circle. The design emphasizes gist-level emotional reaction more than thinking and cognition.

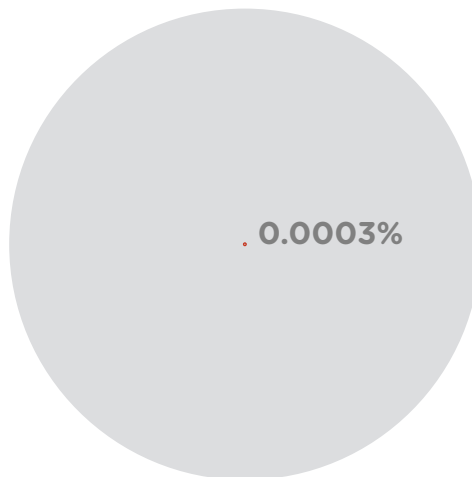
**TESTING ANALYSIS:** With this graphic, people’s gist accuracy was significantly higher and their risk perceptions were lower than with other images. We recommend this graphic.

Good For	Awareness Of Risk, Raise Or Lower Concern
Amount Of Detail	Verbatim Recall
Health Conditions	Down Syndrome
Data I Have	Risk Estimate, Test Result
Graphic Type	Area Graph

DERIVATIVE VARIATIONS

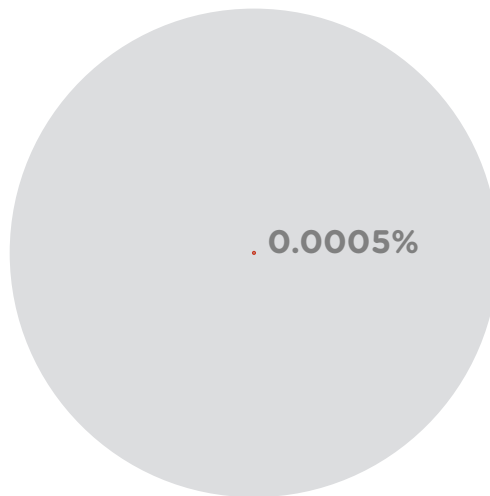


• YOUR RISK OF ANAPHYLAXIS  
FROM GENERAL ANESTHESIA



• YOUR RISK OF HAVING A CHILD  
WITH CYSTIC FIBROSIS

DERIVATIVE VARIATIONS



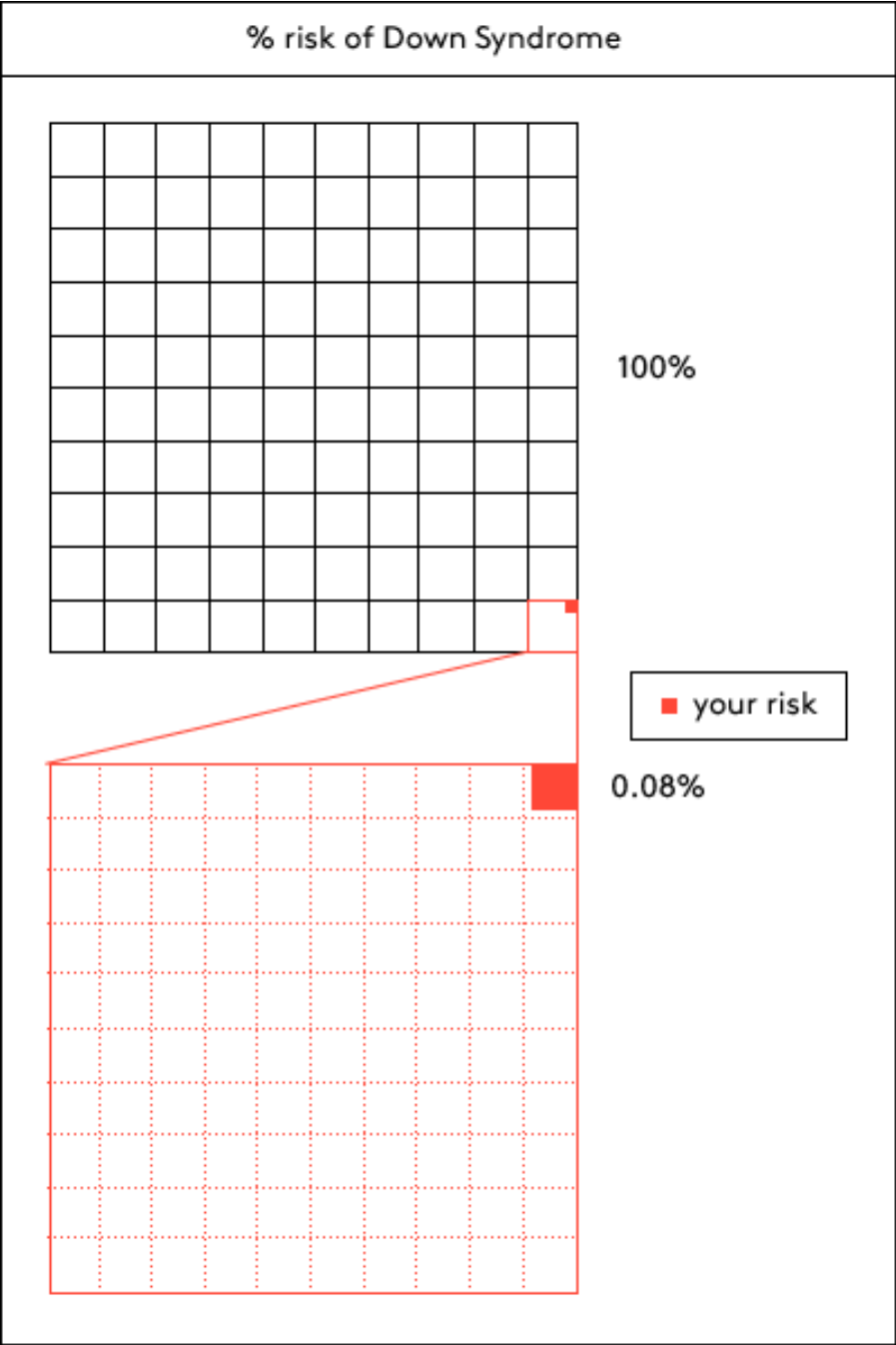
- **INCREASED RISK OF DEATH  
FROM RADIATION EXPOSURE**





This multi-bar graphic uses reference bars at 100%, 50%, 10%, and 1% to make the smallness of the 0.08% risk level much clearer. Please note the European convention of writing 0,08% rather than the American convention of 0.08%. The graphic was tested in this way (in error), but should be corrected before using it with American audiences.

Good For	Awareness Of Risk, Raise Or Lower Concern
Amount Of Detail	Verbatim Recall
Health Conditions	Down Syndrome
Data I Have	Risk Estimate, Test Result
Graphic Type	Color Gradient, Bar Graph



This display uses matrices of squares to represent the full probability space and a callout to reinforce how small the individual risk is.

Good For	Awareness Of Risk, Raise Or Lower Concern
Amount Of Detail	Verbatim Recall
Health Conditions	Down Syndrome
Data I Have	Risk Estimate, Test Result
Graphic Type	Icon Array, Area Graph, X-Y Graph

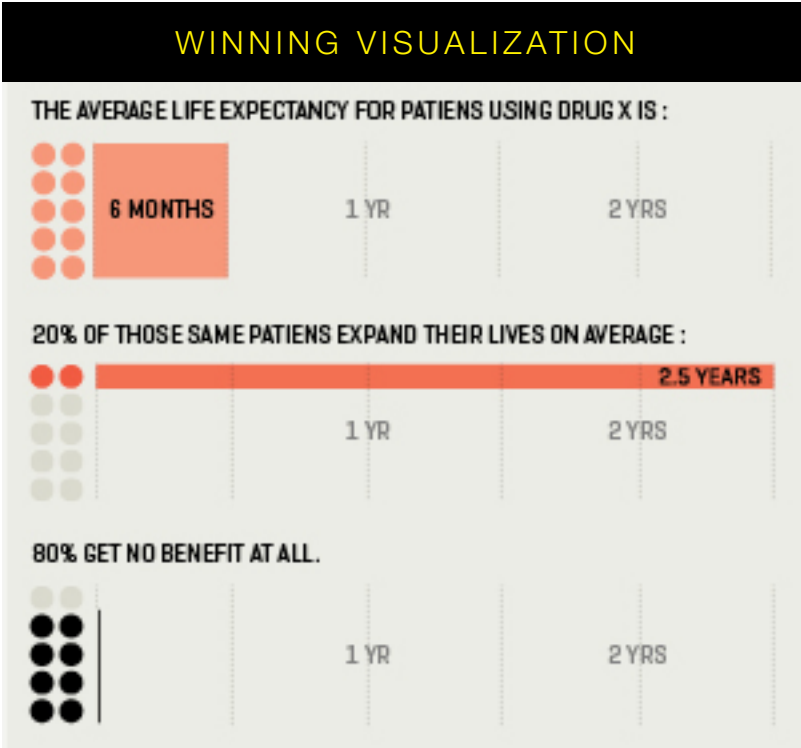


USE CASE

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**WHAT WE TRIED TO DO:**

The benefit of treatments to prolong life can be described in two main ways: 1) how many months or years they add to an average patient's life, or 2) how many patients benefit. Many times, a few people benefit a lot but most don't benefit at all. This image tries to show how the average benefit relates to how many patients benefit.

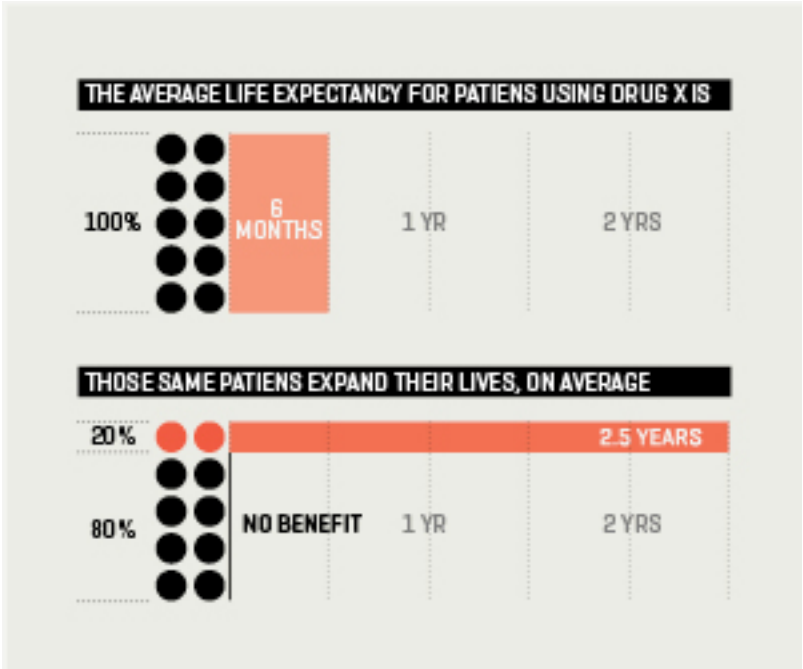


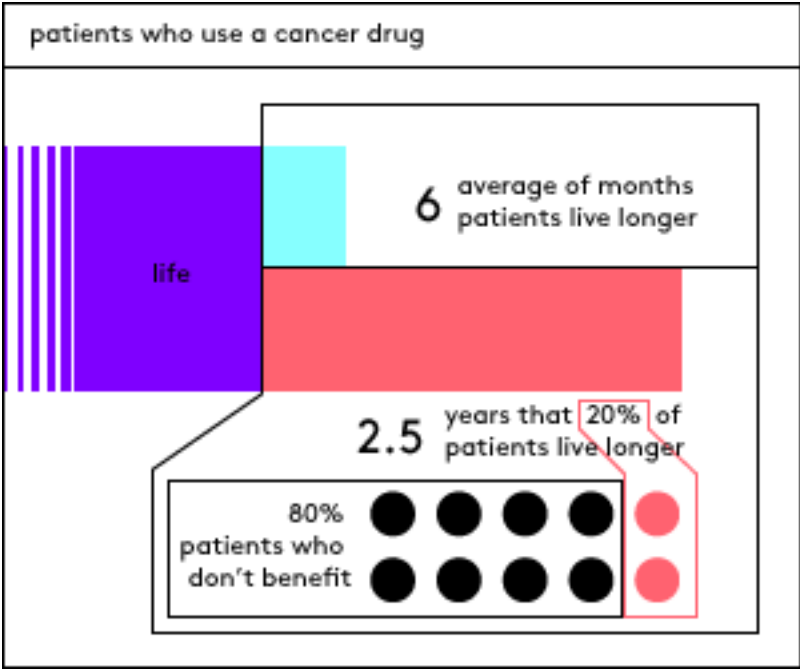
This graphic has three distinct messages: The top graph shows the average life expectancy in a horizontal bar graph, and the orange circles represent the full population of patients. The middle graph highlights the large benefit achieved by 20% of the population (indicated by the 2 dots). The bottom graph shows that the remaining 80% of patients (shown by the 8 dots) get no benefit. Note that the legend has the word “patients” misspelled. The graphic was tested as is, but this should be corrected before use.

**TESTING ANALYSIS:** In testing, this image performed particularly well at helping people realize that the most likely thing is that there will be no additional time benefit for most people. It also resulted in lower perceptions of the likelihood of adding time to one’s life and lower ratings on how good a choice the treatment is. We recommend this graphic because it performed best on the key dimension of clarifying how rare benefit is in this case. Its mildly lower accuracy rates on average time saved is more than compensated for by its good performance on other outcome measures.

Good For	Differences In Likelihood
Health Conditions	Treatment Choice
Data I Have	Risk Estimate, Benefit Estimate
Graphic Type	Line Graph, Icon Array, Bar Graph

DERIVATIVE VARIATIONS

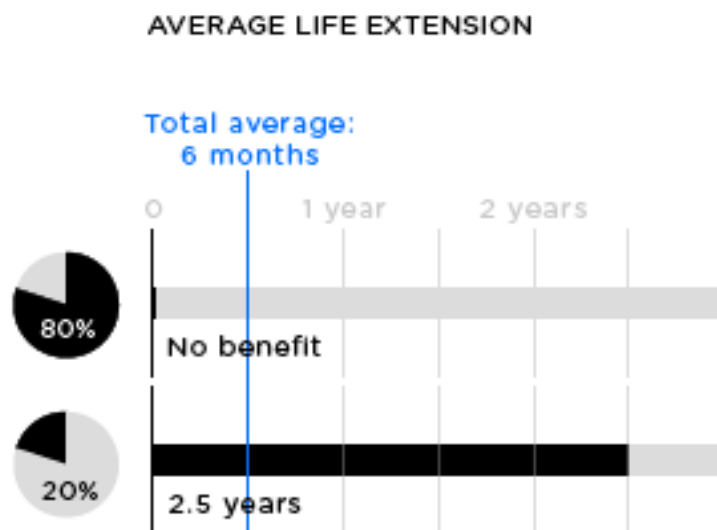




This graphic uses a combination of bars and dots to represent the duality of what happens to patients who use the cancer drug. Note the use of outlining to group different labels with different visual elements.

**TESTING ANALYSIS:** This image scored higher on recall of average time saved, likely because this number is clearly placed in the middle of that graph. However, it does not clarify how rare it is for any benefit to occur. As a result, we do NOT recommend this graphic.

Good For	Differences In Likelihood
Health Conditions	Treatment Choice
Data I Have	Risk Estimate, Benefit Estimate
Graphic Type	Area Graph, Icon Array, Line Graph



This graphic uses a horizontal bar graphic to show magnitude of benefit and pie charts to show the proportion of patients receiving that benefit. Note that the average benefit is more subtly shown using the thin blue line.

Good For	Differences In Likelihood
Health Conditions	Treatment Choice
Data I Have	Risk Estimate, Benefit Estimate
Graphic Type	X-Y Graph, Pie Chart, Bar Graph



15

USE CASE

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**WHAT WE TRIED TO DO:**

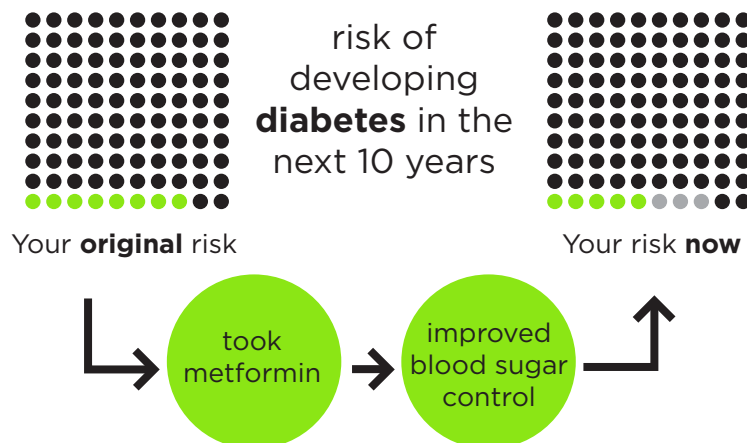
This visual tries to show risk reduction in a way that reinforces positive benefits of work that has already been done by the patient.





## WINNING VISUALIZATION

KEEP IT UP!



This info-graphic combines two icon arrays with other elements to tell a story of how risk changed from the higher risk on the left to the lower risk on the right. Grey shading highlights what risk elements changed as a result of the weight loss and lowered cholesterol. The core message (“keep it up”) is visually placed top and center, rather than buried underneath the data.

**TESTING ANALYSIS:** We recommend this graphic because it performed the best at helping people understand the impact of losing weight (compared to the other images tested) and had consistently acceptable performance on our other measures.

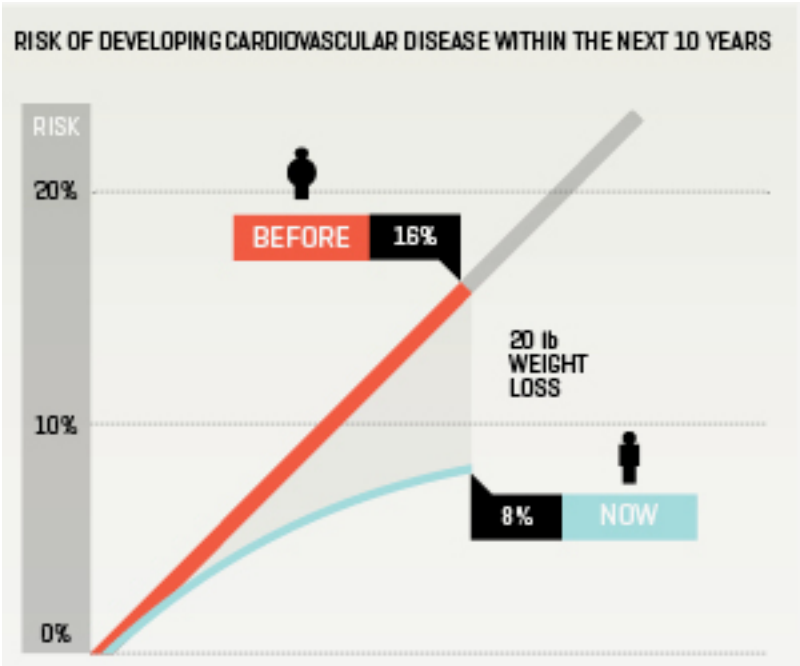
**Good For** Classifying Risks, Raise Or Lower Concern

**Amount Of Detail** Gist Understanding

**Health Conditions** Cardiovascular Disease, Weight Loss

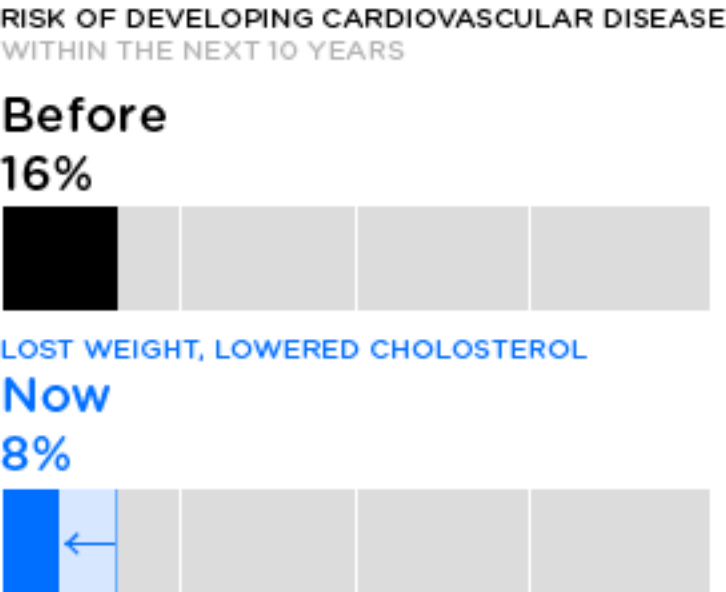
**Data I Have** Benefit Estimate, Test Result

**Graphic Type** Color Gradient, Icon Array Callout



This line graphic uses the separation between the straight and curved lines to show the change in risk due to weight loss. Callouts clearly present the “before” and “now” risk numbers. The (unlabeled) x-axis appears to be representing time, and thus the natural implication is that the risk reduction may grow larger as time progresses further.

Good For	Classifying Risks, Raise Or Lower Concern
Amount Of Detail	Gist Understanding
Health Conditions	Cardiovascular Disease, Weight Loss
Data I Have	Benefit Estimate, Test Result
Graphic Type	Line Graph, X-Y Graph



This minimalist pair of horizontal bar graphics show the change in risk with simple “before” and “now” cues. Note the absence of numerical axis labels. The 25%, 50%, 75%, and 100% marks are implied by the subtle white lines in each bar.

Good For	Classifying Risks, Raise Or Lower Concern
Amount Of Detail	Gist Understanding
Health Conditions	Cardiovascular Disease, Weight Loss
Data I Have	Benefit Estimate, Test Result
Graphic Type	Area Graph, Bar Graph



USE CASE

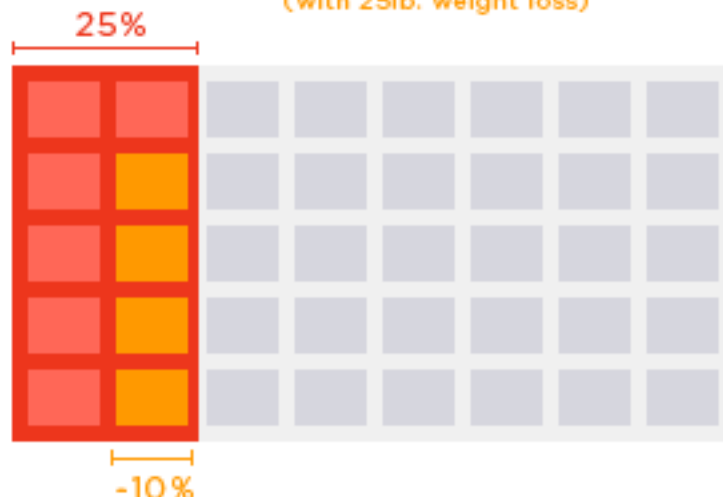
**WHAT WE TRIED TO DO:**

This image presents a risk estimate to a patient, and more importantly, it also shows them how much that risk could be reduced. It uses an icon array display, which research has shown is a particularly effective type of graphic at showing risk but which needed new thinking about how to show risk reduction.

## WINNING VISUALIZATION

### RISK OF DEVELOPING TYPE 2 DIABETES WITHIN THE NEXT 8 YEARS

■ Current risk    ■ Absolute risk reduction (with 25lb. weight loss)

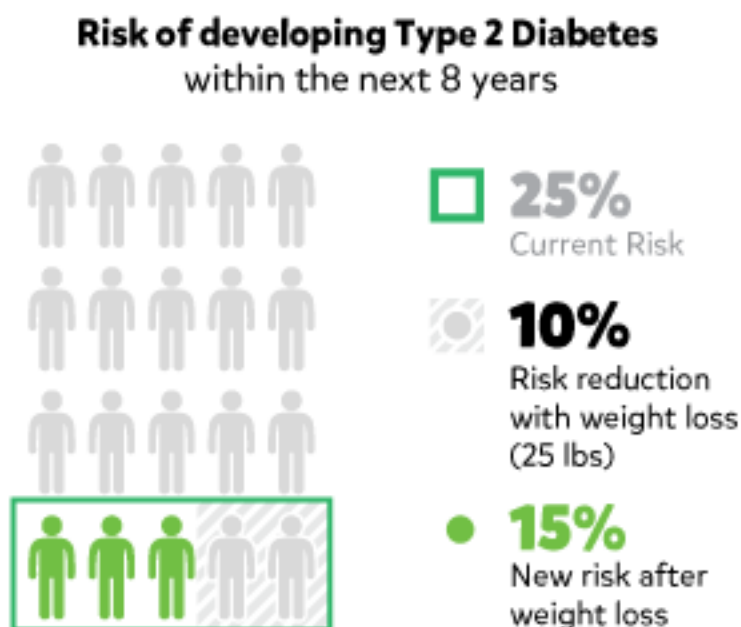


This icon display uses strong background/outline cues to make the current risk very clear. Risk reduction is then shown by color of the blocks themselves. One weakness is that the total level of risk after weight loss is never numerically shown – it is shown only via the number of red blocks.

**TESTING ANALYSIS:** In our testing, this image appeared better at communicating current risk than other images, although it is unclear whether it is the graphic itself or the particular labels and groupings which make it effective. If comprehension of the current risk number is your primary goal, then this graphic may be an appropriate choice. If communicating incremental risk reduction (risk changes) is instead your primary risk communication goal, then this graphic may be a more appropriate choice.

<b>Good For</b>	Raise Or Lower Concern, Differences In Likelihood
<b>Amount Of Detail</b>	Verbatim Recall, Gist Understanding
<b>Health Conditions</b>	Weight Loss, Diabetes
<b>Data I Have</b>	Risk Estimate, Test Result, Benefit Estimate
<b>Graphic Type</b>	Icon Array

## WINNING VISUALIZATION



This design is a variant of the icon array displays that University of Michigan researchers (especially Brian Zikmund-Fisher, PhD, and Angela Fagerlin, PhD) have been testing for many years. Note the use of distinct visual cues to correspond to each of the 3 statistics provided: icon color corresponds to new risk, the green outline corresponds to current risk, and the only background shading corresponds uniquely to the risk reduction. Users interested in this type of graphic can use [iconarray.com](http://iconarray.com), our free, online, icon array generator to create tailored graphics of this type.

**TESTING ANALYSIS:** Compared to other graphics, this image appeared best at communicating the size of the risk reduction or risk change. This may be in part due to the use of the clear 3-part legend that included the risk numbers. If communicating incremental risk reduction (risk changes) is your primary risk communication goal, then this graphic may be an appropriate choice. If, instead, comprehension of the current risk number is your primary goal, then this graphic may be a more appropriate choice.

**Good For** Raise Or Lower Concern, Differences In Likelihood

**Amount Of Detail** Verbatim Recall, Gist Understanding

**Health Conditions** Weight Loss, Diabetes

**Data I Have** Risk Estimate, Test Result, Benefit Estimate

**Graphic Type** Icon Array, Color Gradient

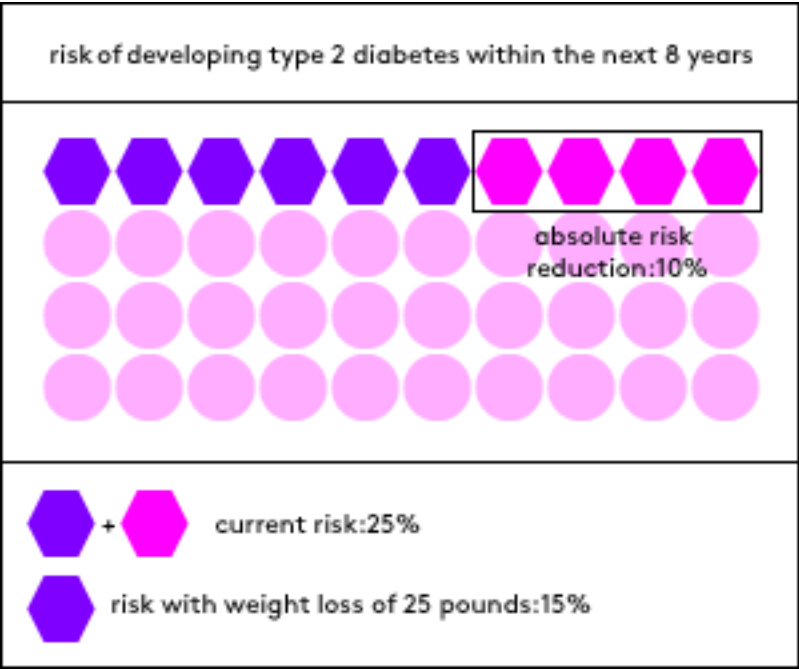


## DERIVATIVE VARIATIONS

RISK OF DEVELOPING TYPE 2 DIABETES  
WITHIN THE NEXT 8 YEARS**25%**

Current risk

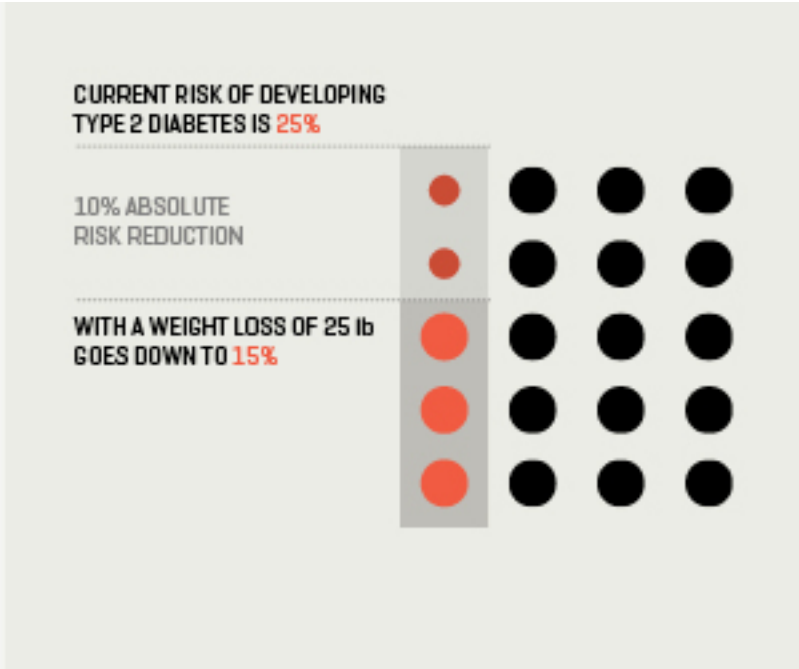
**10%**Risk reduction  
with weight loss  
(25 lbs)**15%**New risk after  
weight loss



This brightly colored icon array uses icon shape, color, and outlining to identify current risk, risk with weight loss, and risk reduction. Note the use of the legend to show that two different types of icons have to be combined to identify the total current risk.

<b>Good For</b>	Raise Or Lower Concern, Differences In Likelihood
<b>Amount Of Detail</b>	Verbatim Recall, Gist Understanding
<b>Health Conditions</b>	Weight Loss, Diabetes
<b>Data I Have</b>	Risk Estimate, Test Result, Benefit Estimate
<b>Graphic Type</b>	Icon Array



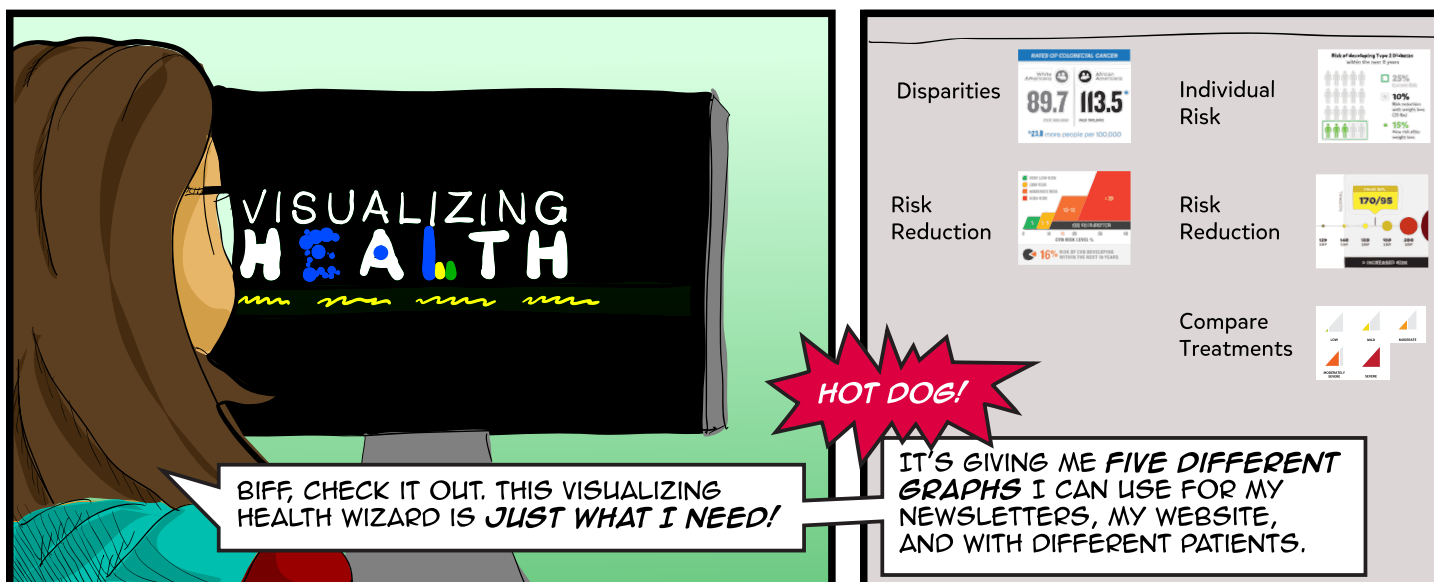
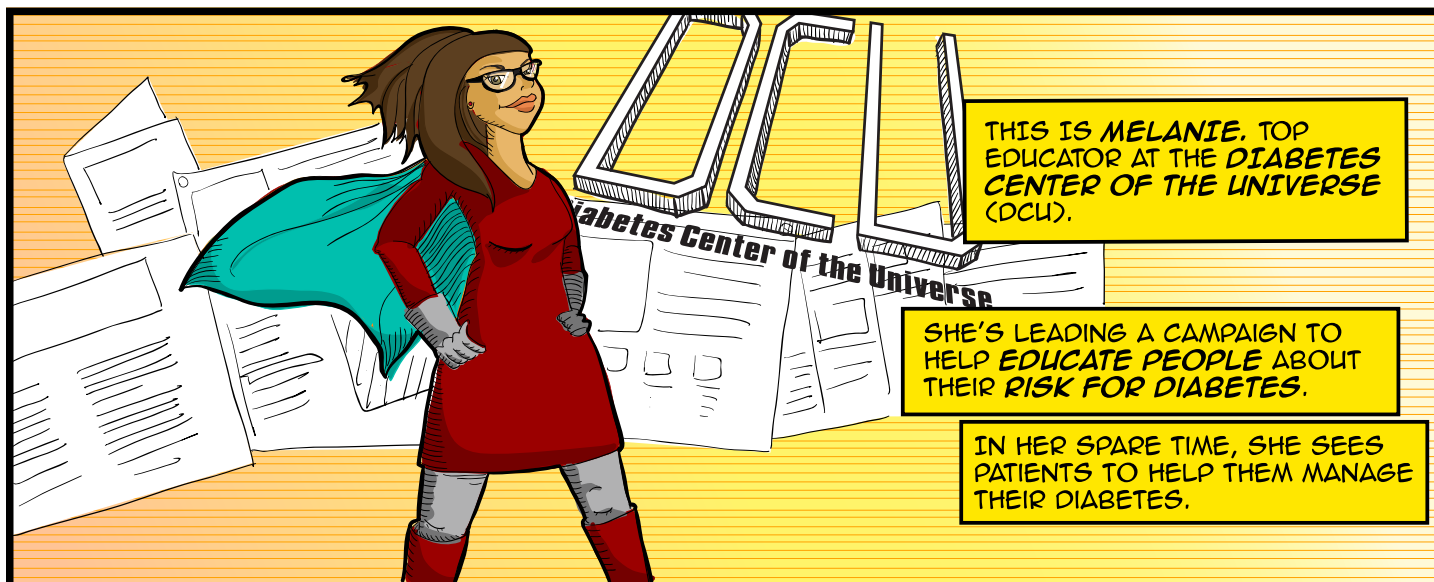


This display uses three cues to highlight particular icons in a dot array: icon size, icon color, and background shading. One weakness is that this design would have problems labeling larger levels of risk (e.g., 55% reducing to 35%) because the labels are closely aligned with the height of the first column of icons.

Good For	Raise Or Lower Concern, Differences In Likelihood
Amount Of Detail	Verbatim Recall, Gist Understanding
Health Conditions	Weight Loss, Diabetes
Data I Have	Risk Estimate, Test Result, Benefit Estimate
Graphic Type	Icon Array

And now...here's visualizing health in practice. How might you use these images to reach diabetes? Follow along with Melanie below.







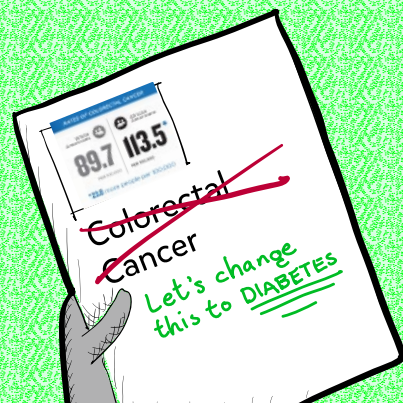
MELANIE IS AS **RESOURCEFUL** AS SHE IS BUSY. SHE USES VISUALIZING HEALTH IMAGES IN A **VARIETY OF WAYS**.

HOW? WE'RE GLAD YOU ASKED.

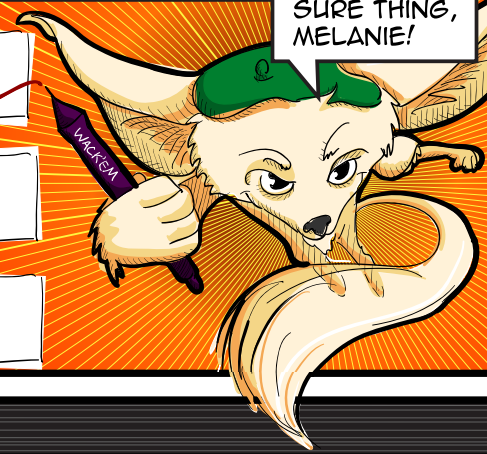
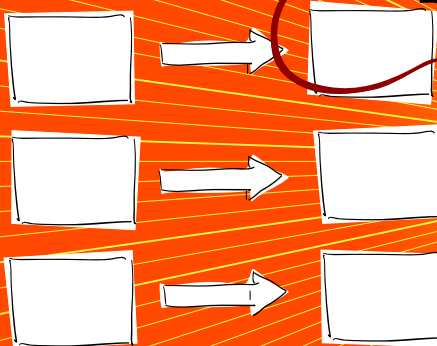
**BIFF!**

COULD YOU **PLEASE ADJUST THESE THREE** FOR THE NEWSLETTER AND WEBSITE? I CAN HANDLE THE ONES FOR PATIENTS MYSELF!

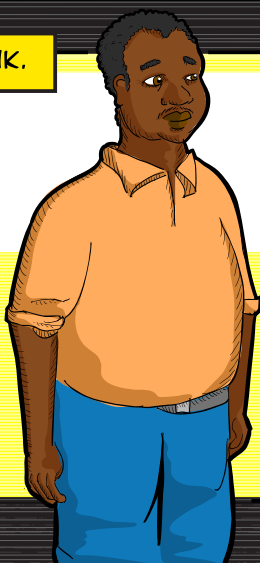
SURE THING, MELANIE!



HMM ... THESE AREN'T ALL ABOUT DIABETES.



MEET FRANK.



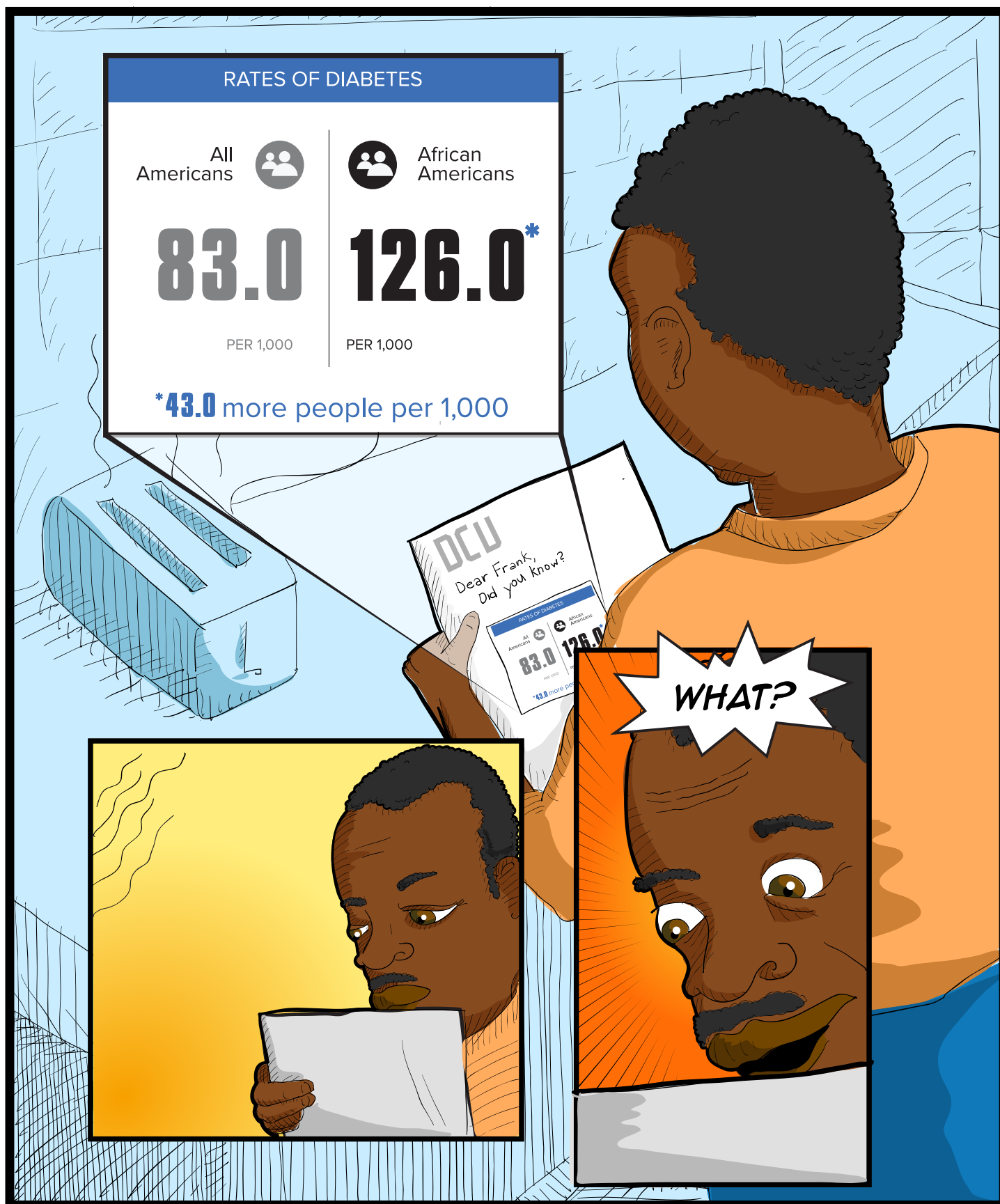
## FRANK

- Does not have diabetes
- Wants to understand if he's at risk for diabetes

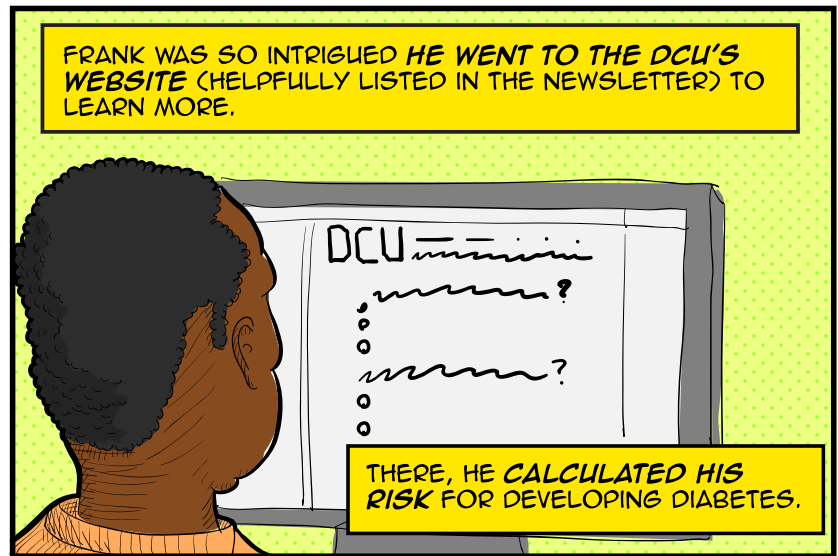
### RISK FACTORS

- African American
- Overweight
- Has high blood pressure
- Has a family history

FRANK GOT A **NEWSLETTER** FROM THE DCU... WHAT HE LEARNS SURPRISES HIM.



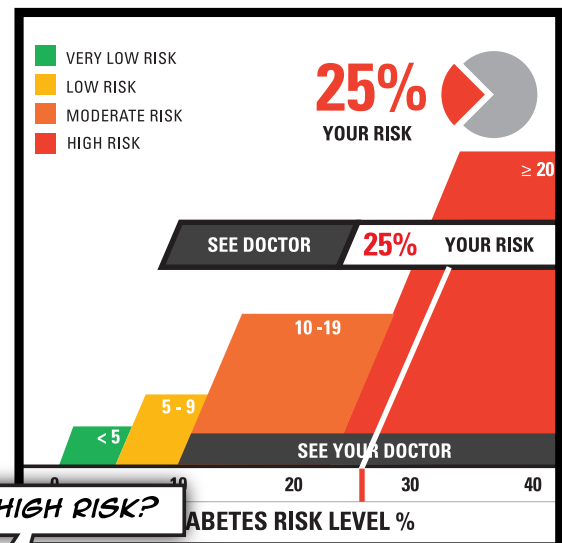




**What is your age?**

- ☐ 18-25
- ☐ 26-35
- ☐ 36-45
- ☐ 46-55
- ☐ 56-65
- ☒ 66-75
- ☐ 76-85

ALL HE HAD TO DO WAS ANSWER QUESTIONS ABOUT HIS FAMILY HISTORY, AGE, GENDER, WEIGHT, AND OTHER RISK FACTORS.



WHAT CAN I DO ABOUT THAT?

I FEEL LIKE I SHOULD CLICK ON...

HOW DO I LOWER MY RISK?

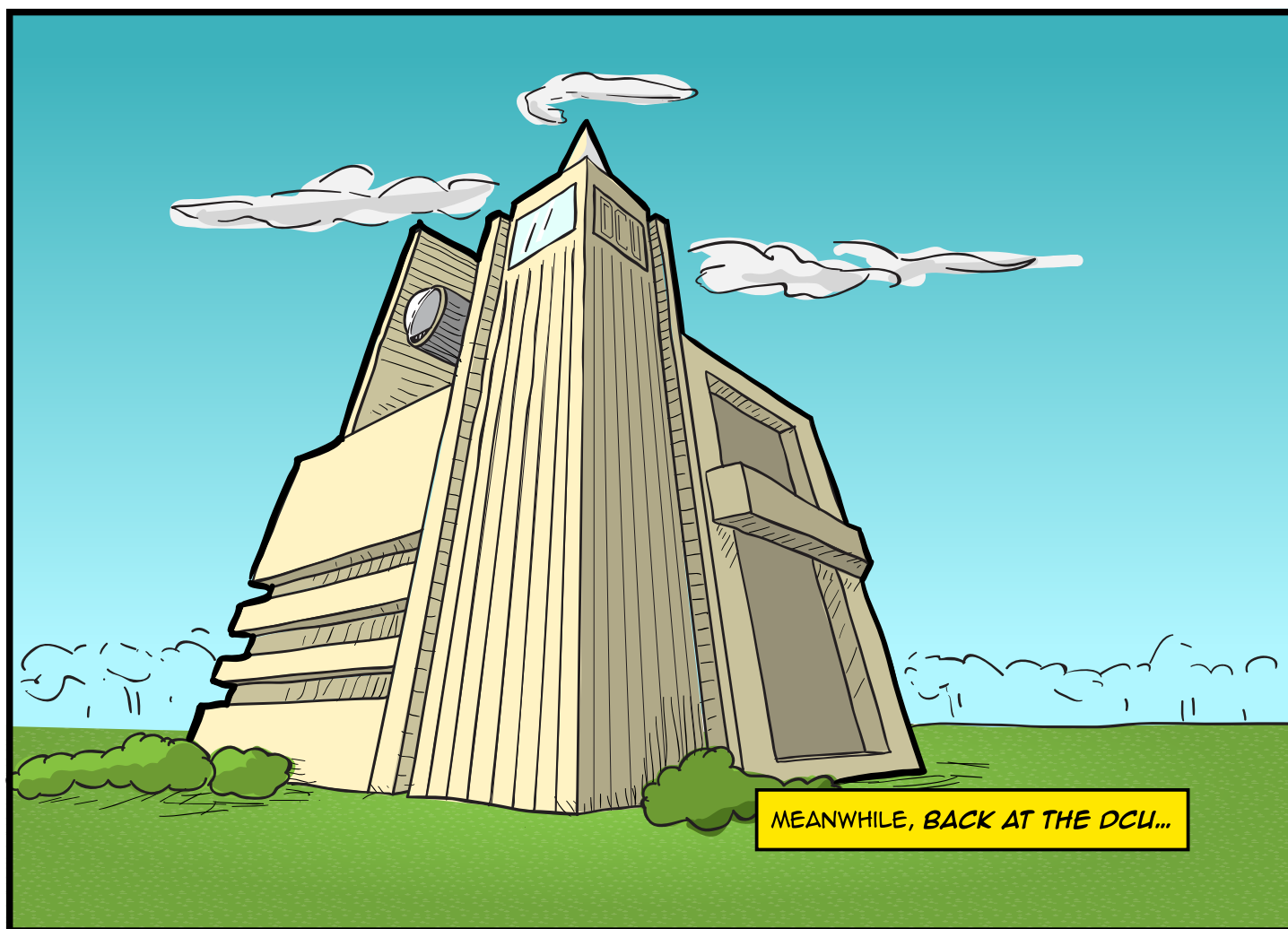
... THIS!

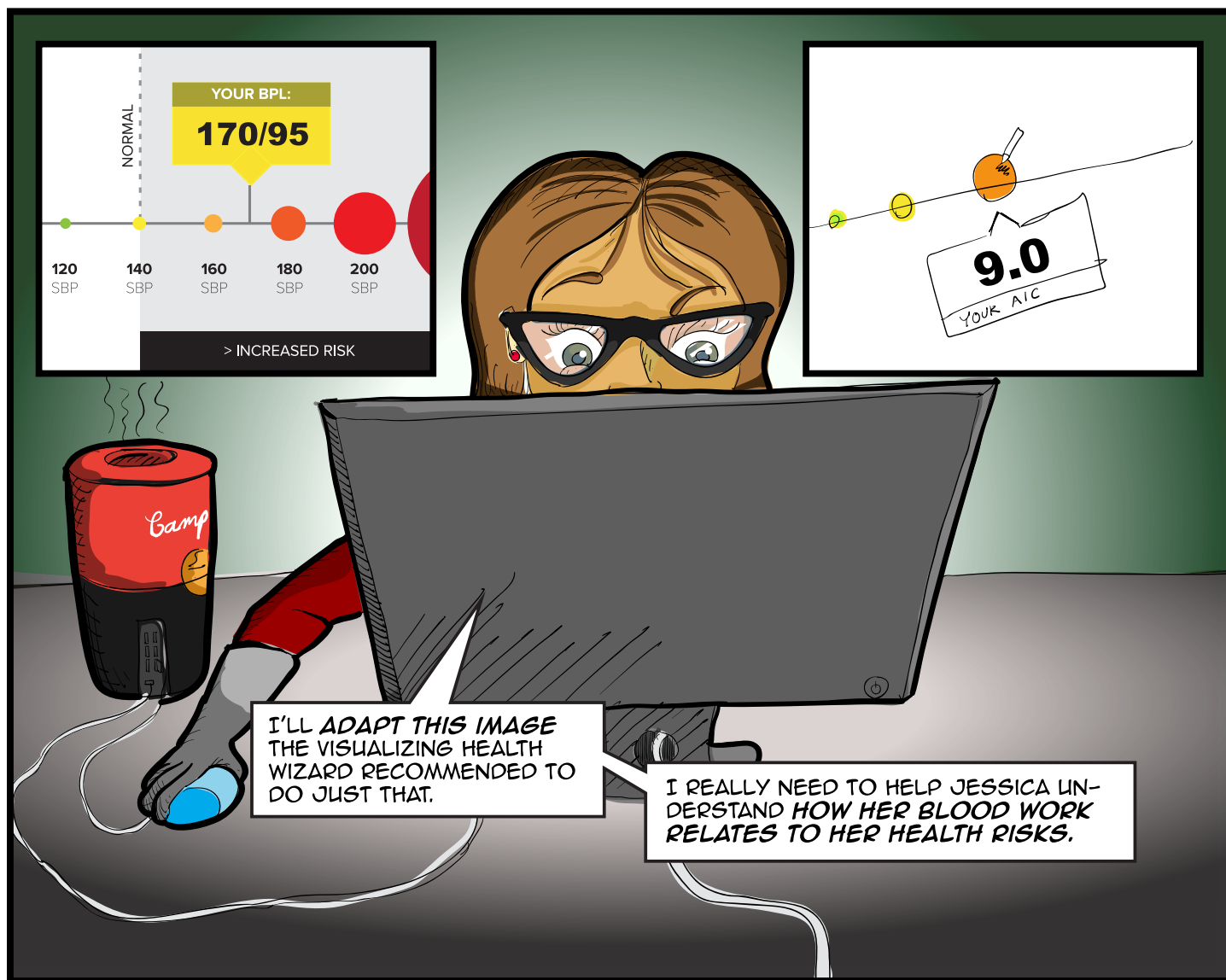
**Risk of developing Type 2 Diabetes within the next 8 years**

- ☐ 25% Current Risk
- ☒ 10% Risk reduction with weight loss (15 lbs)
- ☒ 15% New risk after weight loss

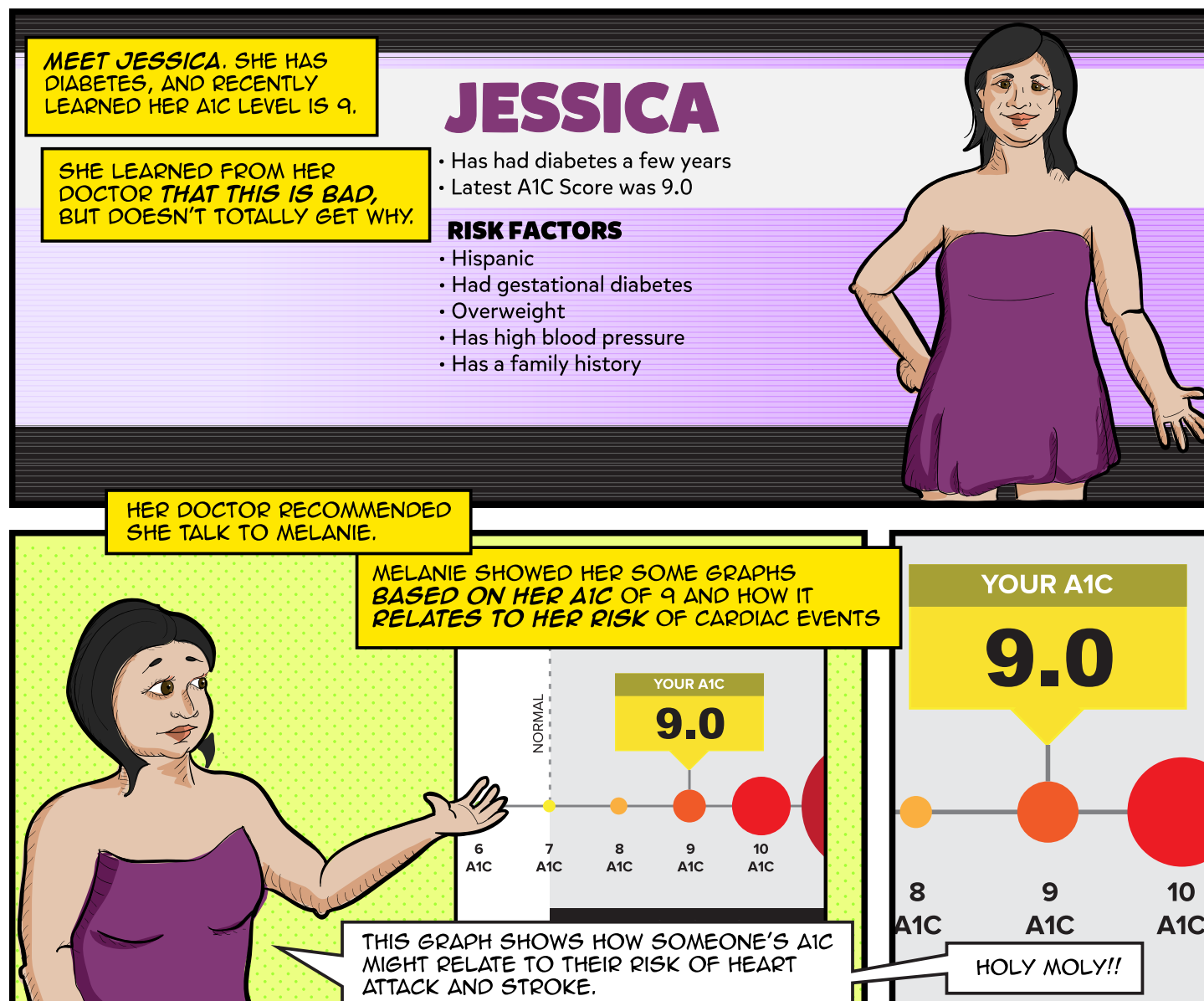
WOW!

IF I LOSE 15 POUNDS, I COULD REALLY LOWER MY RISK FOR DIABETES!











I'VE GOT A LOT MORE RISK AT MY CURRENT LEVEL OF A1C...

THAN I WOULD IF I COULD GET IT A BIT LOWER!

NOW, JESSICA GETS IT, AND **SHE'S DEFINITELY MOTIVATED** TO GET HER A1C UNDER CONTROL.

SHE TALKS TO MELANIE ABOUT HER MEDICATION OPTIONS AND POSSIBLE SIDE EFFECTS.

	Metformin	Glipizide	Insulin
Diarrhea	20%	4%	0%
Anemia	30%	3%	0%
Low Blood Sugar	0%	10%	10%

HMM... I THINK I LIKE METFORMIN THE BEST.

WATCH OUT, A1C. **YOU'RE GOIN' DOWN!**

JESSICA MAKES A CHOICE AND COMMITS TO TALKING WITH HER DOCTOR ABOUT CHANGING MEDICATION. SHE FEELS A **RE-NEWED SENSE OF ENERGY** TO TACKLE HER DIABETES.

