

01. Introduction to Data Visualization

ID 413: Information Graphics and Data Visualization
Spring 2025

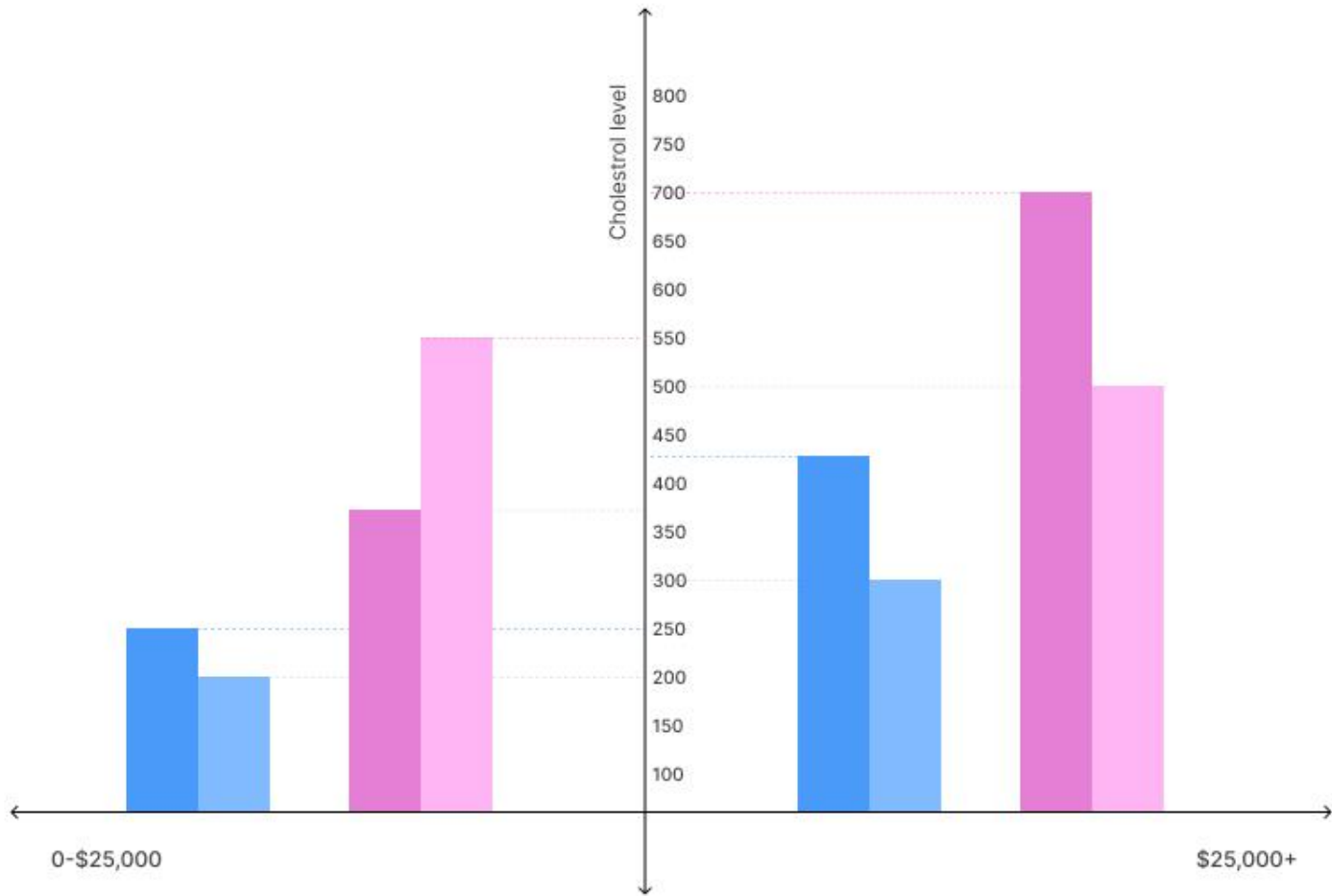
Venkatesh Rajamanickam (@venkatrajam)
venkatra@iitb.ac.in
<http://info-design-lab.github.io>

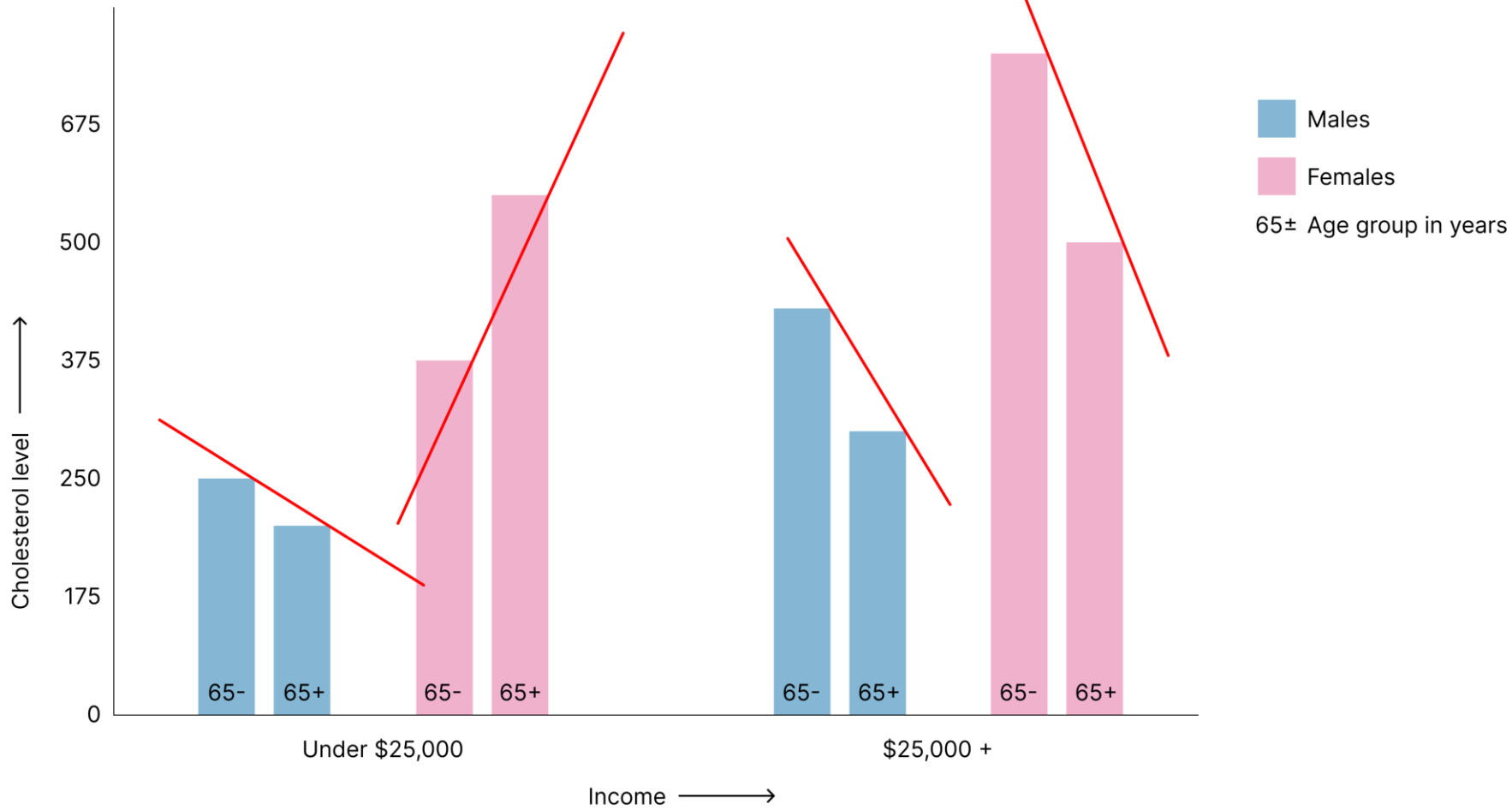
Visualize this!

Which gender or income level group shows different effects of age on cholesterol levels?

Income Group	Males		Females	
	Under 65	65 or Over	Under 65	65 or Over
0-\$24,999	250	200	375	550
\$25,000+	430	300	700	500

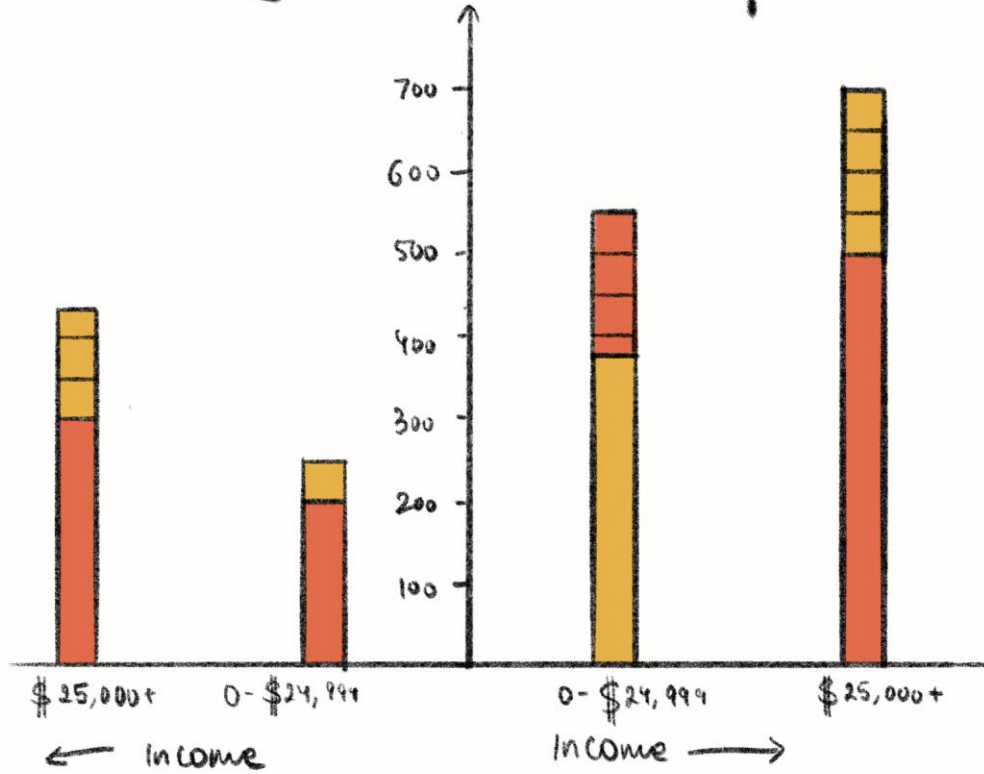
- Male under 65
- Male 65 and above
- Female under 65
- Female 65 and above

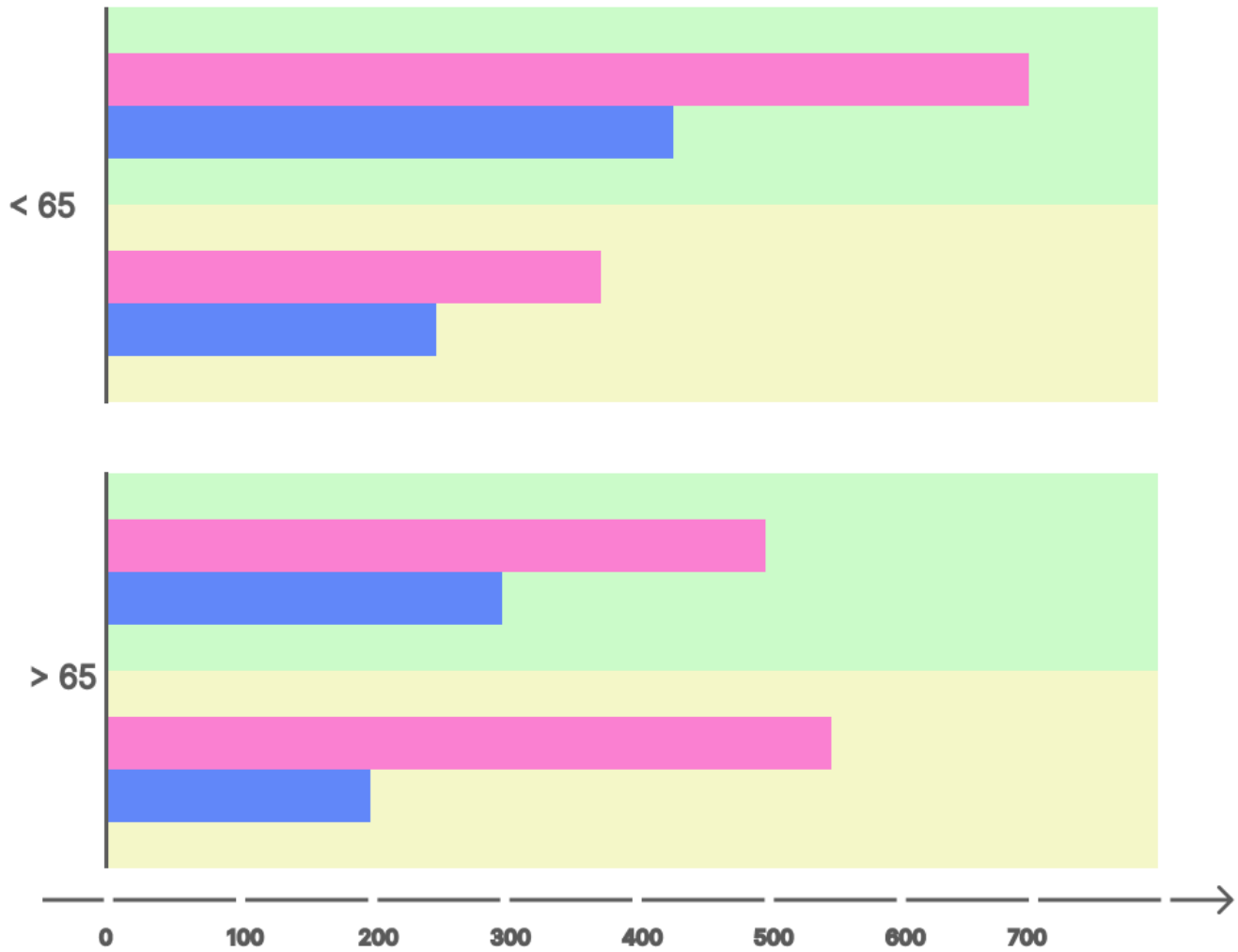
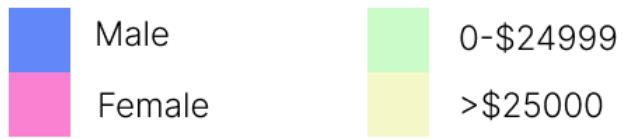


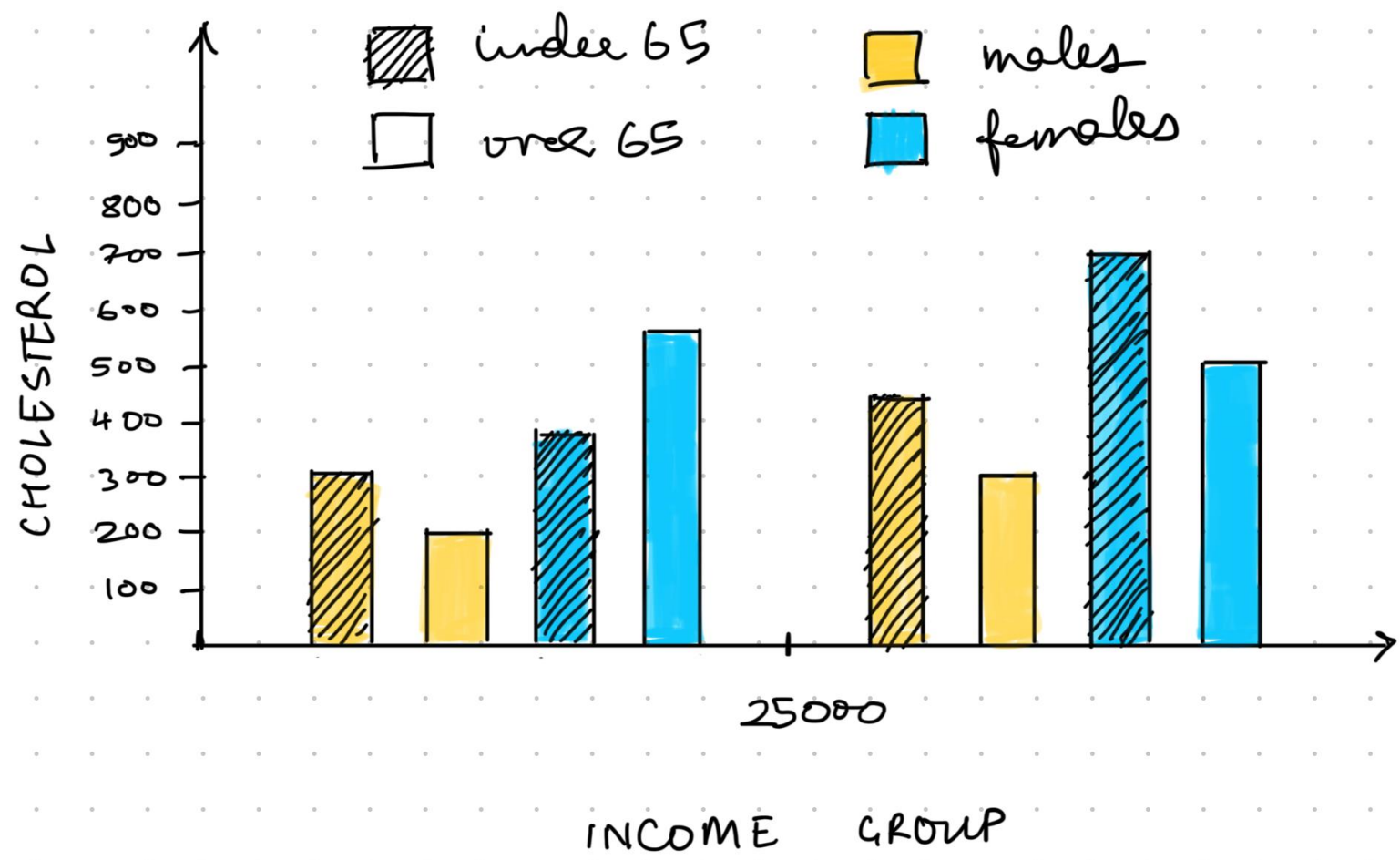


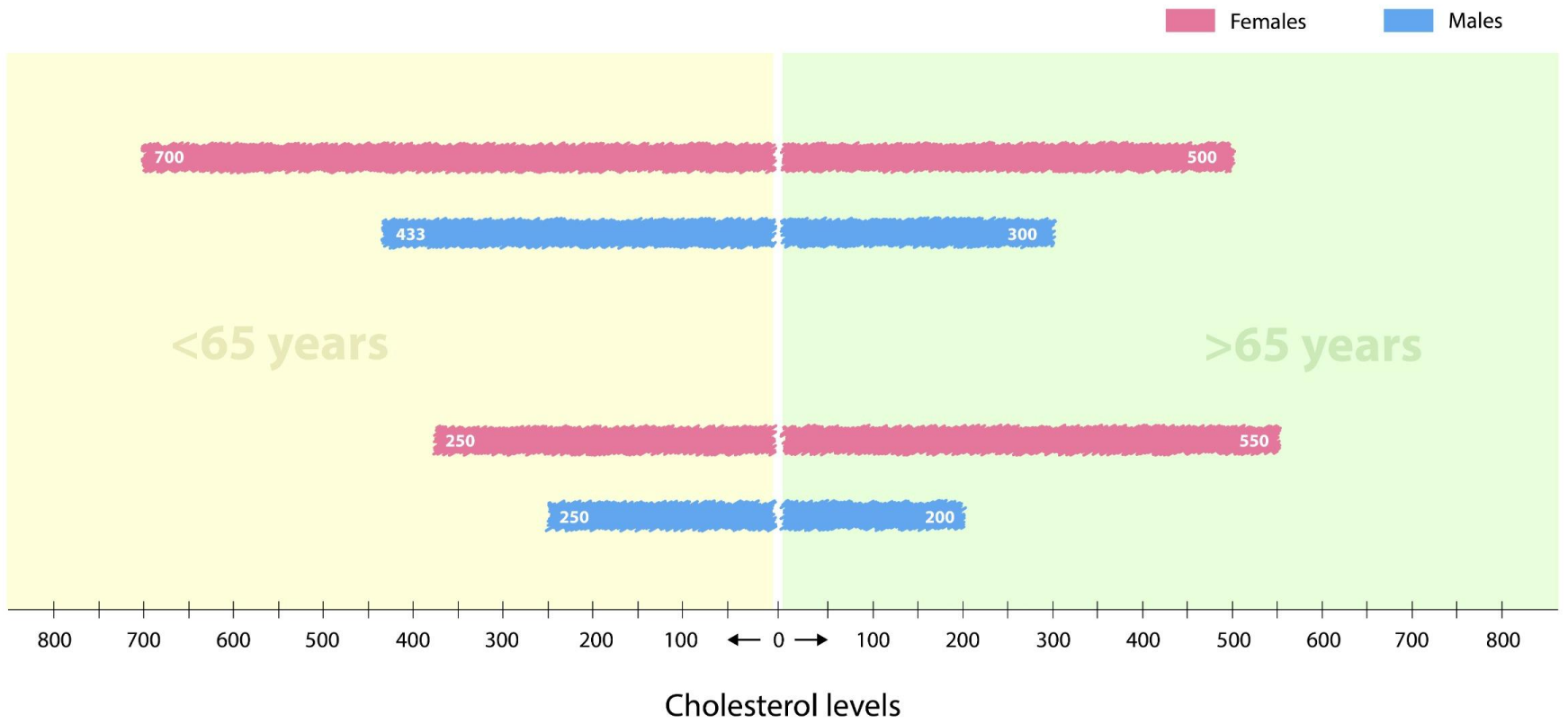


Under 65
65 or Over

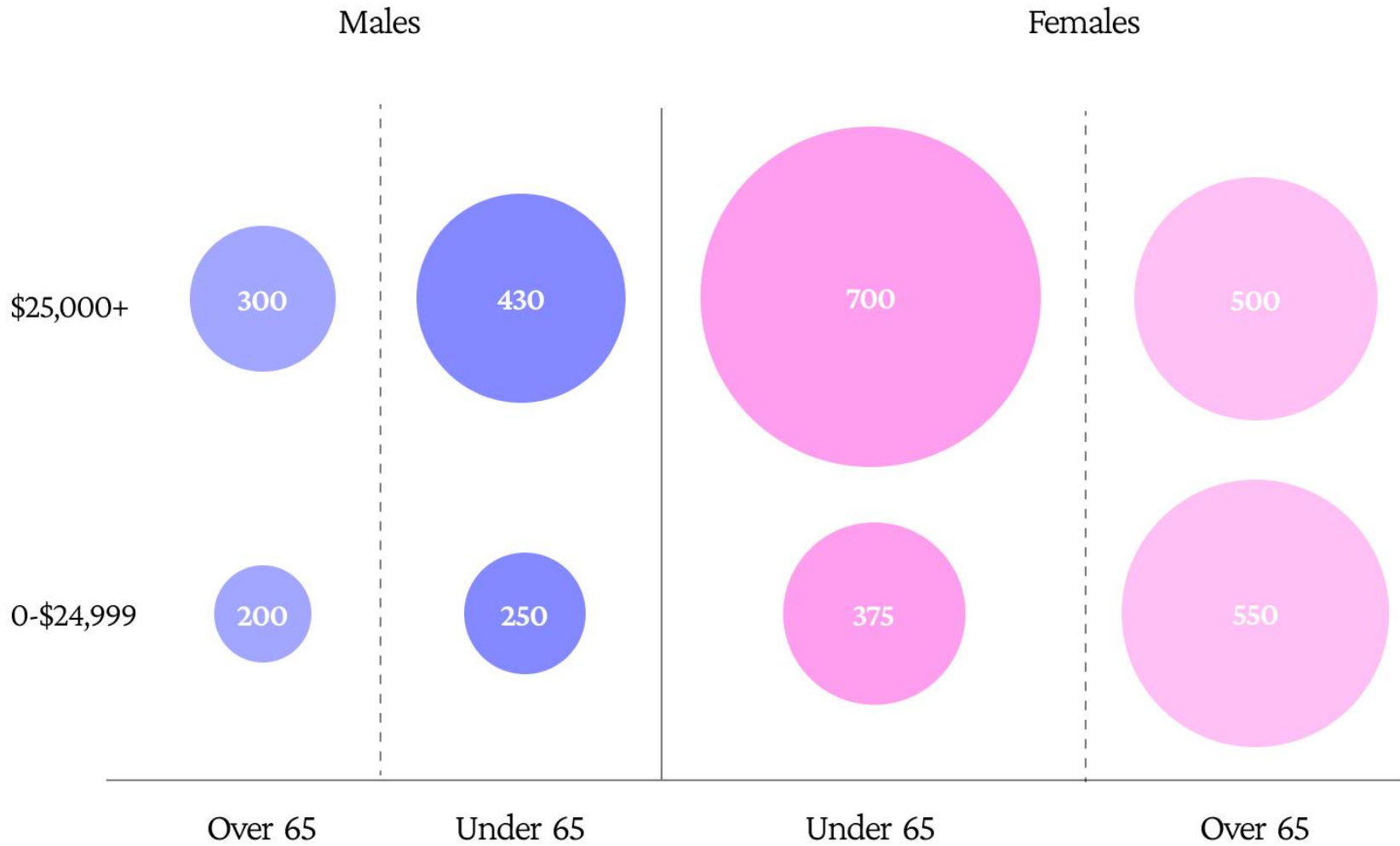


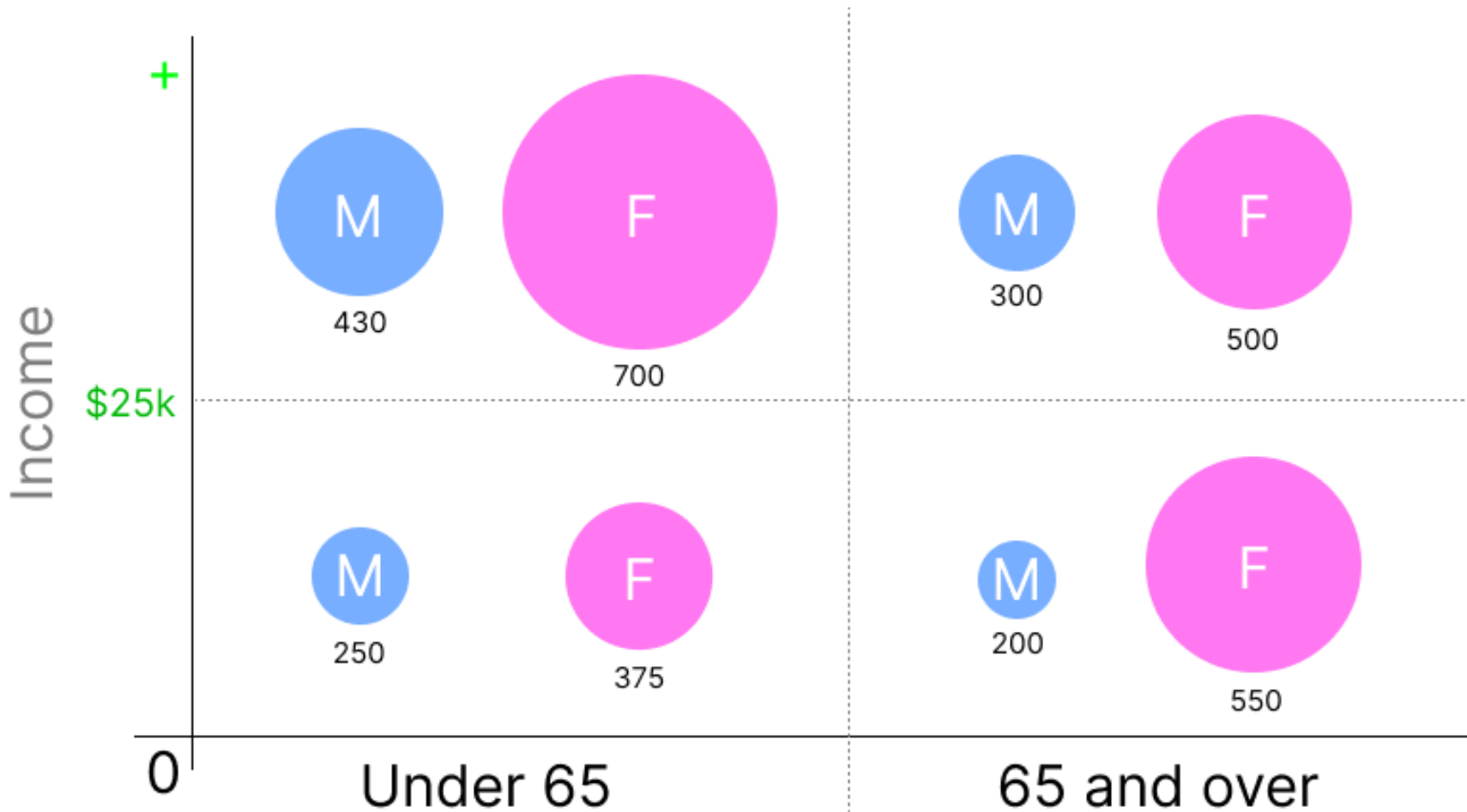






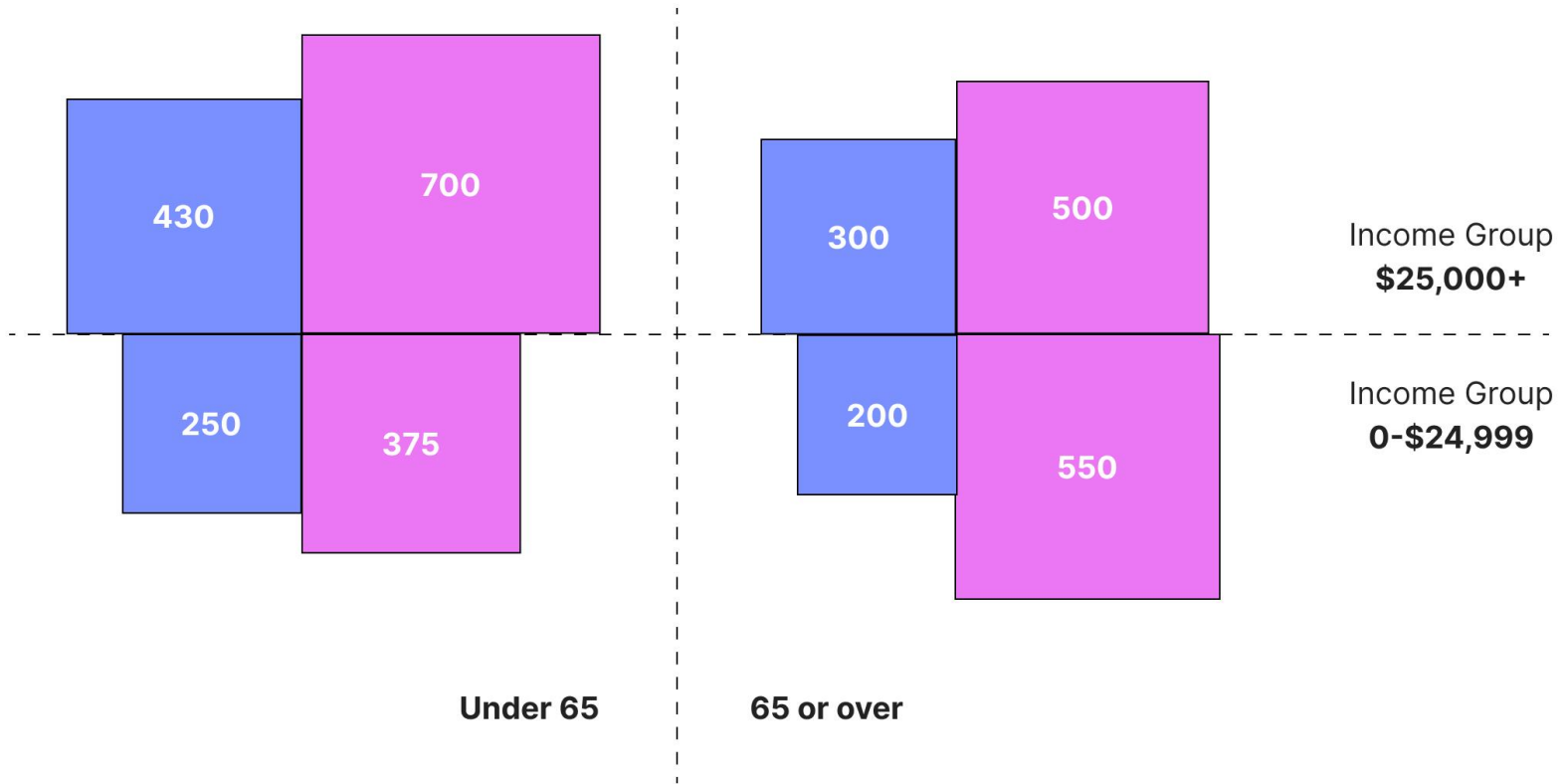
Cholesterol Level among males and females under and over 65 , high and low income



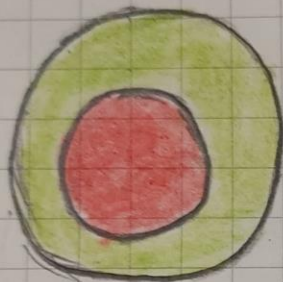


Number of people with cholestrol

■ Males
■ Females



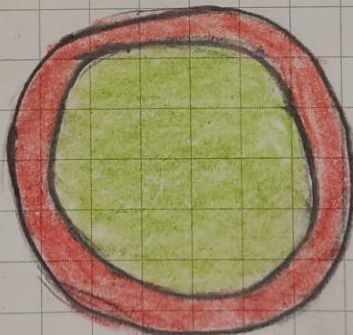
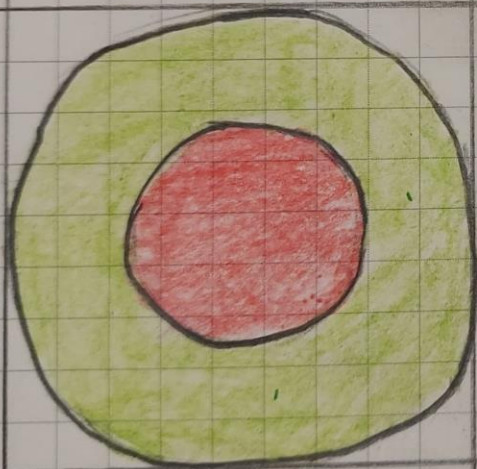
♂



■ \$25,000+

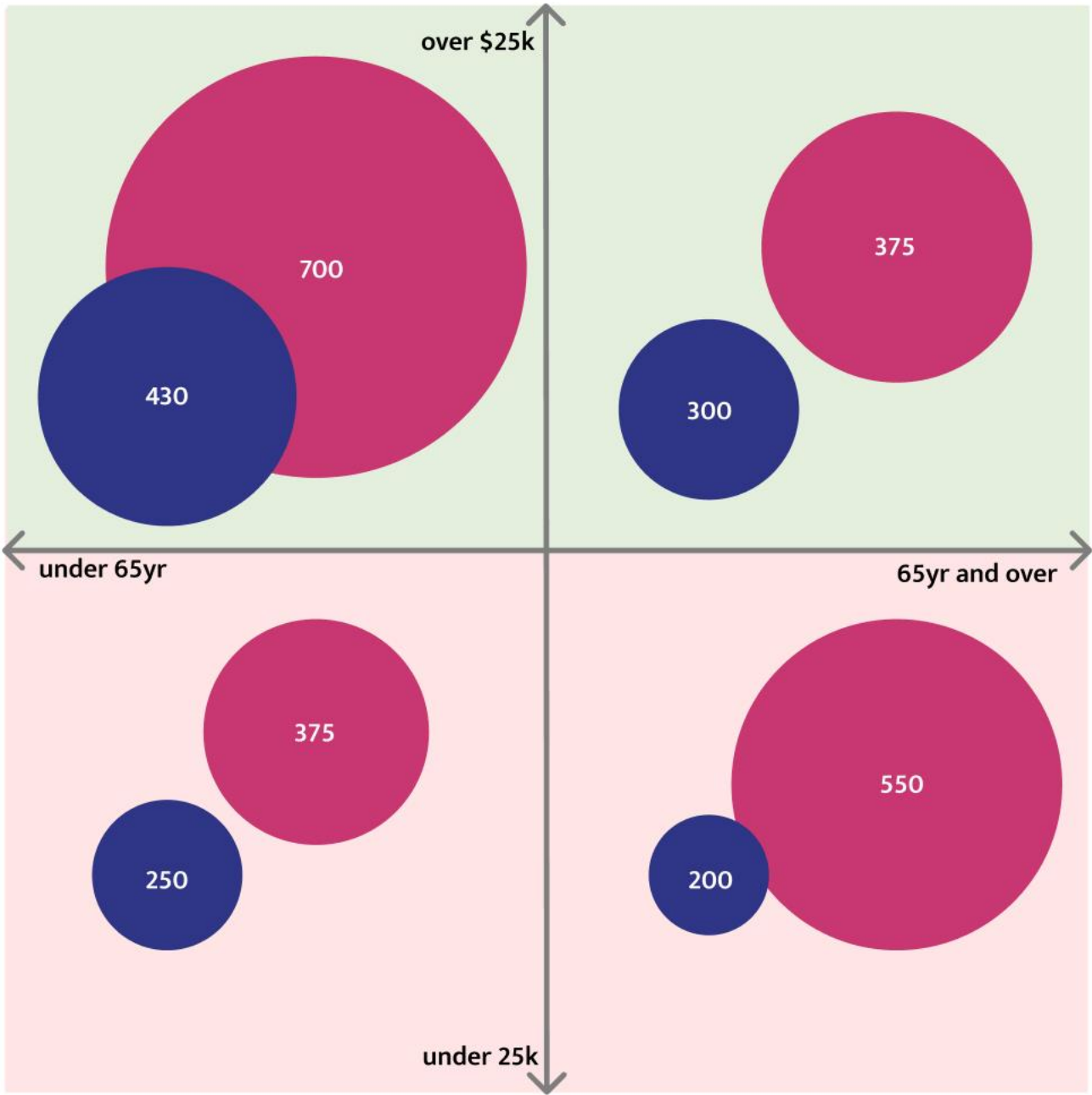
■ \$0 - 24,999

♀



Under 65

65+

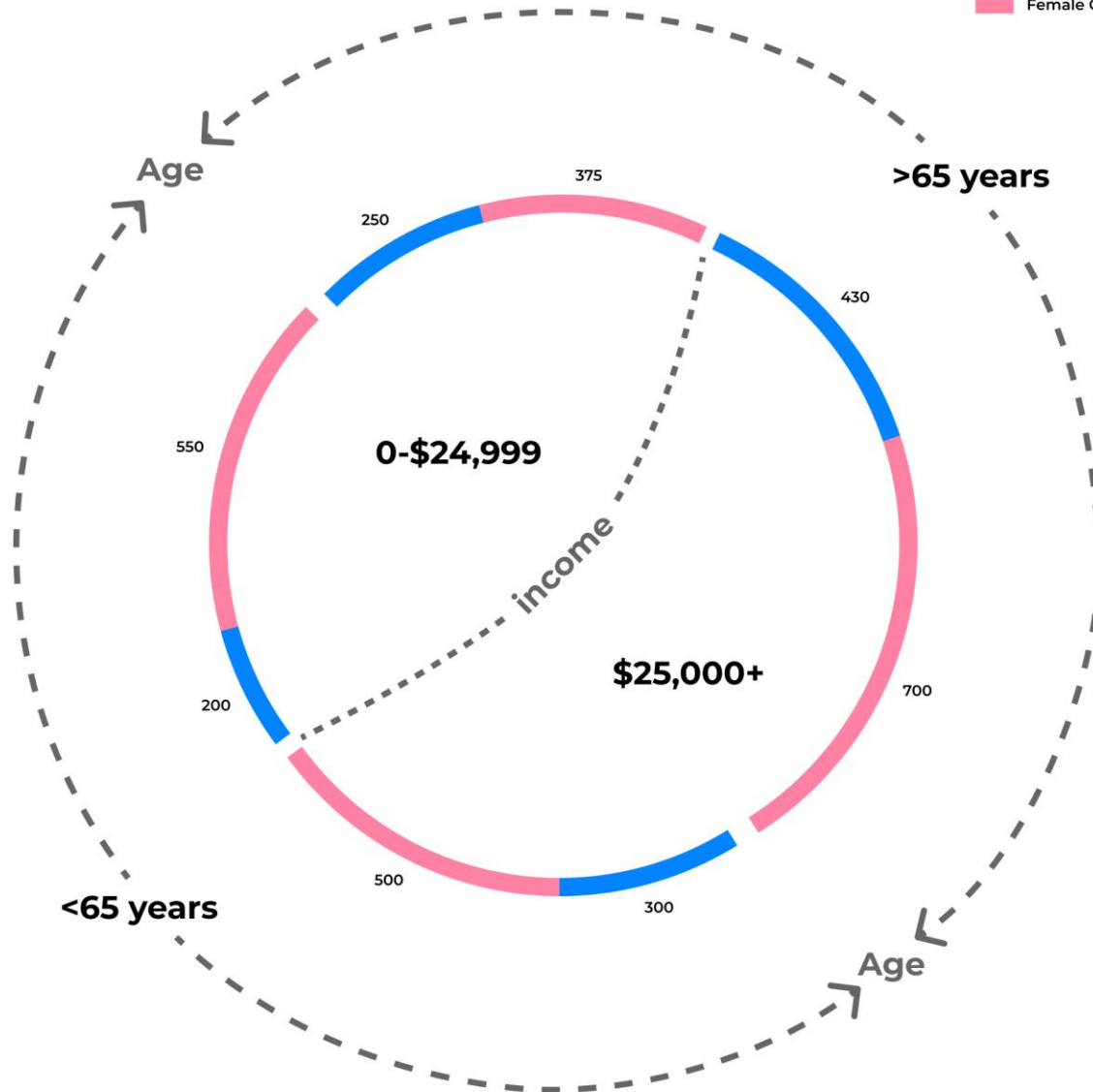


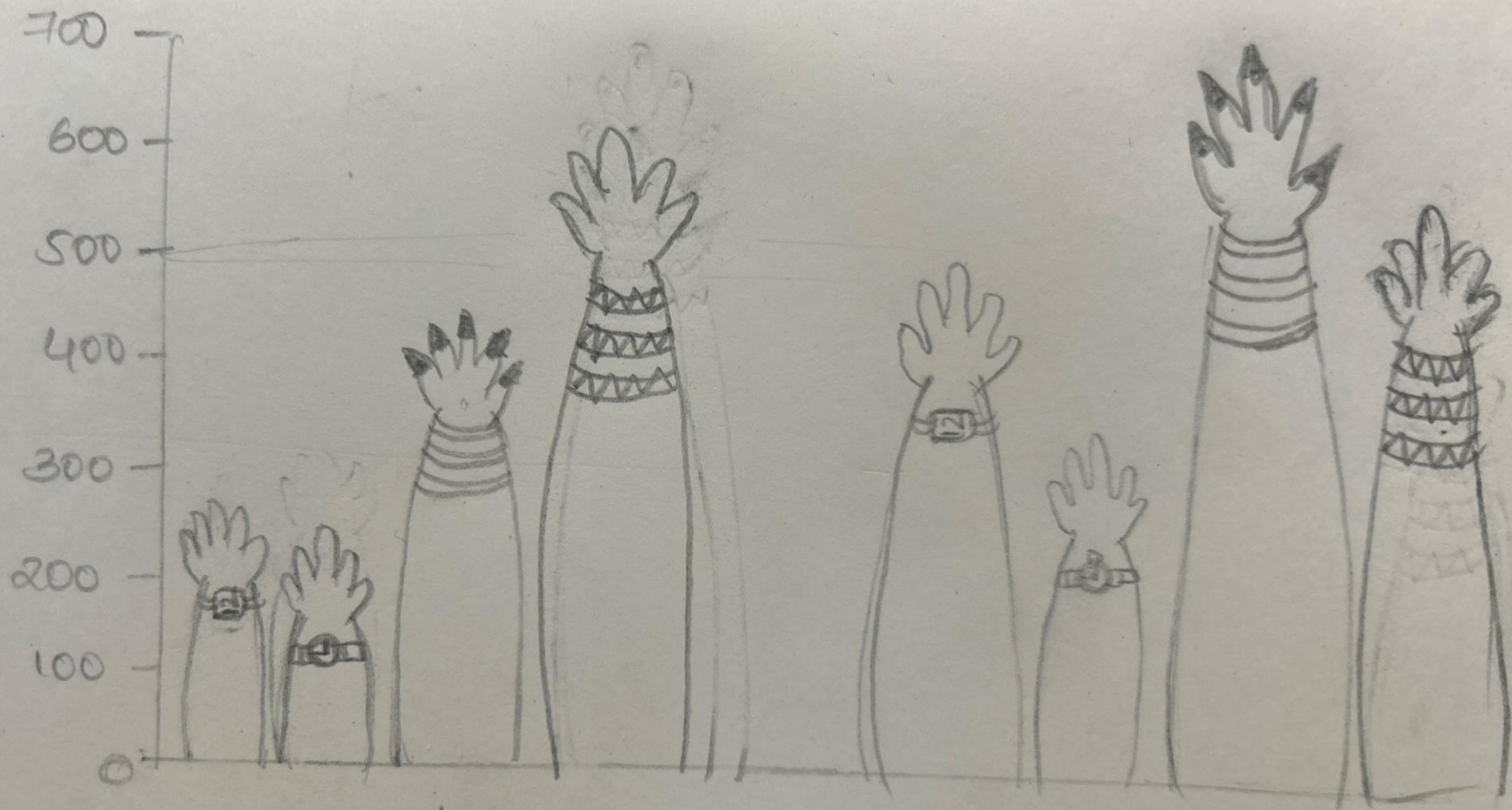
● male

● female

Cholesterol Level

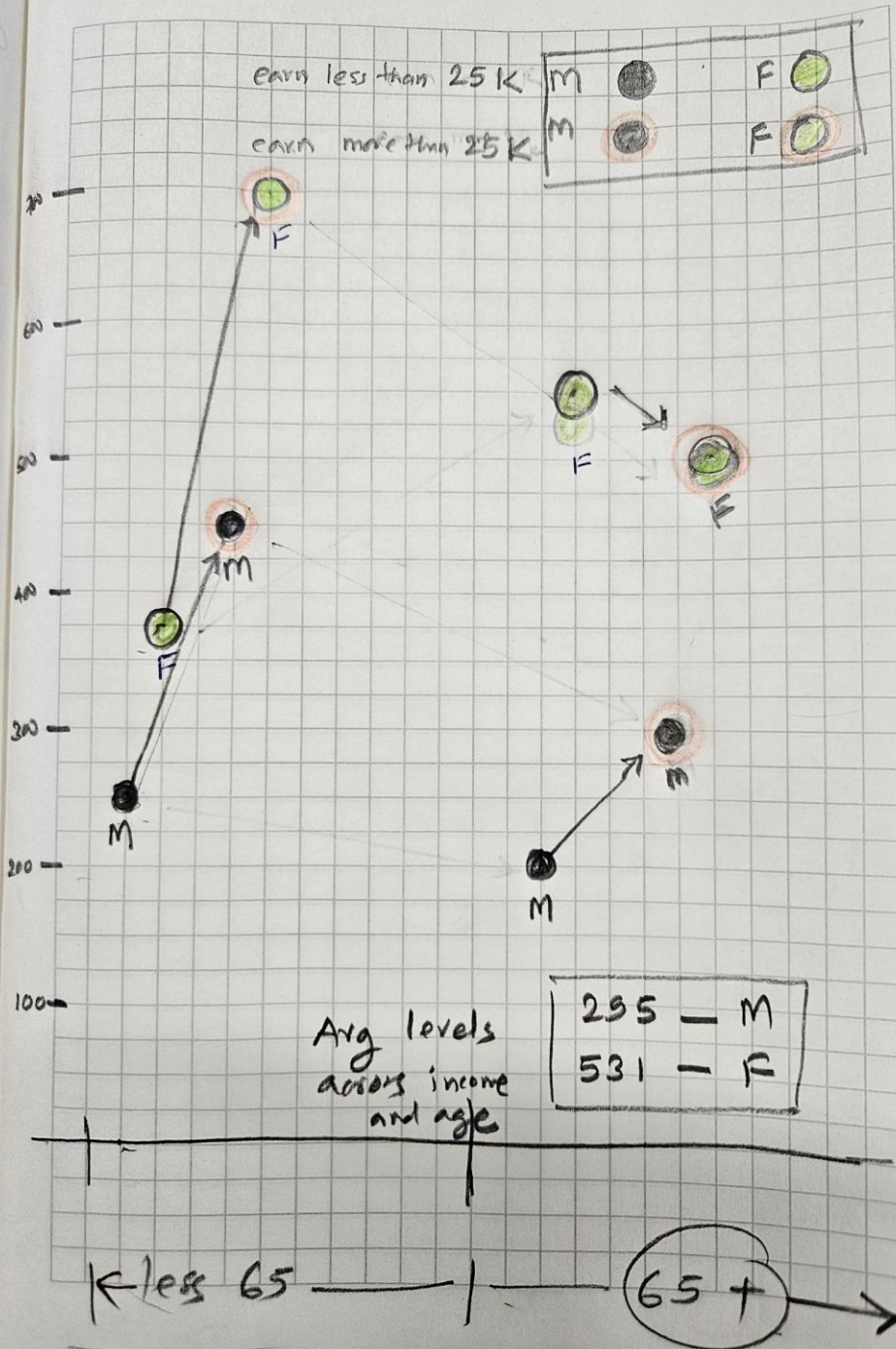
Male Cholesterol Level
Female Cholesterol Level

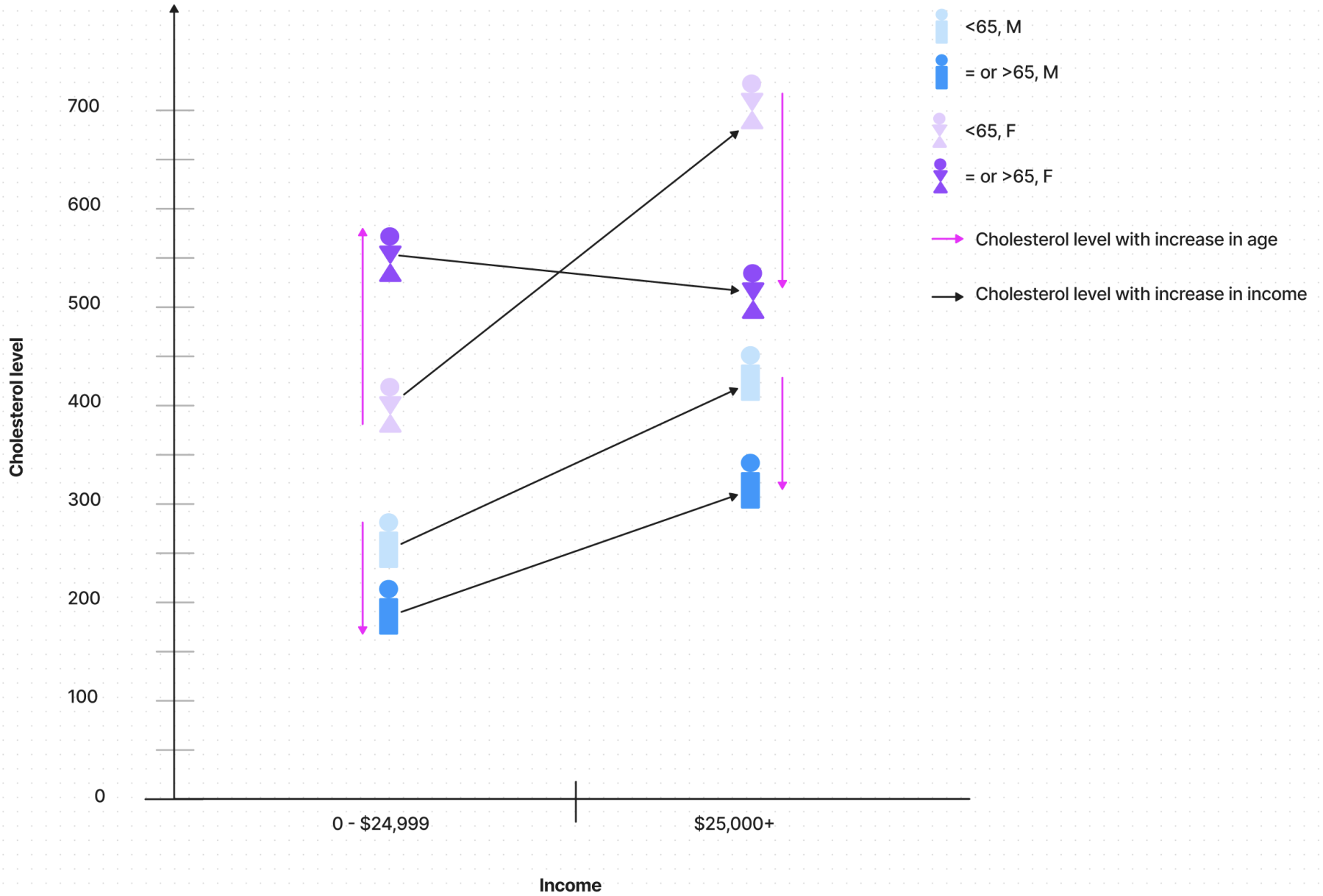




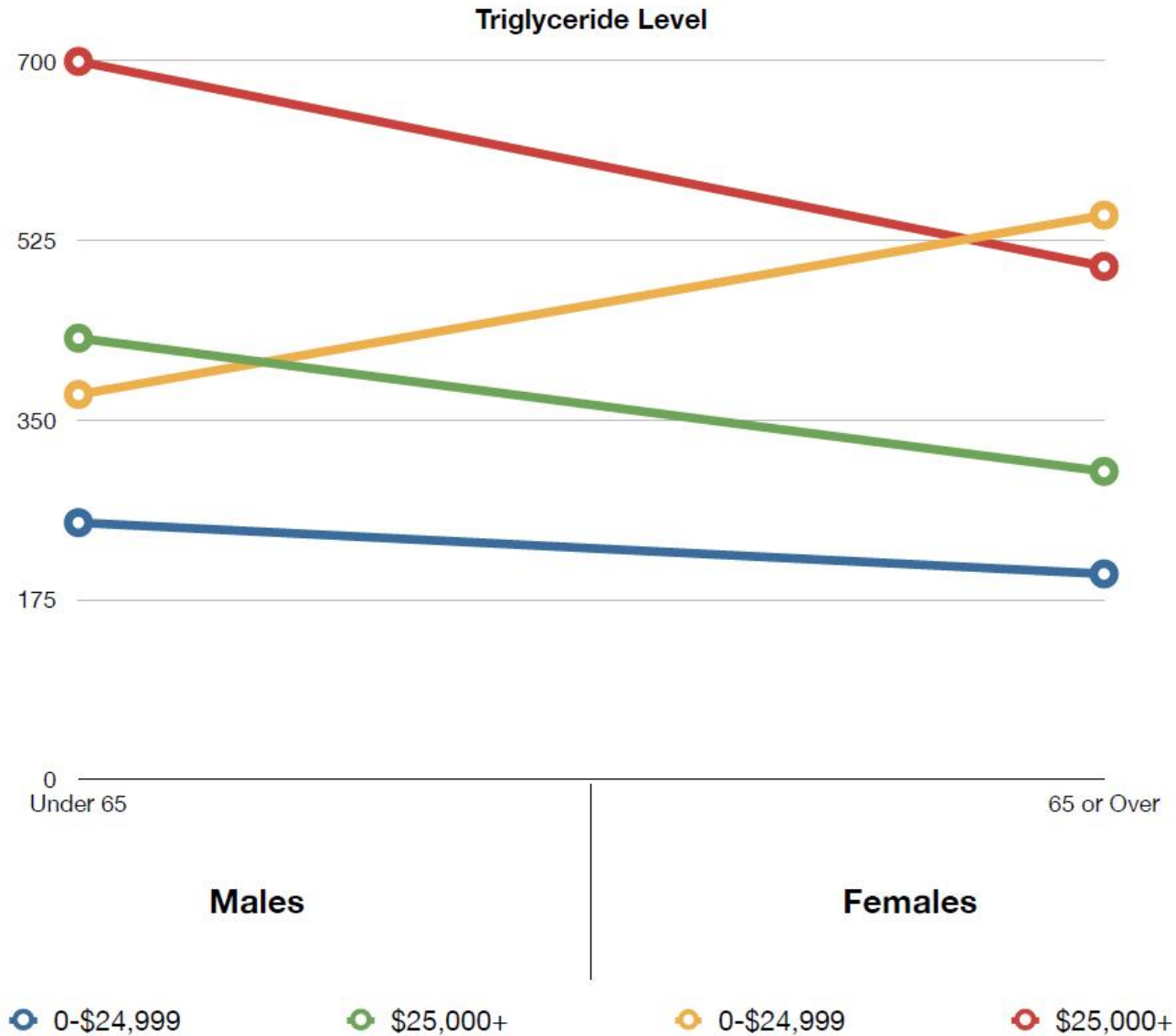
0 - \$24,999

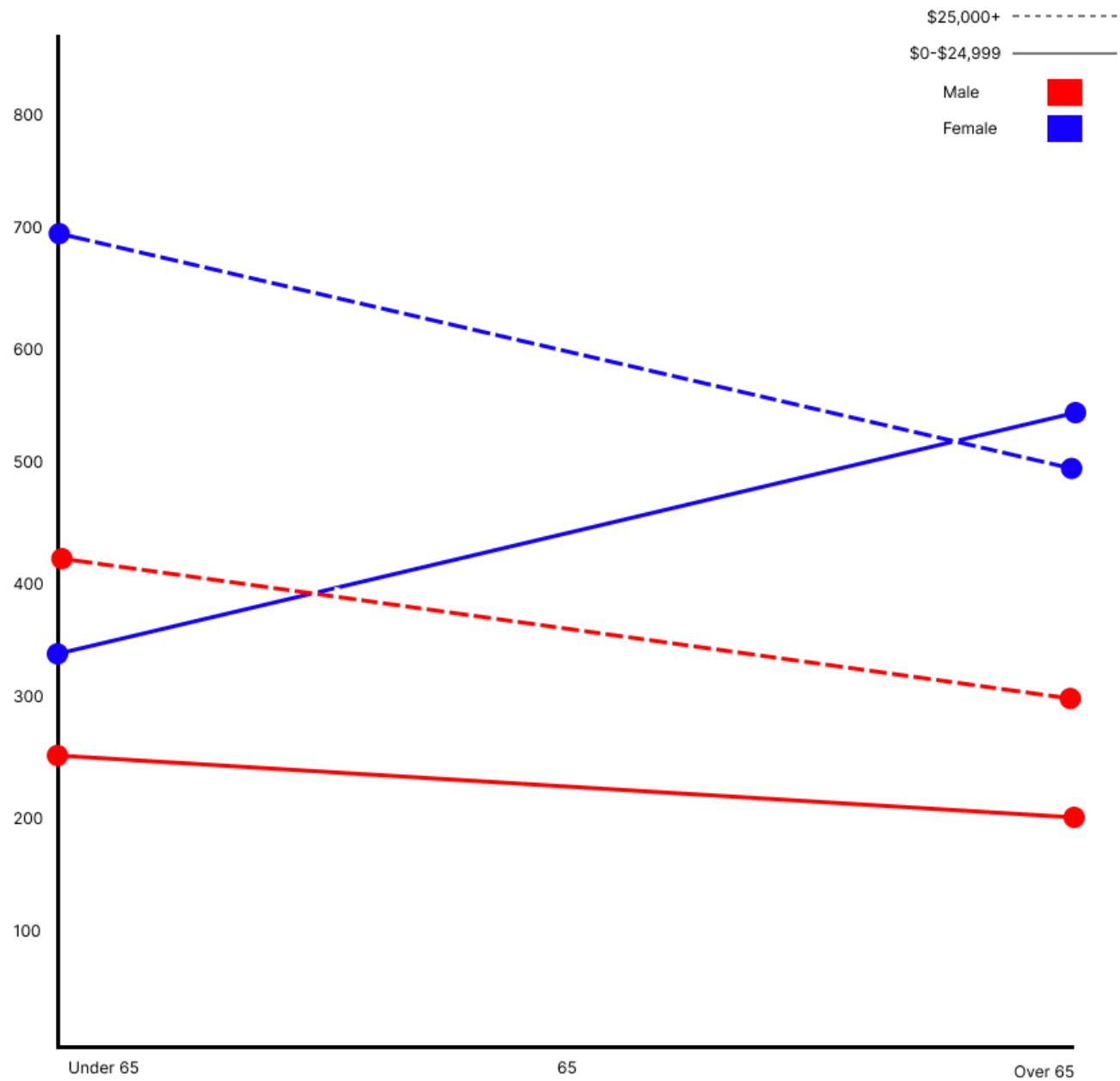
\$25,000 +





Visualize this! - class participation exercise 1





Cholera epidemic 1854 London – Dr Snow

Cholera epidemic 1854 London – Dr Snow



A COURT FOR KING CHOLERA.

Cholera epidemic 1854 London – Dr Snow

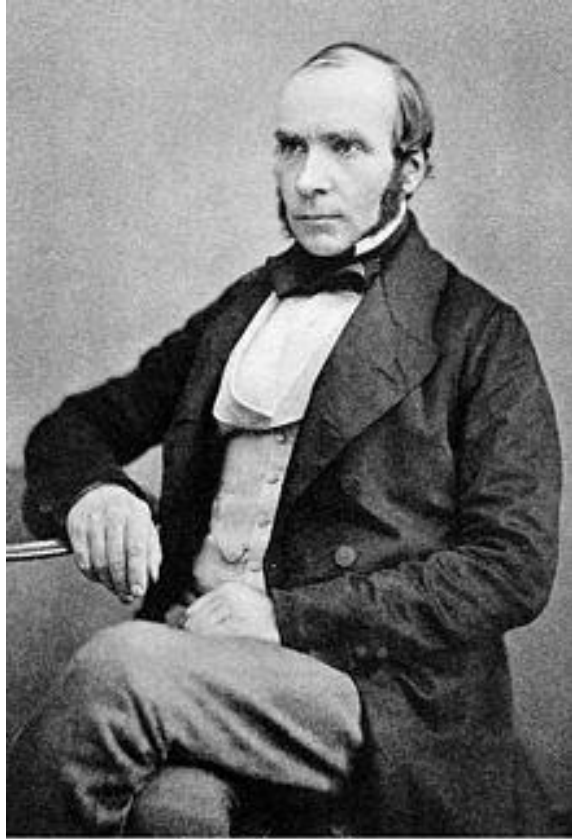


Cholera epidemic 1854 London – Dr Snow



CHOLERA "TRAMPLES THE VICTOR & THE VANQUISH'D BOTH."

Cholera epidemic 1854 London – Dr Snow



John Snow

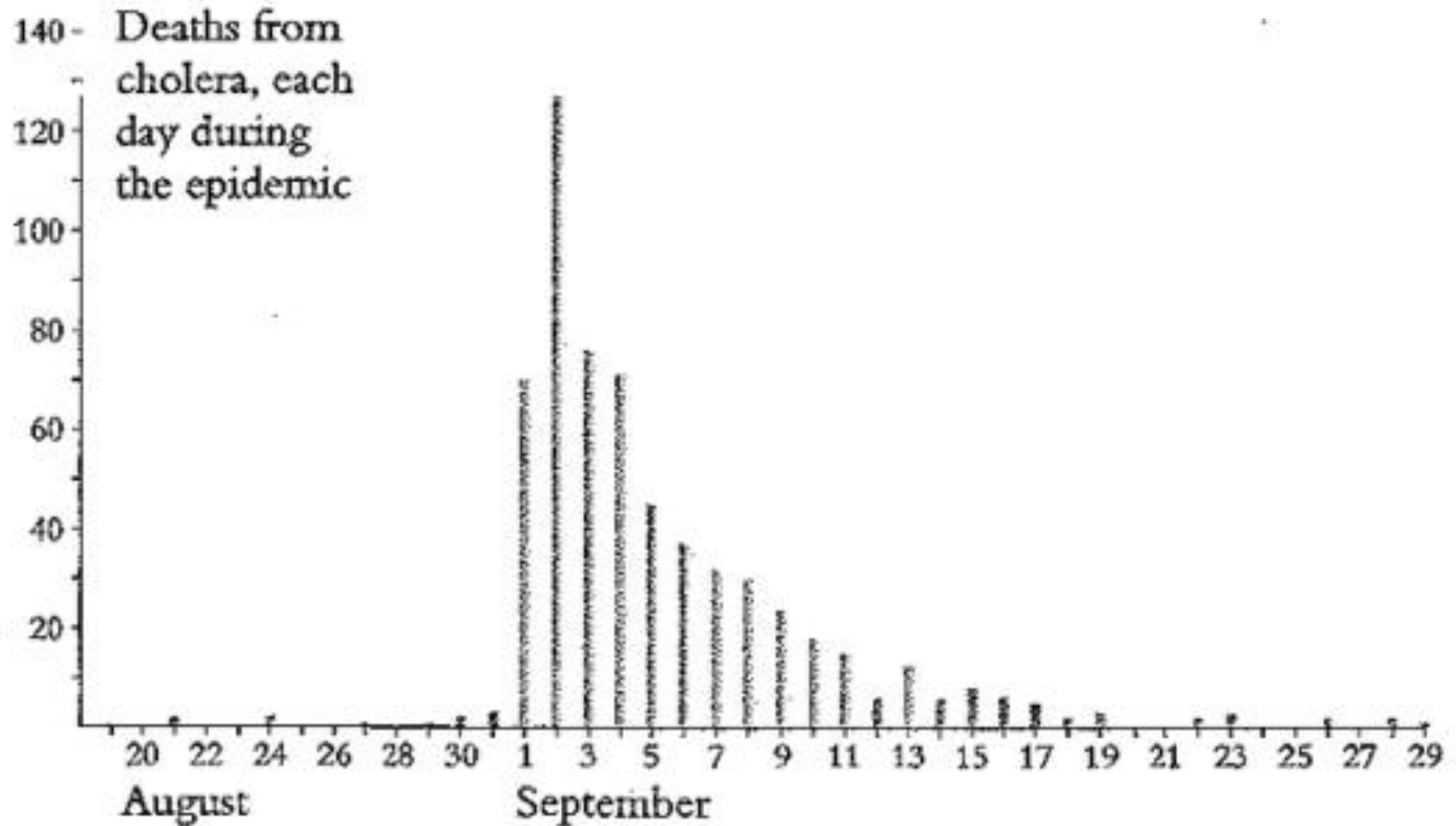




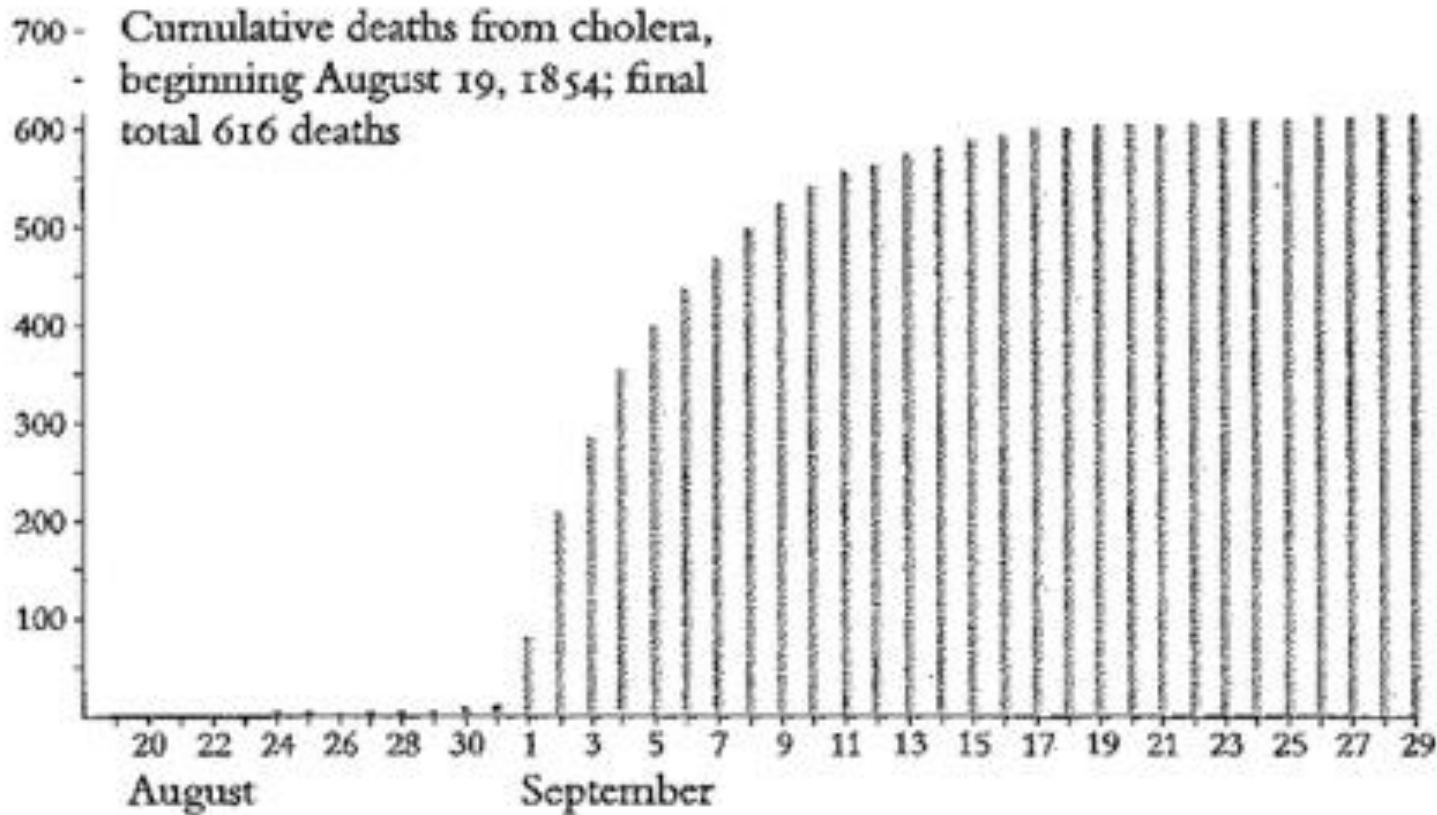
DEATH'S DISPENSARY.

OPEN TO THE POOR, GRATIS, BY PERMISSION OF THE PARISH.

Cholera epidemic 1854 London – Dr Snow



Cholera epidemic 1854 London – Dr Snow



In this case, the task is to create a causal theory about how the disease spread, and time series is a poor match for the task.

Cholera epidemic 1854 London – Dr Snow

The graphical display was aimed at conveying information about a possible cause-effect relationship.

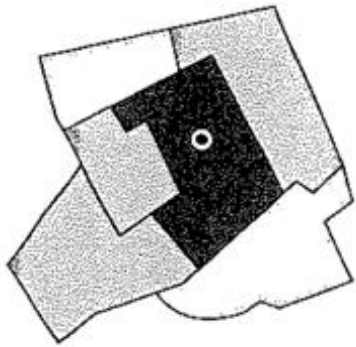
Snow marked

- deaths from cholera (IIIIII)
- locations of 11 community water pumps.

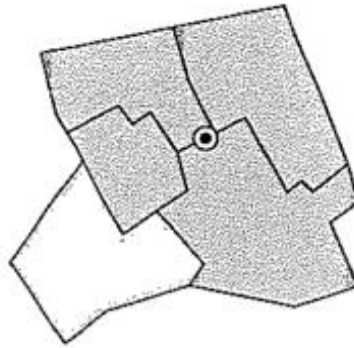
Cholera epidemic 1854 London – Dr Snow

Snow drew a “dot map”, which marks each individual death

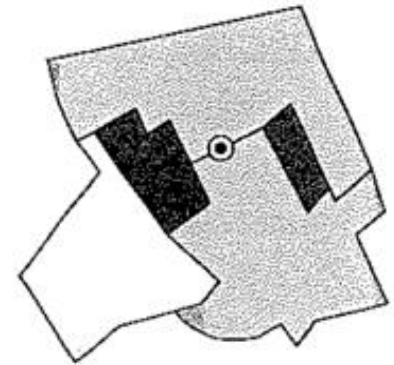
Why not aggregate?



In this aggregation of individual deaths into six areas, the greatest number is concentrated at the Broad Street pump.



Using different geographic subdivisions, the cholera numbers are nearly the same in four of the five areas.



In this aggregation of the deaths, the two areas with the most deaths do not even include the infected pump!

CHOLERA AND **WATER.**

BOARD OF WORKS

**FOR THE LIMEHOUSE DISTRICT,
Comprising Limehouse, Rateliff, Shadwell,
and Wapping.**

The **INHABITANTS** of the District within
which **CHOLERA IS PREVAILING**, are
earnestly advised

**NOT TO DRINK ANY WATER
WHICH HAS NOT
PREVIOUSLY BEEN BOILED.**

Fresh Water ought to be Boiled every
Morning for the day's use, and what
remains of it ought to be thrown away
at night. The Water ought not to stand
where any kind of dirt can get into it,
and great care ought to be given to see
that Water Butts and Cisterns are free
from dirt.

BY ORDER,

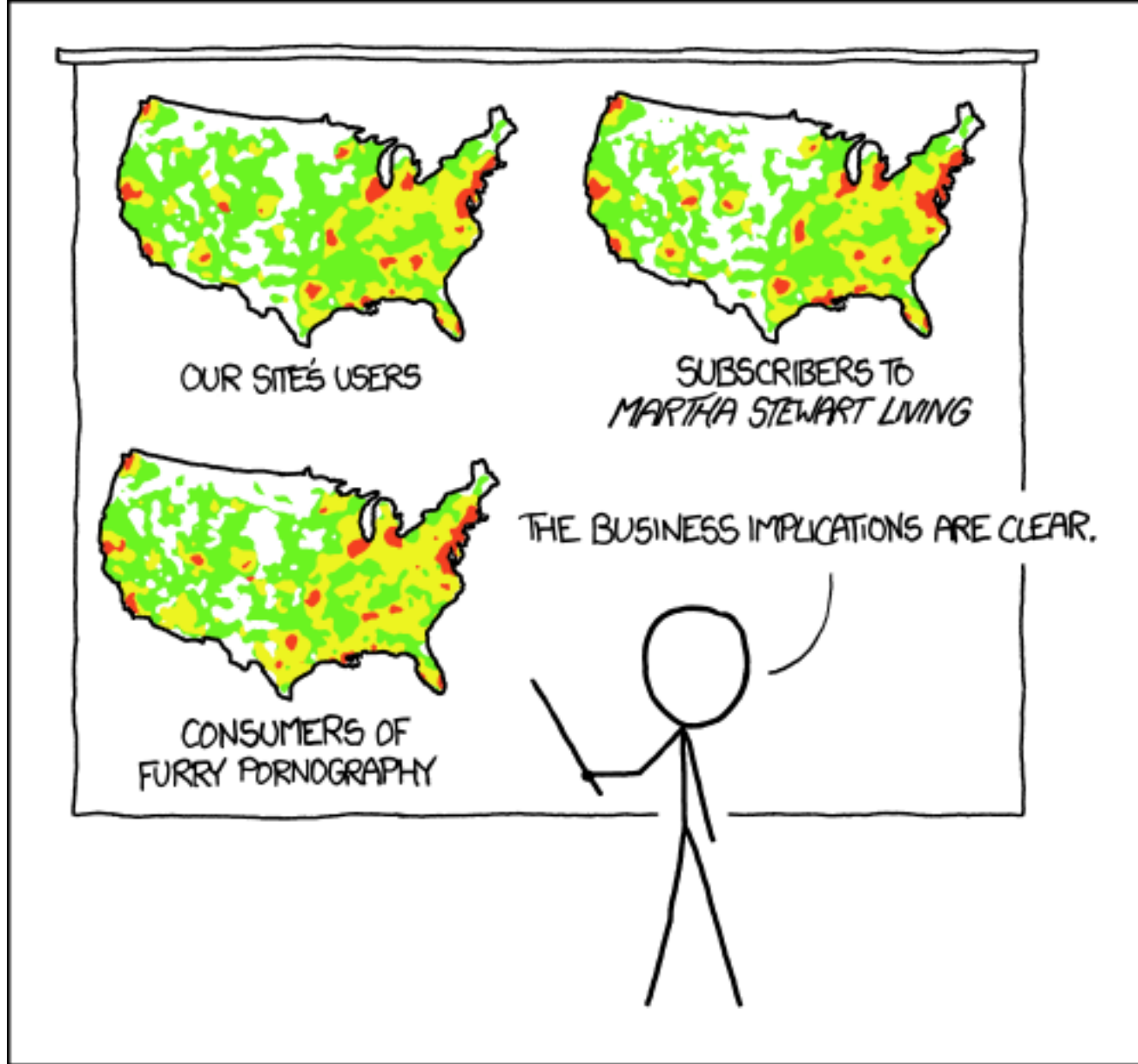
THOS. W. RATCLIFF,
CLERK OF THE BOARD.

Cholera epidemic 1854 London – Dr Snow

But what is the flip side of Snow's Display?

The dot map does not take into account the number of people living in an area

(an area may be free of cases because it is not populated, maybe more people lived near Broad Street pump?)

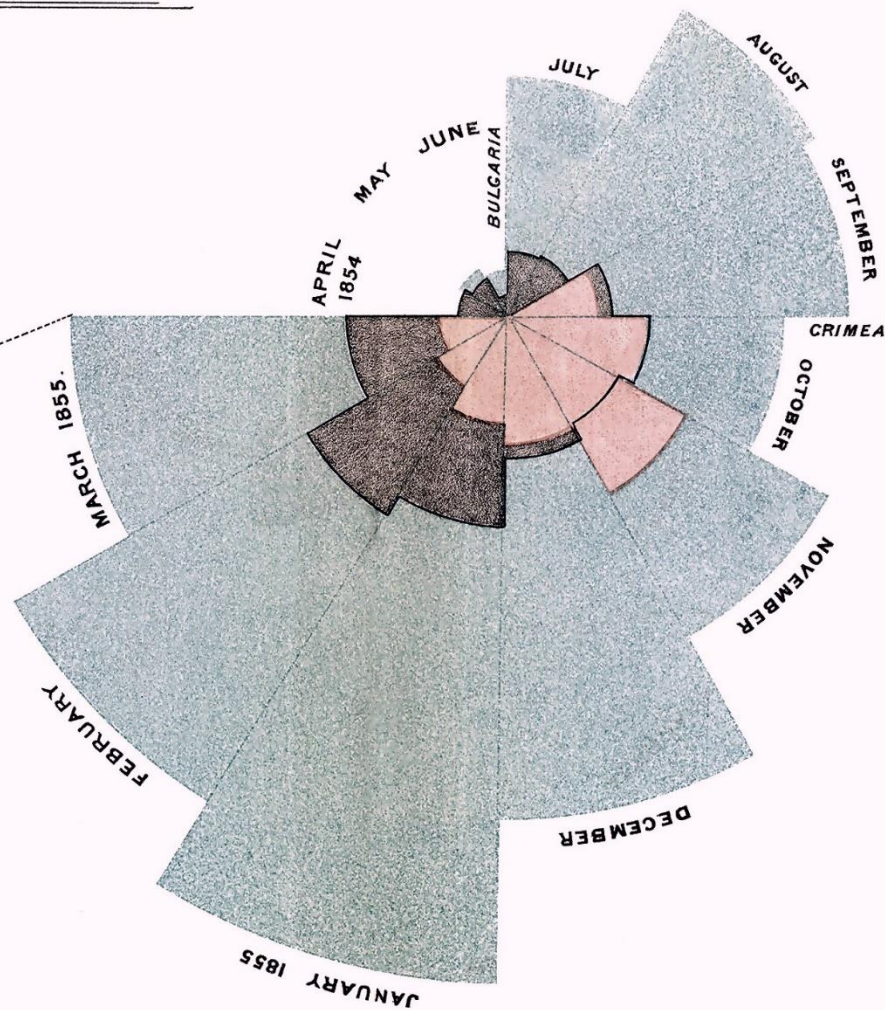


PET PEEVE #208:
GEOGRAPHIC PROFILE MAPS WHICH ARE
BASICALLY JUST POPULATION MAPS

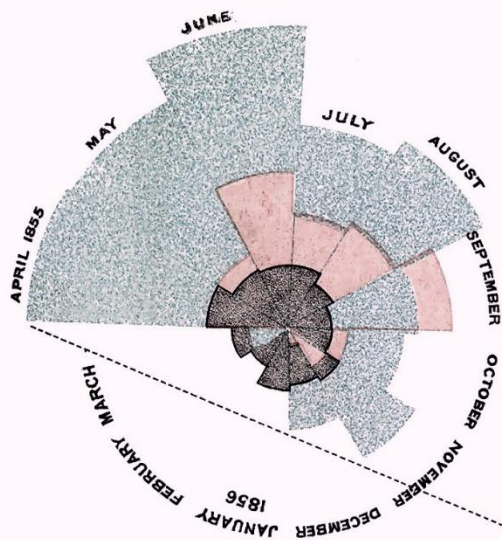
Florence Nightingale on Crimean War. 1858

DIAGRAM OF THE CAUSES OF MORTALITY IN THE ARMY IN THE EAST.

1.
APRIL 1854 TO MARCH 1855.



2.
APRIL 1855 TO MARCH 1856.



The Areas of the blue, red, & black wedges are each measured from the centre as the common vertex.

The blue wedges measured from the centre of the circle represent area for area the deaths from Preventible or Mitigable Zymotic diseases; the red wedges measured from the centre the deaths from wounds; & the black wedges measured from the centre the deaths from all other causes.

The black line across the red triangle in Nov. 1854 marks the boundary of the deaths from all other causes during the month.

In October 1854, & April 1855, the black area coincides with the red; in January & February 1856, the blue coincides with the black.

The entire areas may be compared by following the blue, the red & the black lines enclosing them.

Napoleon's 1812 Russian campaign – Charles Minard

Carte Figurative des pertes successives en hommes de l'Armée Française dans la Campagne de Russie 1812-1813.

Devisé par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite. Paris, le 20. Novembre. 1869

Les nombres d'hommes perdus sont représentés par les longueurs des zones colorées à raison d'un millimètre pour six mille hommes; ils sont de plus écrits en lettres de deux genres. Le rouge désigne les hommes qui ont péri en Russie, le noir ceux qui ont survécu. Les renseignements qui ont servi à dresser la carte, ont été puisés dans les ouvrages de M. K. Obiers, de Legur, de Fezeridac, de Chambrey et le journal inédit de Jacob, plusieurs de l'Armée depuis le 28 Octobre.

Les mieux faits juges à l'œil la diminution de l'armée; j'ai supposé que les corps de Louis-Nicolas et du Maréchal Davoust, qui avaient été détachés sur Minsk et Mielnik, n'avaient pas été détruits, ainsi toujours inscrits avec l'armée.

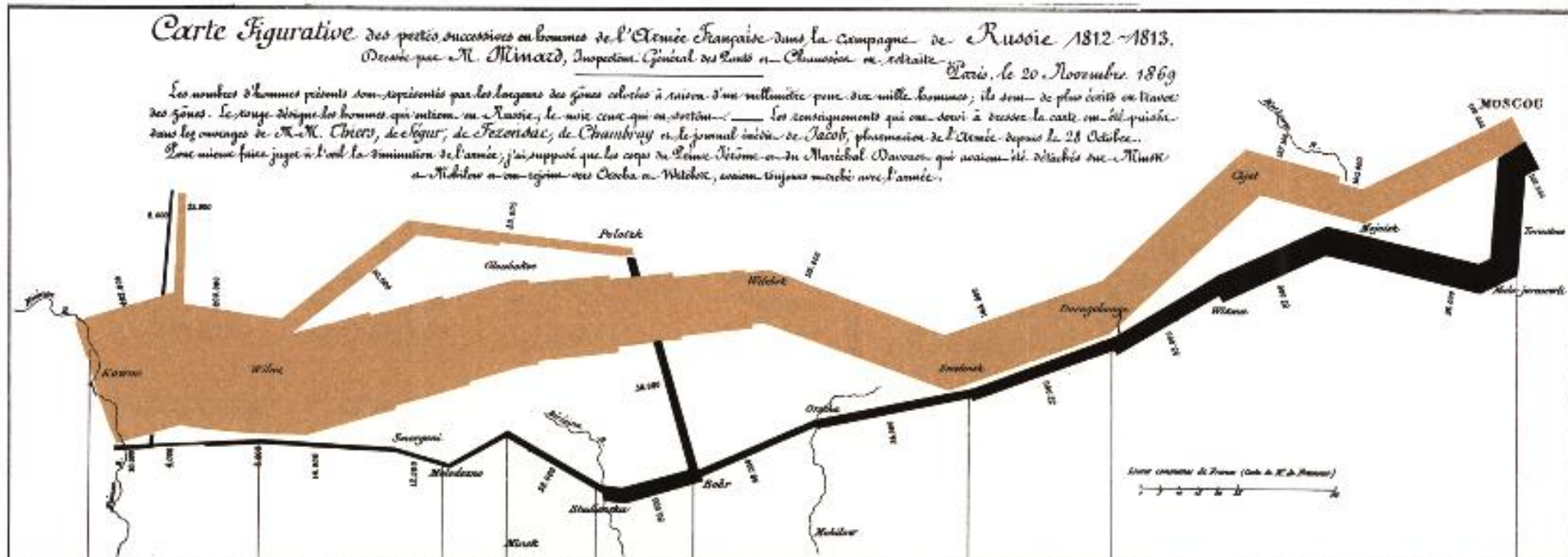
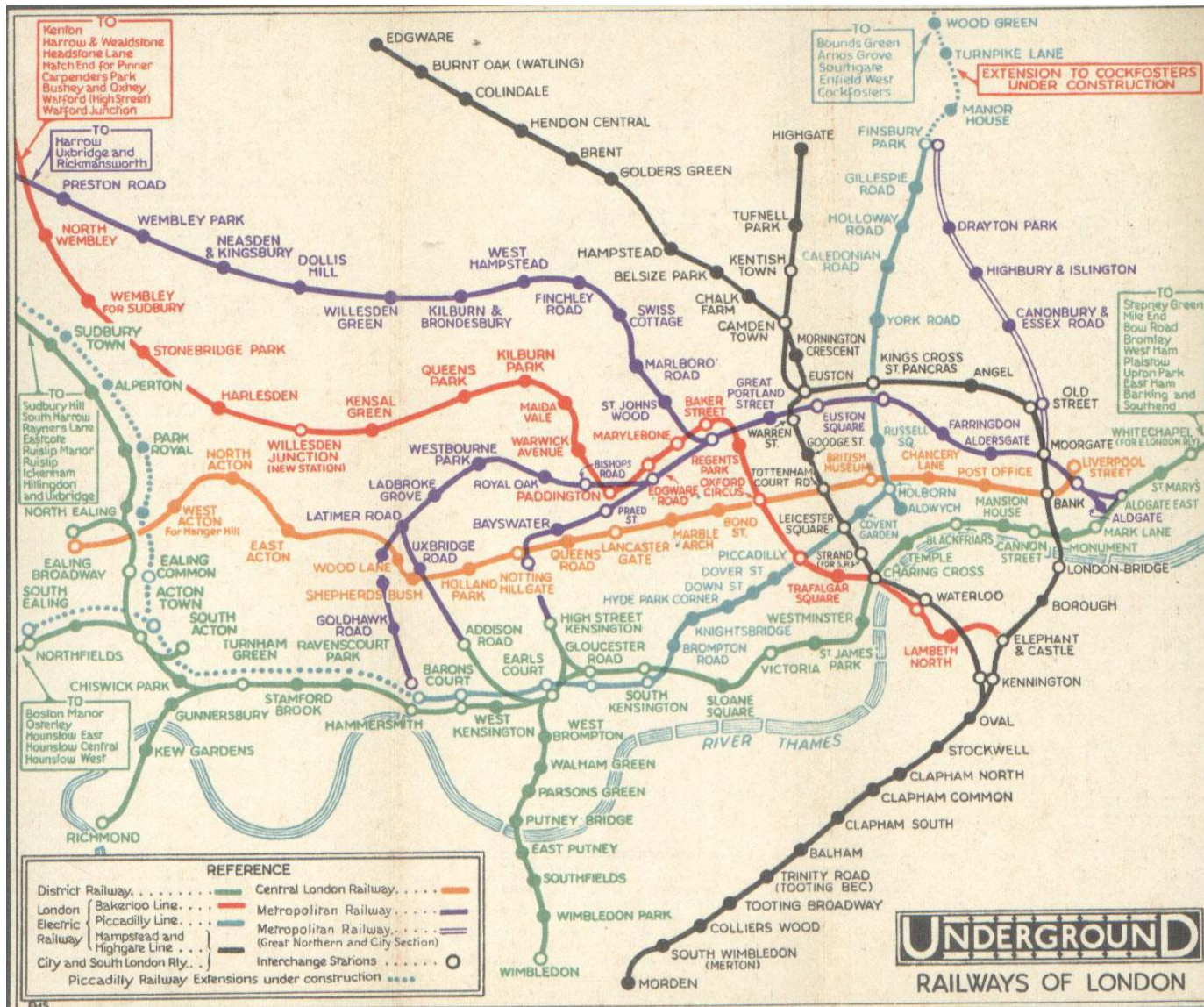


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.



Les Cosaques passent au galop le Niemen gelé.

London Underground Map 1931 – Henry Beck



London Underground Map 1931 – Henry Beck



Periodic Table 1869 – Dimitri Mendeleev

Ueber die Beziehungen der Eigenschaften zu den Atomgewichten der Elemente. Von D. Mendelejeff. — Ordnet man Elemente nach zunehmenden Atomgewichten in verticale Reihen so, dass die Horizontalreihen analoge Elemente enthalten, wieder nach zunehmendem Atomgewicht geordnet, so erhält man folgende Zusammenstellung, aus der sich einige allgemeinere Folgerungen ableiten lassen.

			Ti = 50	Zr = 90	? = 180
			V = 51	Nb = 94	Ta = 182
			Cr = 52	Mo = 96	W = 186
			Mn = 55	Rh = 104,4	Pt = 197,4
			Fe = 56	Ru = 104,4	Ir = 198
		Ni =	Co = 59	Pd = 106,6	Os = 199
			Cu = 63,4	Ag = 108	Hg = 200
H = 1	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112	
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?
	C = 12	Si = 28	? = 70	Sn = 118	
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?
	O = 16	S = 32	Se = 79,4	Te = 128?	
	F = 19	Cl = 35,5	Br = 80	J = 127	
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207
		? = 45	Ce = 92		
		?Er = 56	La = 94		
		?Yt = 60	Di = 95		
		?In = 75,6	Th = 118?		

Periodic Table 1950 – Henry Hubbard

Revised Edition 1965

PERIODIC CHART OF THE ATOMS

Henry D. Hubbard
William F. Meggers

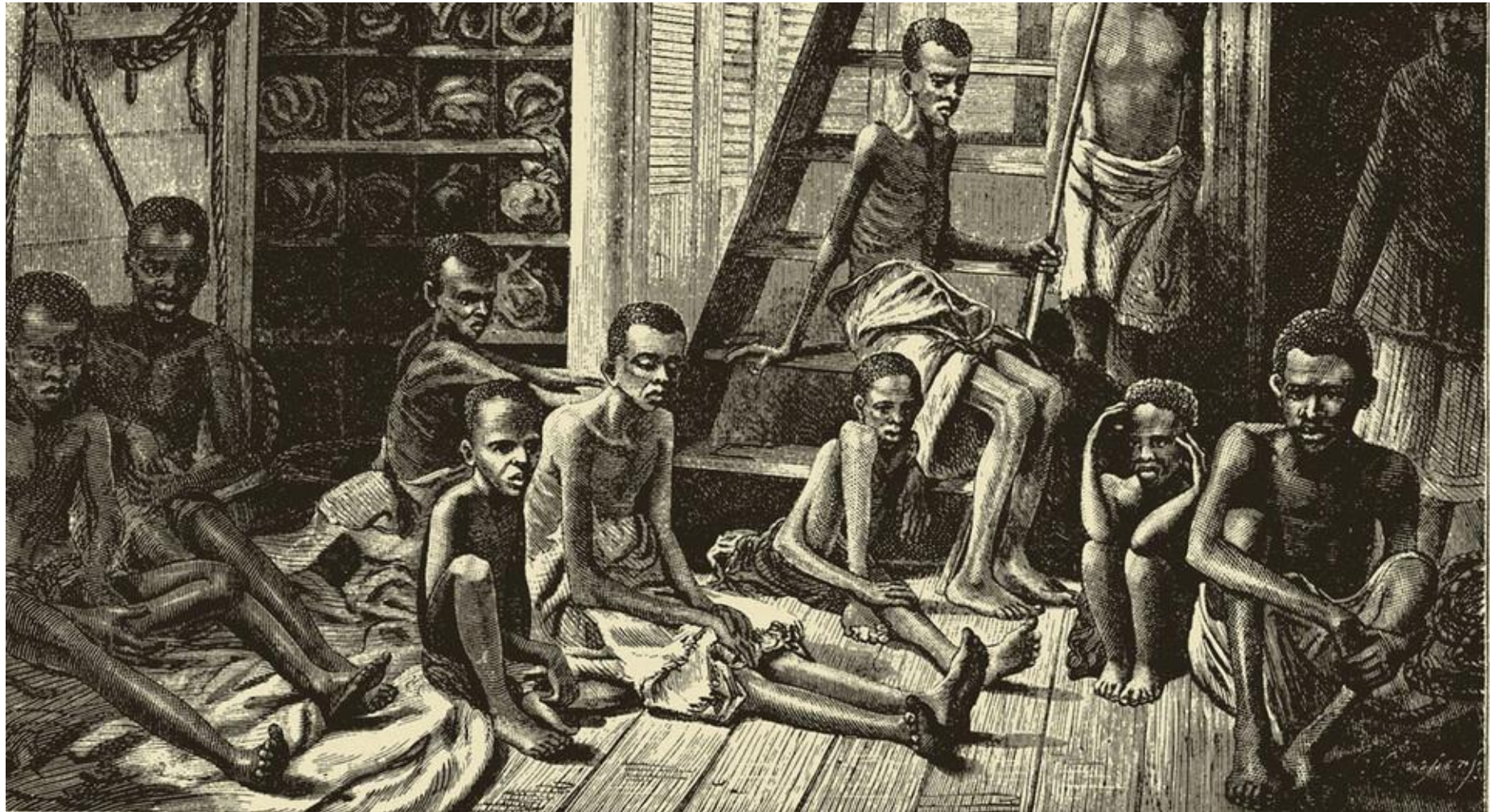
The Atoms Grouped According to the Number of Outer [Valence] Electrons

Planetary electrons in the completed shells

Total Atom No. = $2(1^2 \cdot 2^2 \cdot 3^2 \cdot 4^2 \cdot 4^2 \cdot 3^2 \cdot 2^2)$

Planets	I	II	III	IV	V	VI	VII	VIII	Planetary electrons in the completed shells											
1	1 H 1.00797							2 He 4.0026	2 = 2											
2	2 He 4.0026	3 Li 6.939	4 Be 9.0122	5 B 10.811	6 C 12.01115	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183	10 = 2 · 8										
3	10 Ne 20.183	11 Na 22.9898	12 Mg 24.312	13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948	18 = 2 · 8 · 8										
4	18 Ar 39.948	19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	36 Kr 83.80	36 = 2 · 8 · 18 · 8							
5	36 Kr 83.80	37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc 99	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	54 Xe 131.30	54 = 2 · 8 · 18 · 18 · 8							
6	54 Xe 131.30	55 Cs 132.905	56 Ba 137.34	57 La 138.91	58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm 145	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97	86 Rn 222	86 = 2 · 8 · 18 · 32 · 18 · 8
7	86 Rn 222	87 Fr 223	88 Ra 226	89 Ac 227	90 Th 232.038	91 Pa 231	92 U 238.03	93 Np 237	94 Pu 242	95 Am 243	96 Cm 247	97 Bk 249	98 Cf 251	99 Es 254	100 Fm 253	101 Md 256	102 No 254	103 Lw 257		

Drawings of slave ship Brookes by British abolitionist William Elford. 1788

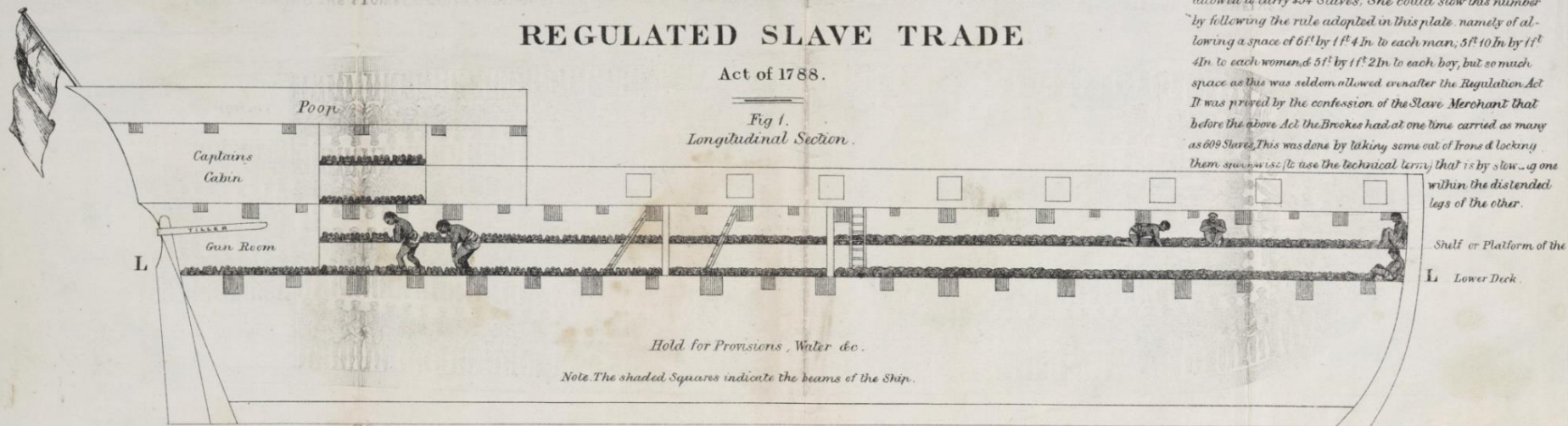


Drawings of slave ship Brookes by British abolitionist William Elford. 1788

STOWAGE OF THE BRITISH SLAVE SHIP "BROOKES" UNDER THE REGULATED SLAVE TRADE

Act of 1788.

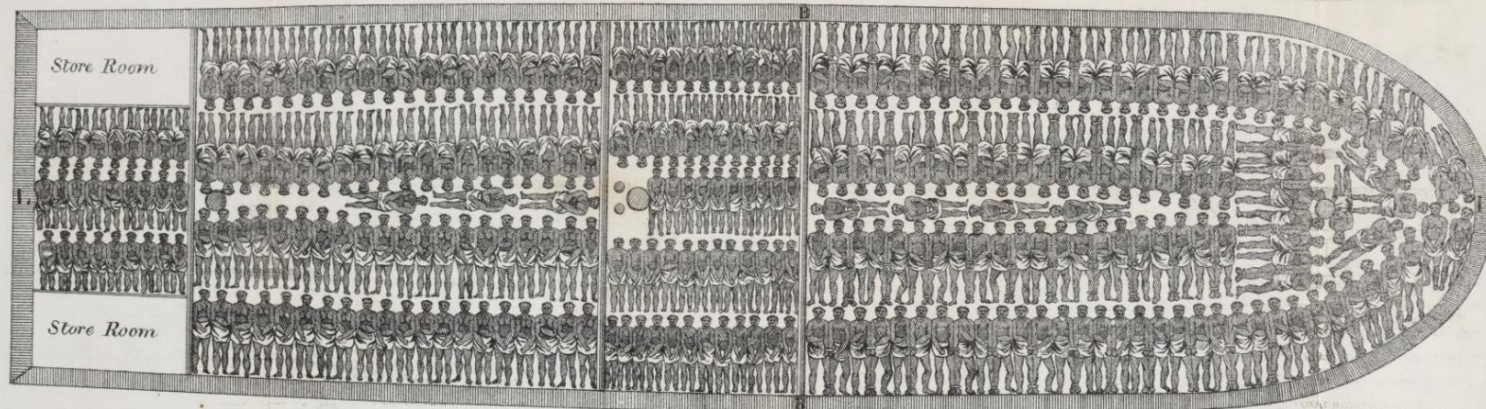
Fig 1.
Longitudinal Section.



PLAN OF LOWER DECK WITH THE STOWAGE OF 292 SLAVES

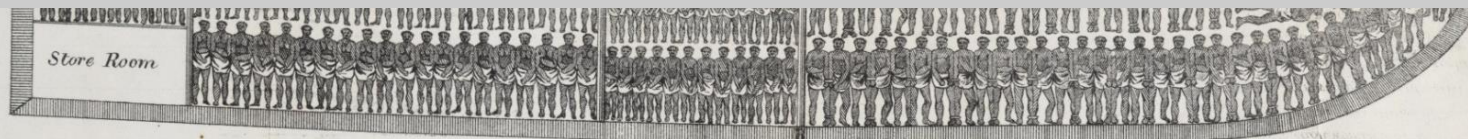
130 OF THESE BEING STOWED UNDER THE SHELVES AS SHEWN IN FIGURE B & FIGURE 3.

Fig 2.



PLAN SHEWING THE STOWAGE OF 130 ADDITIONAL SLAVES ROUND THE WINGS OR SIDES OF THE LOWER DECK BY MEANS OF PLATFORMS OR SHELVES

Drawings of slave ship Brookes by British abolitionist William Elford. 1788



PLAN SHEWING THE STOWAGE OF 130 ADDITIONAL SLAVES ROUND THE WINGS OR SIDES OF THE LOWER DECK BY MEANS OF PLATFORMS OR SHELVES (IN THE MANNER OF GALLERIES IN A CHURCH) THE SLAVES STOWED ON THE SHELVES AND BELOW THEM HAVE ONLY A HEIGHT OF 2 FEET 7 INCHES BETWEEN THE BEAMS: AND FAR LESS UNDER THE BEAMS. See Fig 1.

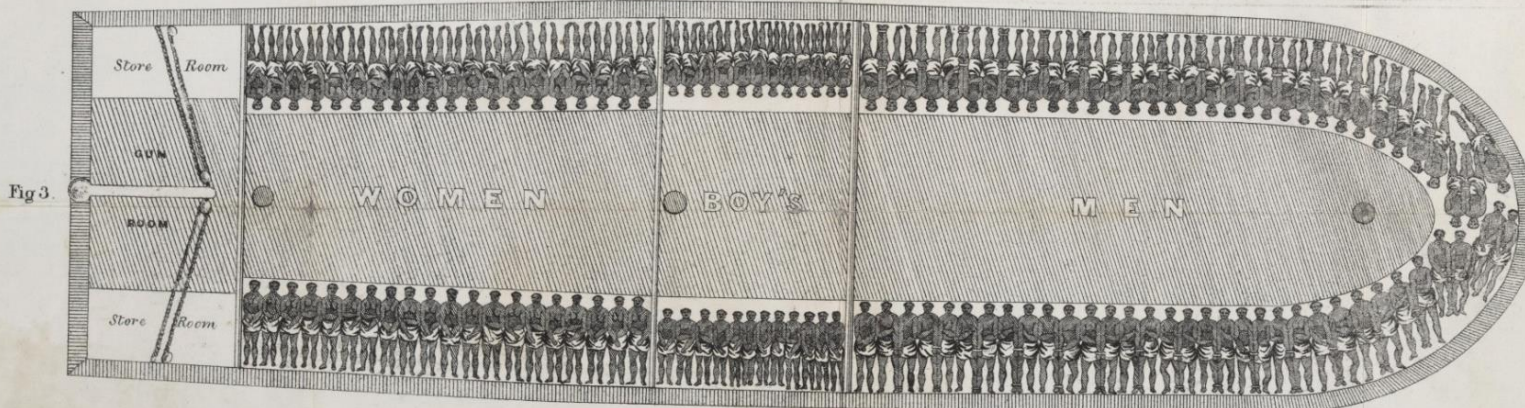


Fig 3.

Fig 4
Cross Section
at the Poop.

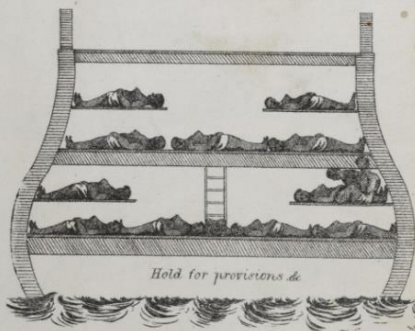


Fig 5.
Cross Section
amidships

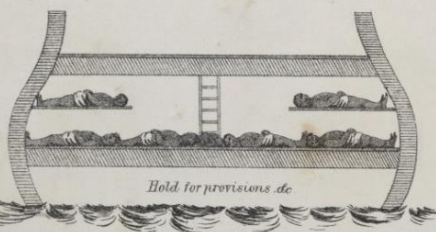


Fig 6.
Lower tier of Slaves under the Poop.

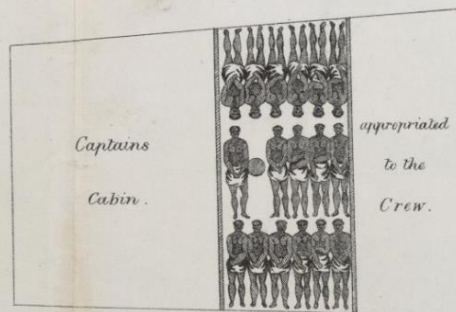
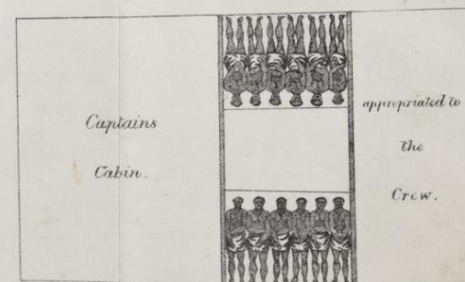
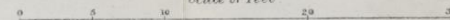


Fig 7.
Shelf tier of Slaves under the Poop.



Scale of Feet



What is visualization?

Clear thinking made visible – Edward Tufte

It is not about designing graphics. It is all about designing information
– Richard Saul Wurman

Vision can no longer be employed simply to support verbal and conceptual meanings: Its potential as a cognitive power in its own right must be exploited – Kepes

Visualization is really about external cognition, that is, how resources outside the mind can be used to boost the cognitive capabilities of the mind – Stuart Card

Why visualize?

To convey information through visual representations in order to:

- Map/record
- Clarify/explain
- Instruct/communicate
- Discover
- Inspire/tell a story

// PROGRAMM

MITTWOCH 21.04.2004

	12:00	13:00	14:00	15:00	16:00	17:00
LAGERHALLE						
KUNSTHALLE DOMINIKANERKIRCHE						

DONNERSTAG 22.04.2004

	12:00	13:00	14:00	15:00	16:00	17:00
LAGERHALLE	BRAVE NEW WORLD 12:00 // 58 min		ELSEWHERE 13:30 Le Gout du Koumiz // 66 min		MEMORIES ARE MADE OF THIS 15:30 // 84 min	JONAS AT THE OCEAN 16:00 // Peter Szepiel / Xiam / 2002 // 85 min
ARTHOUSE 4					DIE PERLE IN DER KACKE 16:30 // Dirk BSE // 80 min	EWIG 17:30 // -KURZ
ARTHOUSE 5					MIWATORI WA HADASHI DA 16:30 // Arima Masahiko // Japan 2002 // 114 min // 0min	ARAG 17:30 // / Farb
HAUS DER JUGEND (HDJ)	STUDENT FORUM: MEDIA ACADEMIES / PART I 12:00 TAMKE Kyoko Christa Sommerer (A/JP)		13:00 Academy of Fine Arts, Prague Anetta Moravčíková (SK/CZ)		STUDENT FORUM: MEDIA ACADEMIES / PART II 15:00 TBU Offshoot Bernard Fapo (D)	
					16:00 AKI Shachide Rie Syuhatsu (NL)	17:00 KEM Kiki Karin Petras (D)

FREITAG 23.04.2004

	12:00	13:00	14:00	15:00	16:00	17:00
LAGERHALLE	SUICIDE 12:00 // Amelko Tronogov / 70 min		OFI) BALANCE 13:30 // 80 min		RETROSPEKTIVE: C. MACLAINE 15:00 // 80min // 60 min	VISIONS OF DELIGHT 16:00 // 95 min
ARTHOUSE 4					EWIGE SCHÖNHEIT 16:30 // Marcel Schwela // 90 min // mit Vorfilm: -KURZfilme-	DIE PI 17:30 //
ARTHOUSE 5					VAMPIRE HUNTER 16:30 // Yoshiki Kawajiri // Japan 2000 // Artime // 105 min // 35mm // Deutsche Fassung	NIWA 17:30 //
HAUS DER JUGEND (HDJ)	TRANSMITTER PART I 12:00 Dr. Karja Kowalek, Uli München // Introduction		13:00 Ken Frelgold (USA) -Doo-Arco	14:00 Tim Fritzen/Chaos Computer Club (D) -Bilderrechte	TRANSMITTER PART II 15:30 Fadelman (D) -Transmitter, Transponder, RTTU	
					16:30 Earle Ruth Gell (E) -The Media House	17:30 -Arts
DGB-GEBÄUDE						

was one of three direct hits on the New Orleans area past 100 years. Almost a Category 5 storm when it ashore at Grand Isle, Betsy had weakened to a Category 3 an hour later when its eye was 35 miles west of New Orleans, battering the city with 125 mph. A storm surge ranging from 8 to 16 feet flooded 5,000 square miles of the coast, topping 8-foot in Chalmette, along the Mississippi River-Gulf Outlet in New Orleans, and at Camp Leroy Johnson on the north shore. The surge also pushed through underneath a levee along the Inner Harbor Navigation Canal, flooding the 9th Ward.



DAMAGE

and widespread in St. Bernard Parish, eastern New Orleans, and the 9th and 12th wards. About 17,000 people were injured and 250,000 displaced. Some buildings survived off their foundations, were carried to the water, or ended up against levees or in the rubble of others. Several slips ran aground on the Mississippi River levees.



SOLUTION

and by public opinion resulting from Betsy, the Army Corps of Engineers began planning for a series of flood control and levee-building projects that were already under way to protect the New Orleans area from future hurricanes that hit the city in 1915 and 1947.



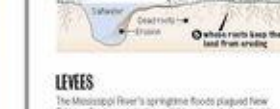
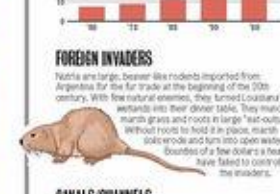
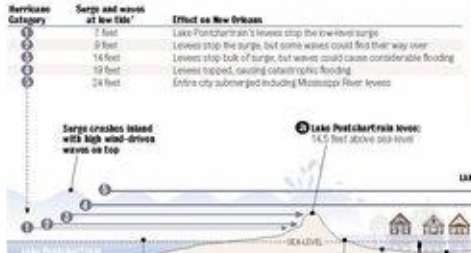
ARE WE REALLY SAFE? ...

NEW ORLEANS MOST RECENTLY DODGED CATASTROPHIC FLOODING IN 1998, WHEN HURRICANE GEORGES CUT ACROSS THE GULF OF MEXICO ON A BEELINE TO THE MOUTH OF THE MISSISSIPPI RIVER. AS HALF THE POPULATION FLED, THE STORM VEERED TO THE EAST AND MADE LANDFALL IN MISSISSIPPI. THE HURRICANE CAUSED FLOODING IN ST. BERNARD PARISH AND ALSO PUSHED WAVES FROM LAKE PONTCHARTRAIN UP AGAINST ITS SOUTH SHORE LEVEES, LEAVING MANY TO PONDER: WHAT IF?



CITY BELOW THE SEA

When a hurricane even stronger than Georges hit New Orleans, Lake Pontchartrain—a foot higher than sea level—will be the city's biggest threat. Surge water from the Gulf of Mexico, topped by towering waves, will swell the lake above levees and cause widespread flooding. A look at average surge levels by category, compared to a cross-section of the city known as the "bowl".

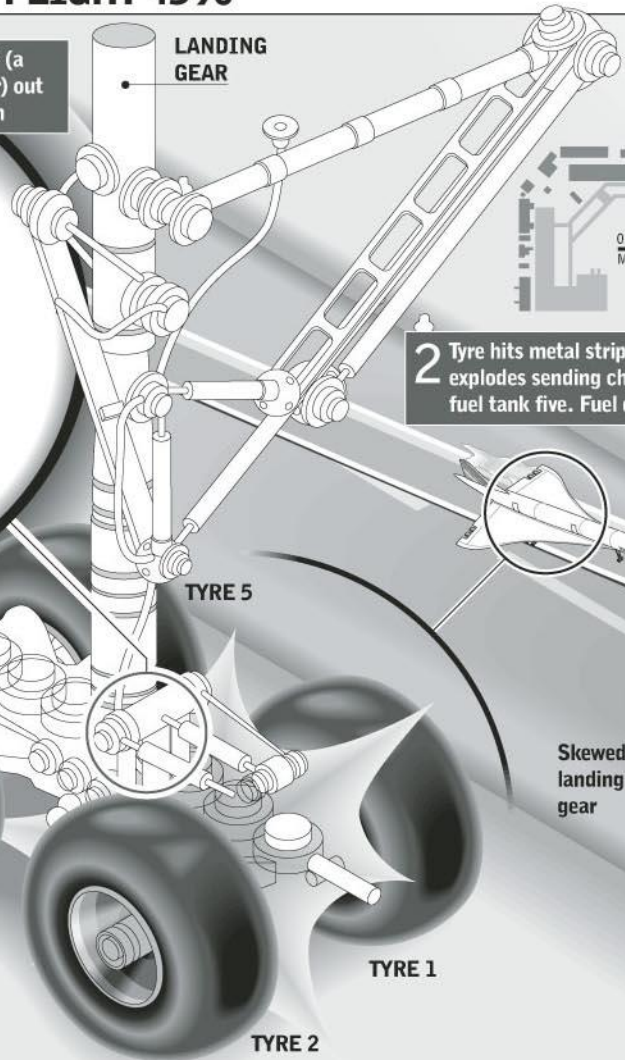
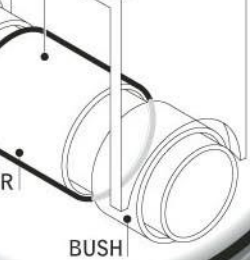


Map: Figures constructed by author using maps, data from FEMA's "What If? Hurricane Georges" and other sources. FEMA files used address shown in this map. All other figures are approximate. Source: USGS Coastal Water Resources Research Institute, Army Corps of Engineers, NOAA.

DISASTER OF FLIGHT 4590

The ground staff leave 'spacer' (a component of the landing gear) out of service – four days before crash

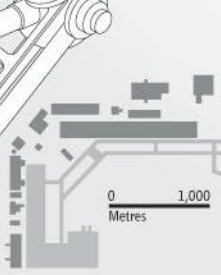
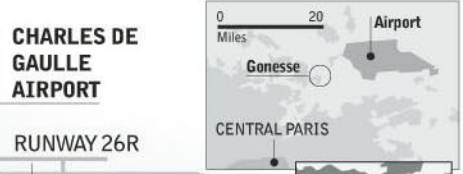
LENGTH 12 inches
DIAMETER 5 inches



2 Tyre hits metal strip on runway and explodes sending chunks of tyre into fuel tank five. Fuel catches fire

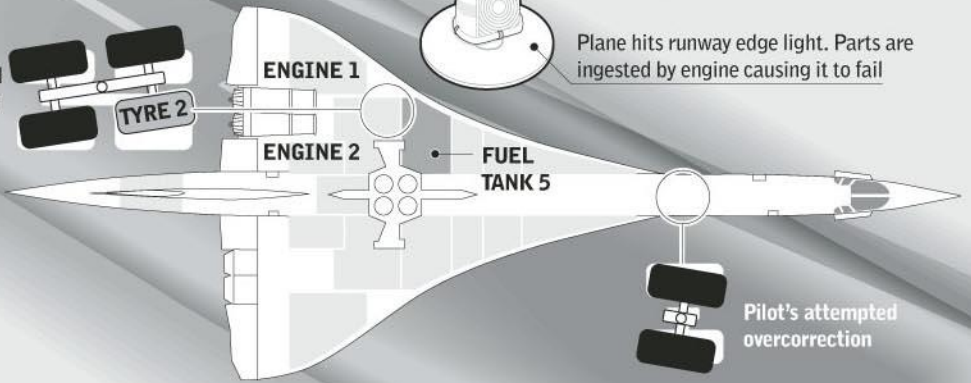
3 Missing spacer may have caused landing gear to skew left, plane then skids towards runway edge and out of control

4 Pilot forced to take-off below recommended minimum speed to avoid ploughing into grass and impact with 747 on taxiway



BOEING 747 WITH JACQUES CHIRAC ONBOARD

Skewed landing gear

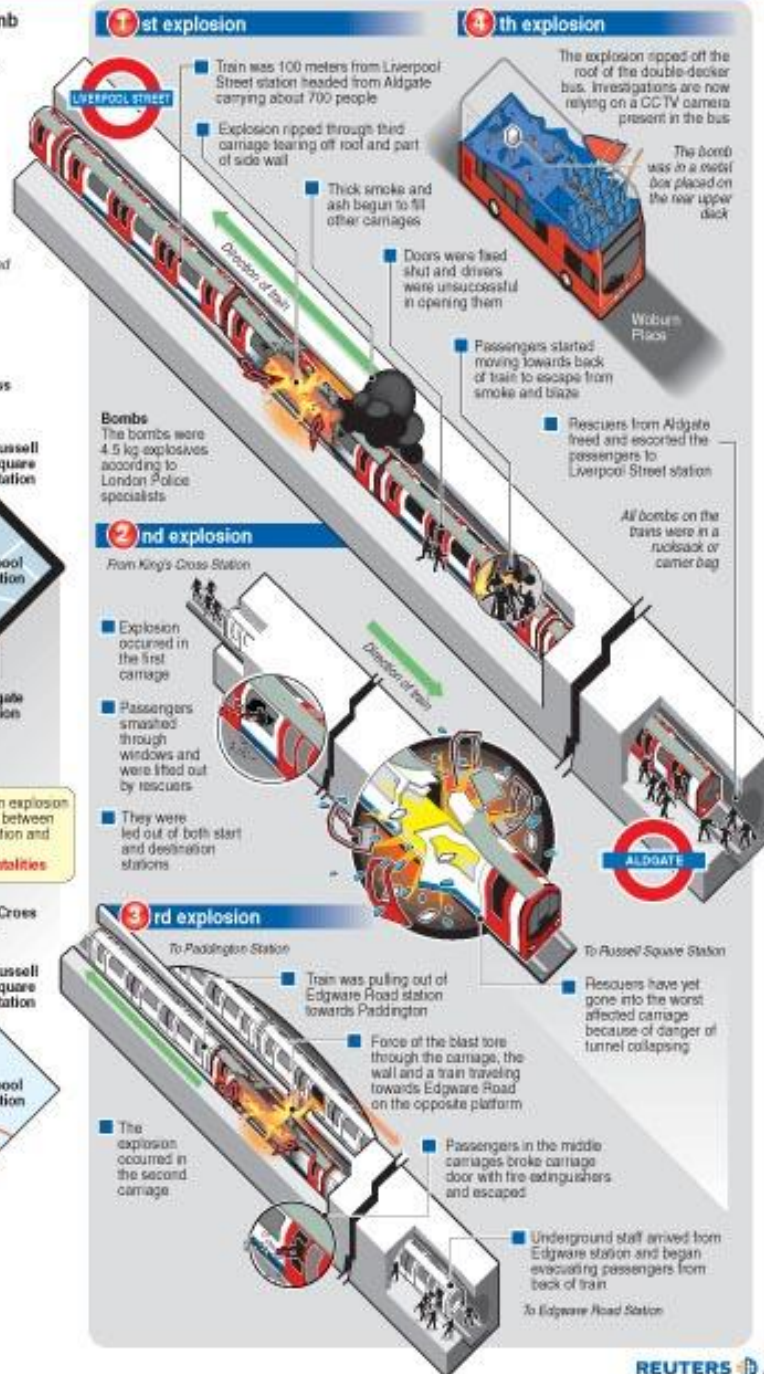
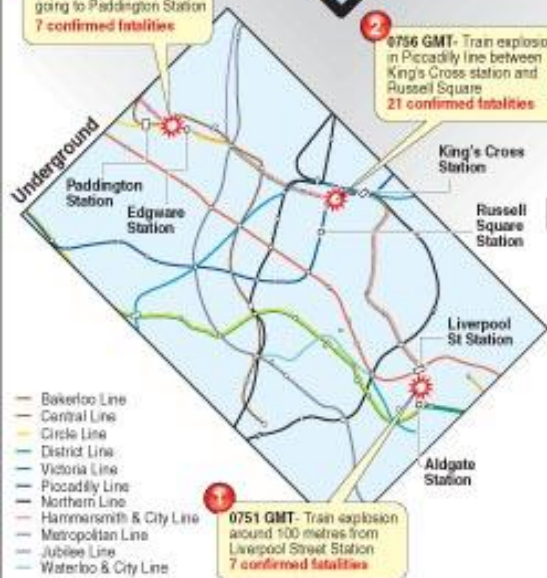


Plane hits runway edge light. Parts are ingested by engine causing it to fail

Pilot's attempted overcorrection

LONDON BLASTS

More than 50 people were killed and 700 injured in bomb attacks on a bus and several underground trains in London on Thursday. Officials believe the blasts bore hallmarks of an al-Qaeda terrorist attack



SUPERintrigante

Perguntas instigantes, respostas surpreendentes

BOCA EM AÇÃO COMO É O TRÁFICO NA FAVELA?

Os pontos de tráfico de drogas, conhecidos como "bocas", operam como empresas, escondidos em favelas e bairros pobres das grandes cidades. Os criminosos se organizam em uma hierarquia preocupada em garantir duas coisas: o abastecimento constante de cocaína, maconha e outros entorpecentes e o sistema de proteção contra a polícia ou quadrilhas rivais.

Para garantir a eficiência do negócio, são contratados diversos funcionários. O esquema de segurança e a acirrada disputa entre traficantes põem em risco a vida de compradores e moradores da favela. "Até chegar à boca, o usuário tem que andar na favela. Ele é avaliado e nem percebe. Se os seguranças pensarem que ele é um policial disfarçado, atiram", diz o delegado Carlos Roberto Alves de Andrade, da Delegacia de Repressão ao Crime Organizado do Departamento de Narcóticos de São Paulo. **5**

por Christian Scott

CRÍME ORGANIZADO

VÁRIOS FUNCIONÁRIOS ESTÃO ENVOLVIDOS NO ESQUEMA DE TRÁFICO

AVIÓZINHOS

Os garotos que levam a droga da boca para os clientes são mais comuns no Rio de Janeiro. Em São Paulo, onde as favelas são planas, a distância entre a boca e o consumidor é pequena e o serviço deles nem sempre é necessário.

ALTO ESCALÃO

Traficantes de maior hierarquia ficam posicionados sobre lajes e barracos, onde podem se proteger melhor e alistar em caso de tentativa de invasão. Carregam fuzis, ideais para combates a longa distância.

A BOCA

Geralmente fica perto de riachos, esgotos ou barrancos, para dificultar a chegada da polícia. Em uma mesma favela, podem existir várias bocas e nem toda a droga fica aqui. Barracos conhecidos como "paiol" são usados para armazenamento de grandes quantidades e da munição da quadrilha.

GERENTE DA BOCA

É responsável pela chegada da droga e pela contratação do pessoal. É ele que comanda toda a operação dentro da favela e, por isso, é sempre alguém de muita confiança do dono da boca.

SEGURANÇAS

A função deles é proteger os arredores da boca da polícia e de traficantes rivais. Eles usam armas próprias para combater a curta distância.

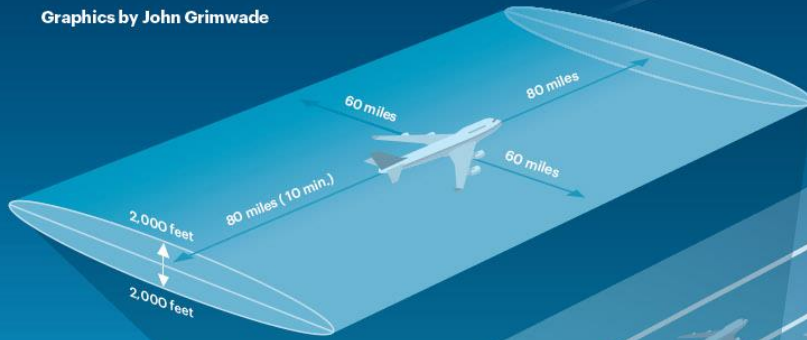
ENQUANTO ISSO...

O dono da "boca" não lida diretamente com a venda da droga. Ele comanda o tráfico de um barraco ou casa afastada, por meio dos gerentes. Bocas bem-sucedidas podem transformar traficantes em homens ricos e bem de vida.

THE TRANSATLANTIC SUPERHIGHWAY

Every day, about 1,200 aircraft fly inside the North Atlantic Organized Track System. Here we follow a typical evening flight from New York's JFK to London's Heathrow as it cruises along the V track at 35,000 feet.

Graphics by John Grimwade



ORGANIZED TRACK SYSTEM

- FLIGHT LEVELS (FEET)**
- 39,000
 - 37,000
 - 35,000
 - 33,000
 - 31,000
 - 29,000

1 GETTING IN LINE
Taking into account airlines' preferred routes, oceanic controllers at Gander, Newfoundland, organize aircraft approaching from different directions into position for the Atlantic crossing. This flight is entering the system on track V at 35,000 feet.

2 SAFETY ENVELOPE
Aircraft must keep minimum distances from one another in the track system, while maintaining constant altitude and speed.

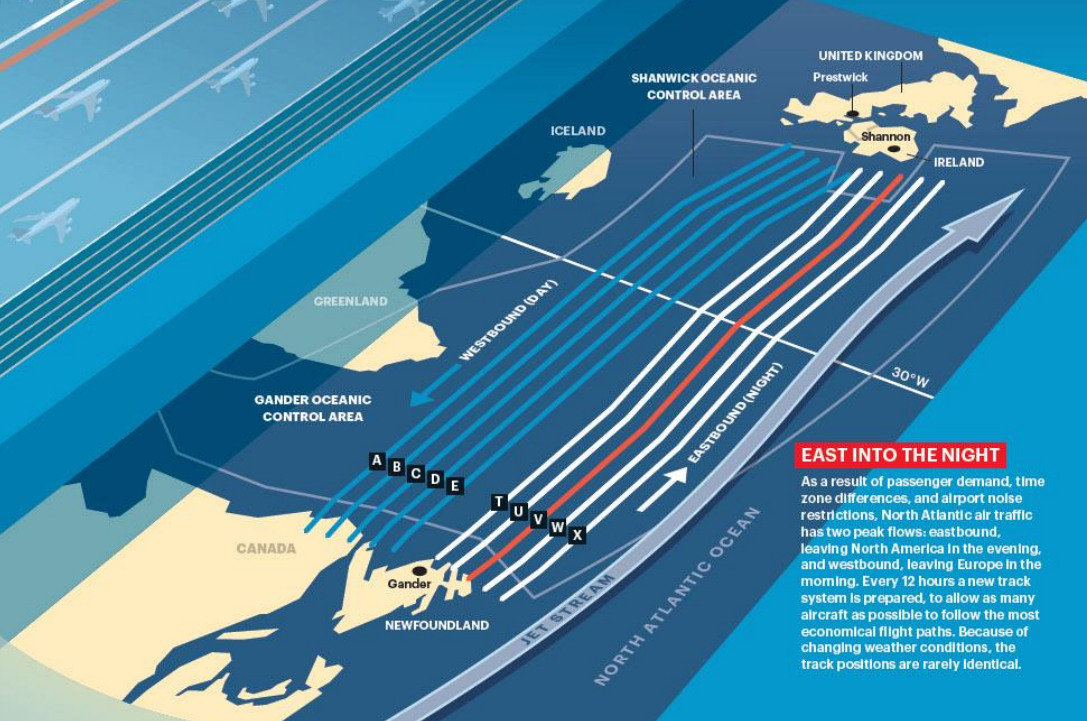
3 POSITION CHECK
Aircraft in oceanic airspace are out of radar contact for about four hours. Position reports are made by radio at every 10 degrees of longitude, and the information is used to update displays at the oceanic control centers.

Concorde flew between 50,000 and 60,000 feet, far above the main traffic flow.

4 HALFWAY POINT
At 30°W, responsibility for the flight is transferred from Gander to Prestwick Oceanic ATIS Traffic Control in Scotland.

Some flight levels are reserved for aircraft flying in the direction opposite the peak flow.

Aircraft crossing the main traffic flow (for example, Madrid to Los Angeles) are routed above or below the track system.



EAST INTO THE NIGHT

As a result of passenger demand, time zone differences, and airport noise restrictions, North Atlantic air traffic has two peak flows: eastbound, leaving North America in the evening, and westbound, leaving Europe in the morning. Every 12 hours a new track system is prepared, to allow as many aircraft as possible to follow the most economical flight paths. Because of changing weather conditions, the track positions are rarely identical.

**BREITLING
EMERGENCY
WATCH**

**SECONDARY
ANTENNA**
Pulling out the
auxiliary antenna
extends the
transmitter's
range without
drawing more
power.

CRYSTAL
The transmitter
and watch works
are separate.
Increasing the
likelihood that
even if the watch
is damaged in a
crash, the
transmitter may
function.

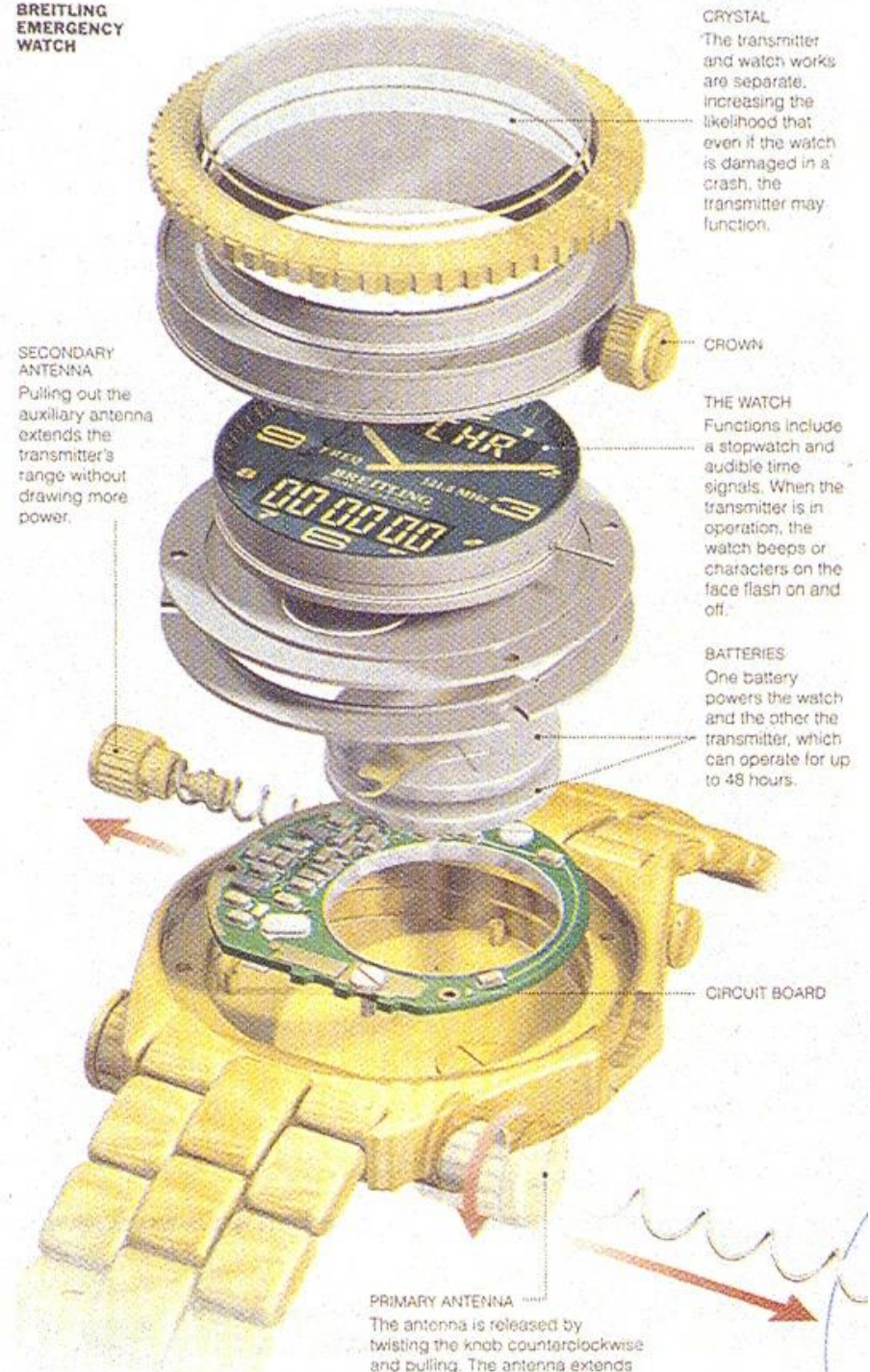
CROWN

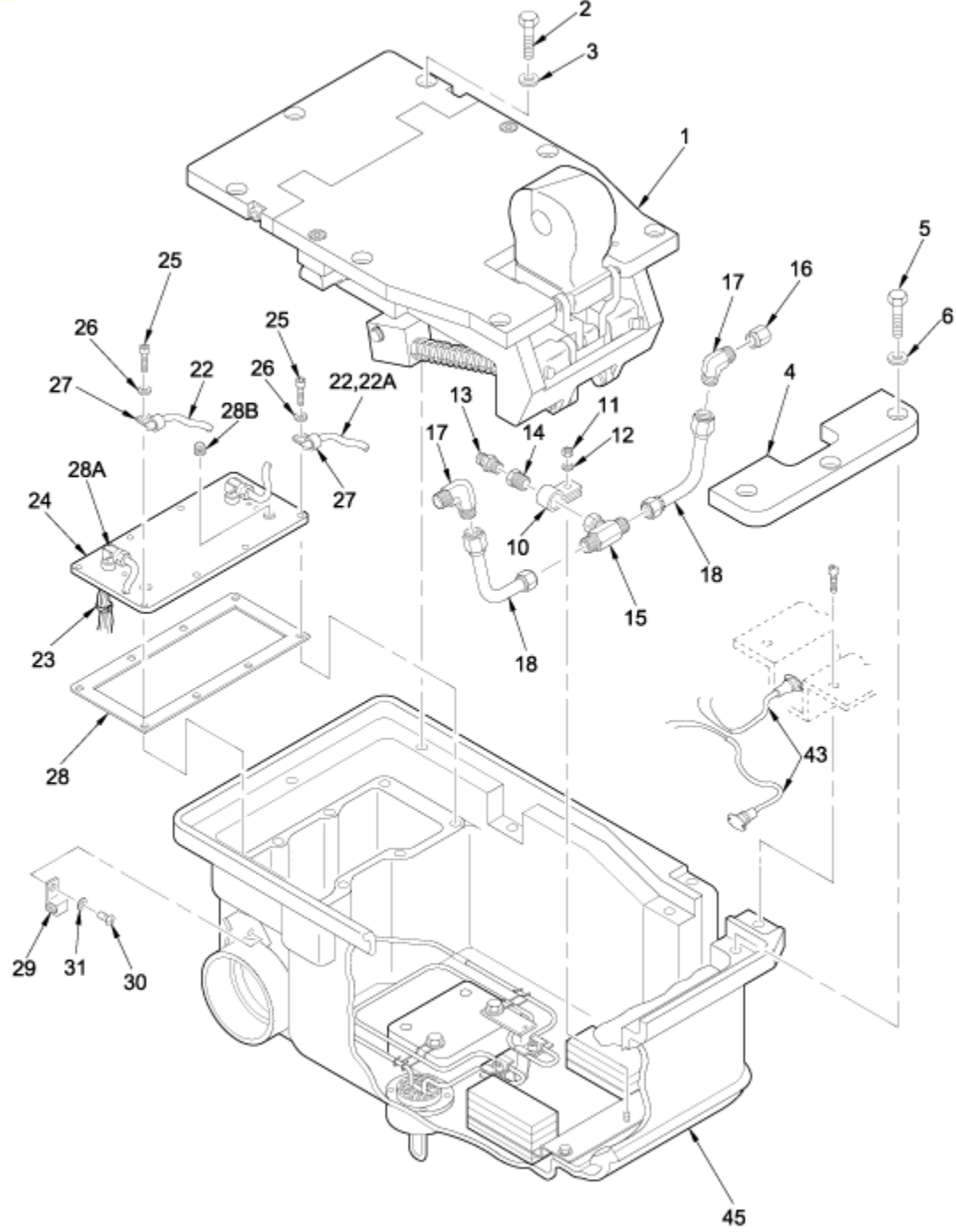
THE WATCH
Functions include
a stopwatch and
audible time
signals. When the
transmitter is in
operation, the
watch beeps or
characters on the
face flash on and
off.

BATTERIES
One battery
powers the watch
and the other the
transmitter, which
can operate for up
to 48 hours.

CIRCUIT BOARD

PRIMARY ANTENNA
The antenna is released by
twisting the knob counterclockwise
and pulling. The antenna extends





JOB LOSSES SOAR; U.S. VIRUS CASES TOP WORLD



Since the coronavirus descended on Brooklyn Hospital Center three weeks ago, the staff has handled over 800 potential cases.

New Data Shows Staggering Toll of Outbreak

This article is by Ben Casselman, Patricia Cohen and Tiffany Hsu. More than three million people filed for unemployment benefits last week, sending a collective shudder throughout the economy that is unlike anything Americans have experienced.

The alarming numbers, in a report released by the Labor Department on Thursday, provide some of the first hard data on the economic toll of the coronavirus pandemic, which has shut down whole swaths of American life faster than government statistics can keep track.

Just three weeks ago, barely 200,000 people applied for jobs; benefits, a historically low number. In the half-century that the government has tracked applications, the worst week ever, with 852,000 so-called initial claims, had been in 1982. Thursday's figure of nearly 3.3 million set a grim record. A large part of the economy had collapsed," said Ben Hertz, executive director of IHS Markit, a business data and analytics firm.

The numbers provided only the first hint of the economic calamity in progress. Even comparatively optimistic forecasters expect millions more lost jobs, and with them foreclosures, evictions and bankruptcies. Thousands of businesses have closed in response to the pandemic, and many will never reopen. Some economists say the decline in gross domestic product this week could rival the worst years of the Great Depression.

And there was fresh evidence on Thursday of the relentless nature of the virus itself. Cases in the United States now exceed 80,000, the most of any nation, even China and Italy, according to a New York Times database. More than 1,000 deaths across the country have been linked to the virus, at least 160 million people are

Labeling Regions by Risk President Trump told governors he planned to classify counties as red, yellow or green, according to the risk of coronavirus infection. Page A11.

Under Trump, Unfilled Posts Hinder Action The coronavirus descended on Brooklyn Hospital Center three weeks ago, the staff has handled over 800 potential cases. Page A11.

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Unfilled Posts Force Scramble By Washington

By Jennifer Steinhilber and Zolan Kanno-Youngs WASHINGTON — Of the 75 senior positions at the Department of Homeland Security, 29 are either vacant or filled by acting officials, including Chad F. Work, the acting secretary who recently was unable to fill a Senate committee how many respirators and protective face masks were available in the United States.

The National Park Service, which like many federal agencies has a large number of vacant positions, tried this week to fill the job of a director for the national capital region after borders of visitors flocked to see the cherry blossoms near the National Mall, creating a potential public health hazard as the coronavirus continues to spread.

At the Department of Veterans Affairs, workers are scrambling to order medical supplies on Amazon as they face a lack of experience in disaster responses, asked to prepare for the onslaught of patients at its medical centers. Ever since President Trump came to office, a record high turnover and unfilled jobs have emptied offices across wide swaths of the federal bureaucracy. Now, current and former administrators say the coronavirus has exposed those findings as never before. Continued on Page A11.

Weekly unemployment claims



Source: Bureau of Labor Statistics

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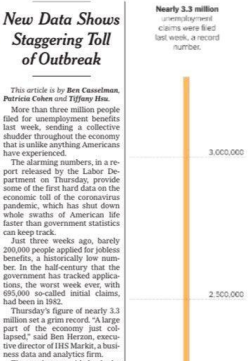
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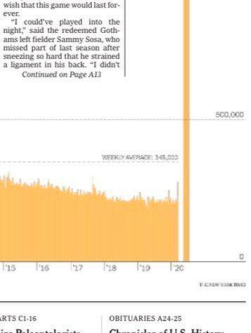
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Source: Johns Hopkins University



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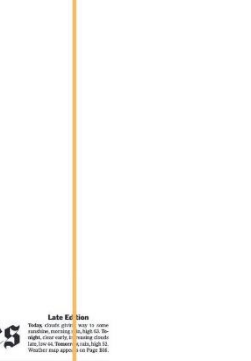
Source: Bureau of Labor Statistics



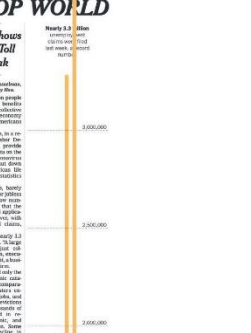
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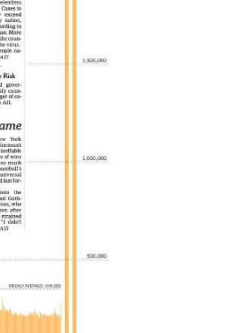
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Armed With Sewing Machines With hospitals desperate for masks, people are pulling out their sewing machines to fill the void. PAGE B1

A Gusher Can't Be Contained A volcanic eruption between supply and demand for oil means the world is running out of places to store it. PAGE B3

Brushing Aside a Slaughter Russia and China, which often revel in grudges against other countries, are employing selective memory to address a massacre that occurred on their border in 1904. PAGE A8

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Oliver Byrne's *Elements of Euclid*. 1847



THE complements


 and  of the parallelograms which are about the diagonal of a parallelogram are equal.



Q. E. D.







TO a given straight line (—) to apply a parallelogram equal to a given tri-


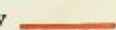


angle (), and having an angle equal to a given rectilinear angle

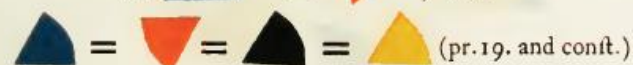
().



Make  =  with  =  (pr. 42.)

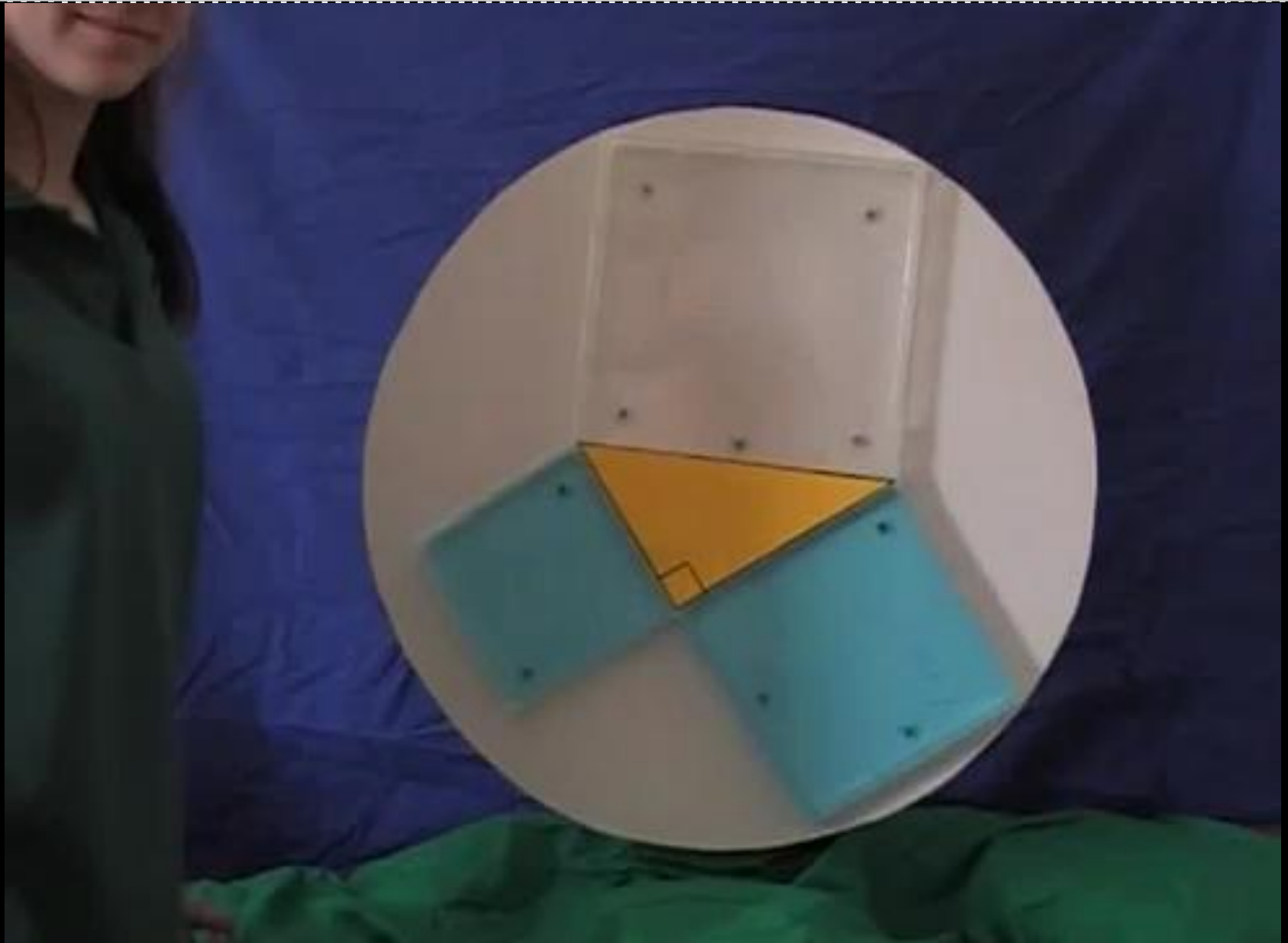
and having one of its sides ----- conterminous with and in continuation of ———.

Produce ——— till it meets  || ----- draw  produce it till it meets ----- continued; draw  || ----- meeting  produced, and produce -----.

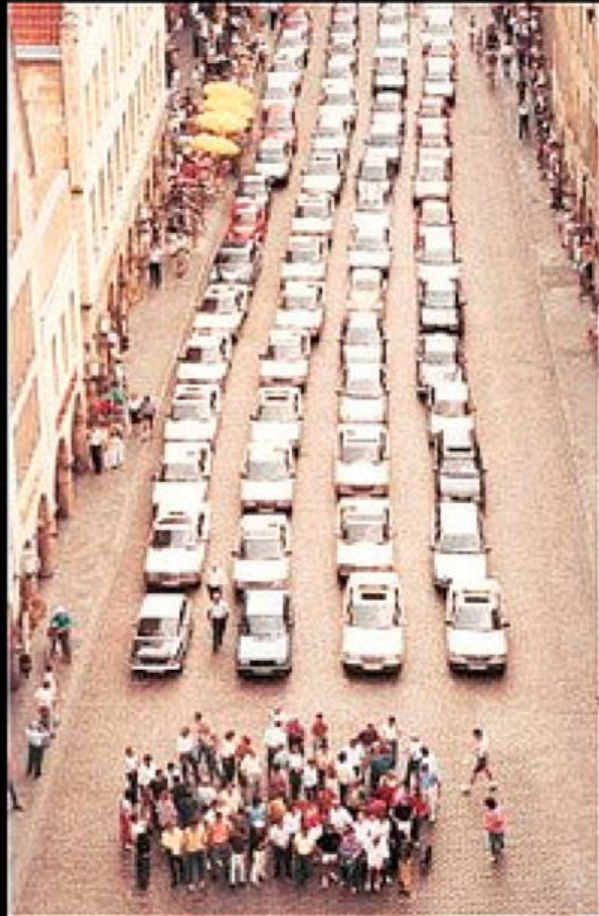


Q. E. D.

A tangible visualization of Pythagorean theorem



space required to transport 60 people



car



bus



bicycle

Nadeem Haidary's visualization of caloric consumption per capita



PIZZAEXPRESS



1 car space = 10 bicycles



Hungry Planet: What The World Eats – Peter Menzel

<https://time.com/8515/what-the-world-eats-hungry-planet/>



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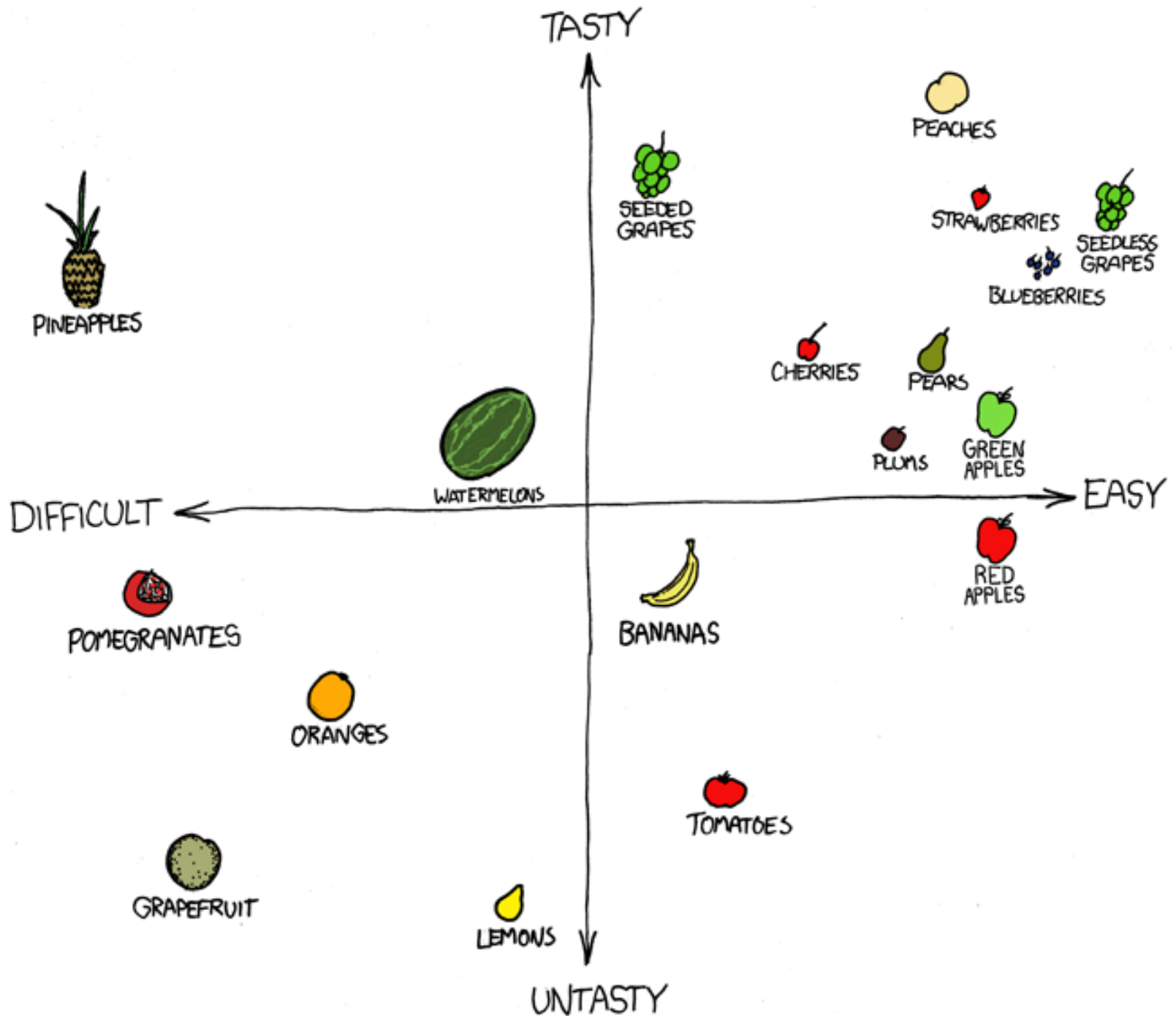
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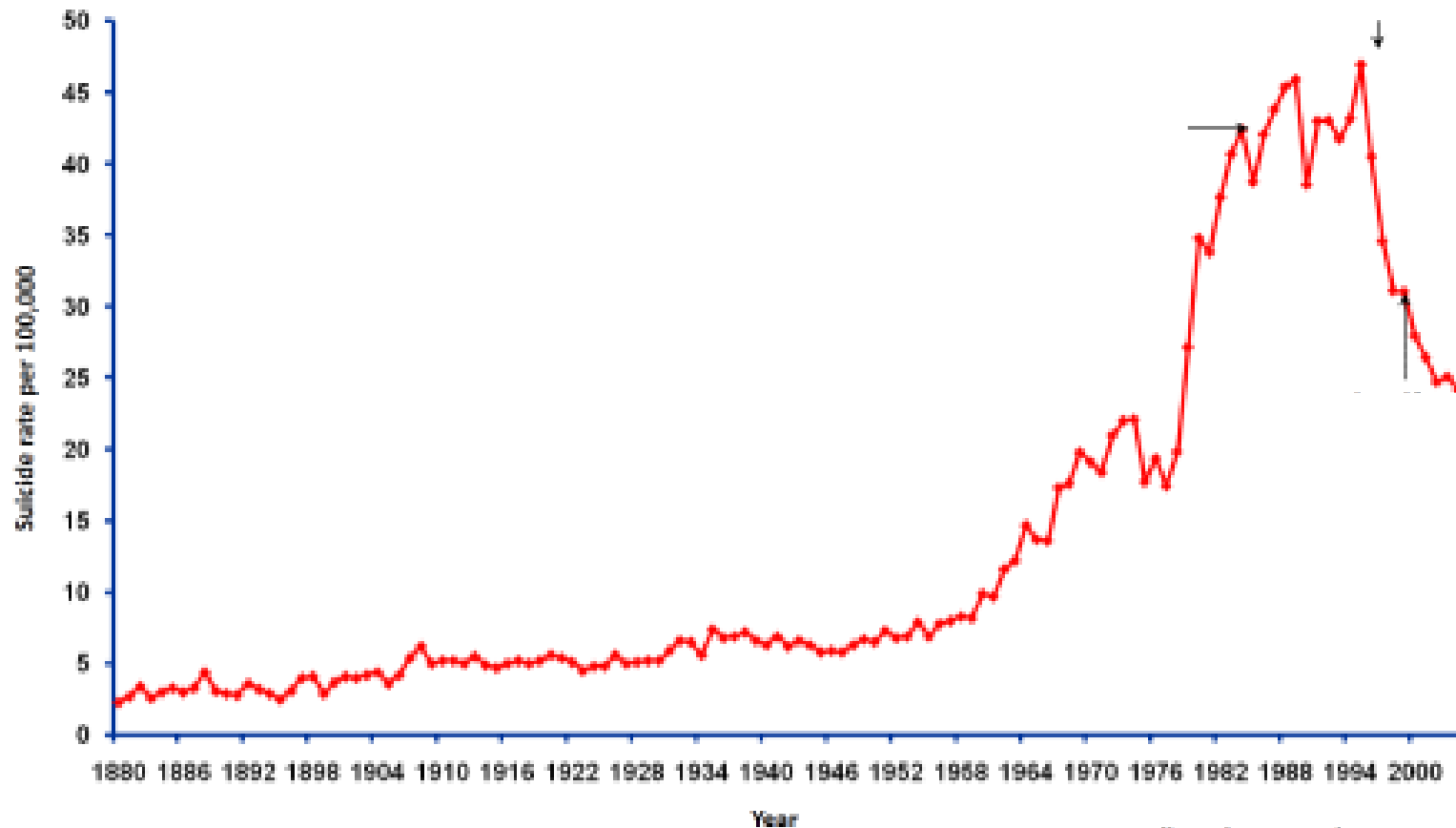


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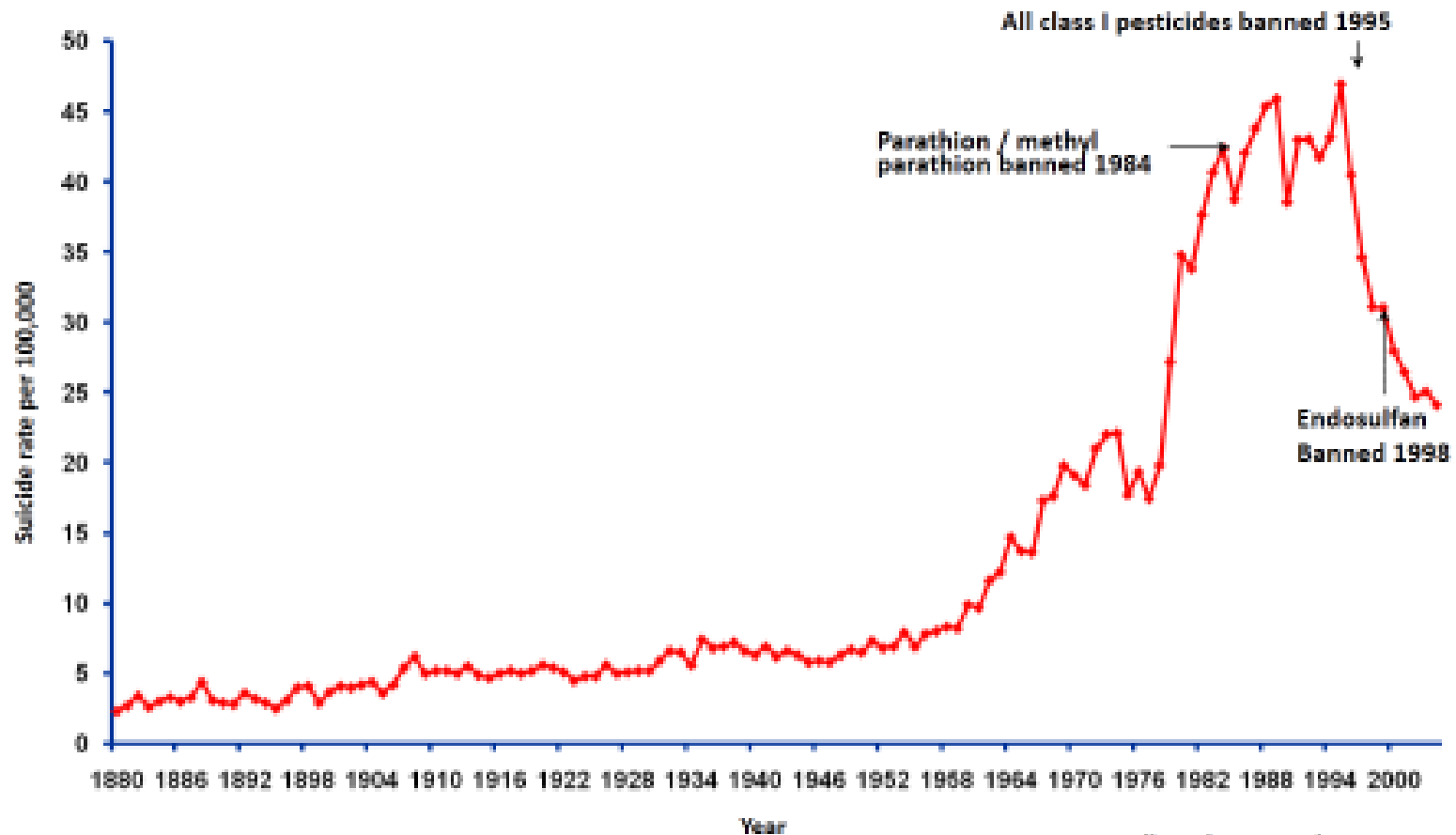


Suicide rates in Sri Lanka 1880-2005



Gunnell *et al*, *Int J Epid* 2007

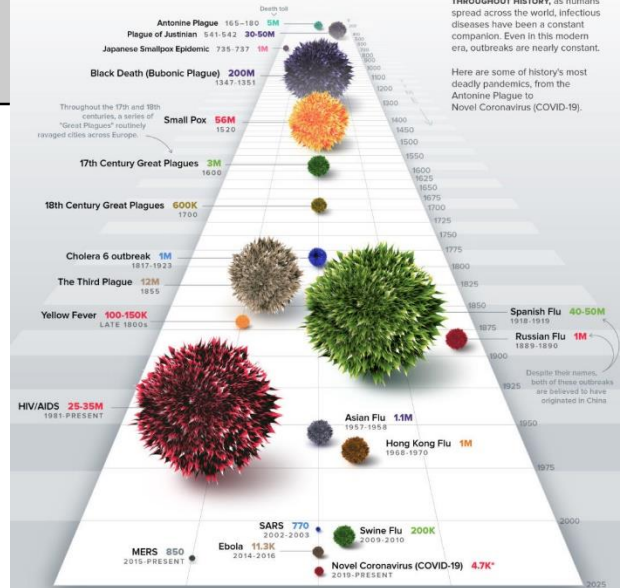
Suicide rates in Sri Lanka 1880-2005



Assignment 1

HISTORY OF PANDEMICS

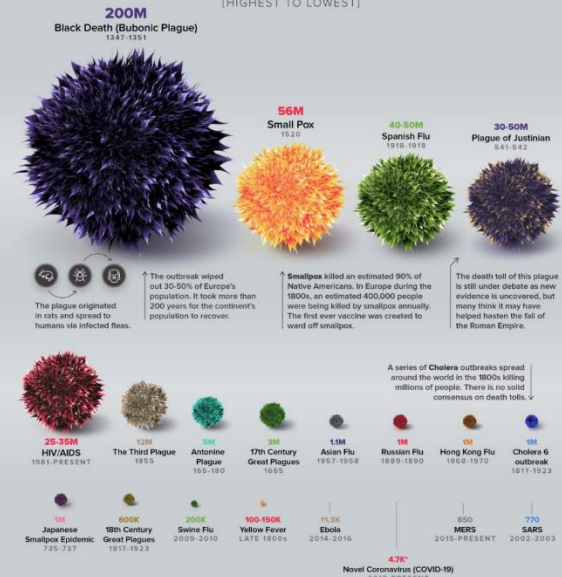
PAN-DEM-IC (of a disease) prevalent over a whole country or the world.



THROUGHOUT HISTORY, as humans spread across the world, infectious diseases have been a constant companion. Even in this modern era, outbreaks are nearly constant.

Here are some of history's most deadly pandemics, from the Antonine Plague to Novel Coronavirus (COVID-19).

DEATH TOLL [HIGHEST TO LOWEST]



<https://www.visualcapitalist.com/history-of-pandemics-deadliest/>

Assignment 1

- Comparison of length, area, or volume?
- Fuzzy edges
- Colour coding?
- Shape coding?
- Semantic coding?
- *Ponzo illusion* (linear perspective - unless blobs are created inside some strictly observed three-dimensioned model of space)
- Annotations?
- Should it be relative to time? How does 1 million in 6 years compare with half a million in 6 weeks?
- Should it be adjusted for era? (5 million deaths from 165 to 180 AD would be something like 180 million today)
- 7 of them are caused by bacteria, not viruses

