

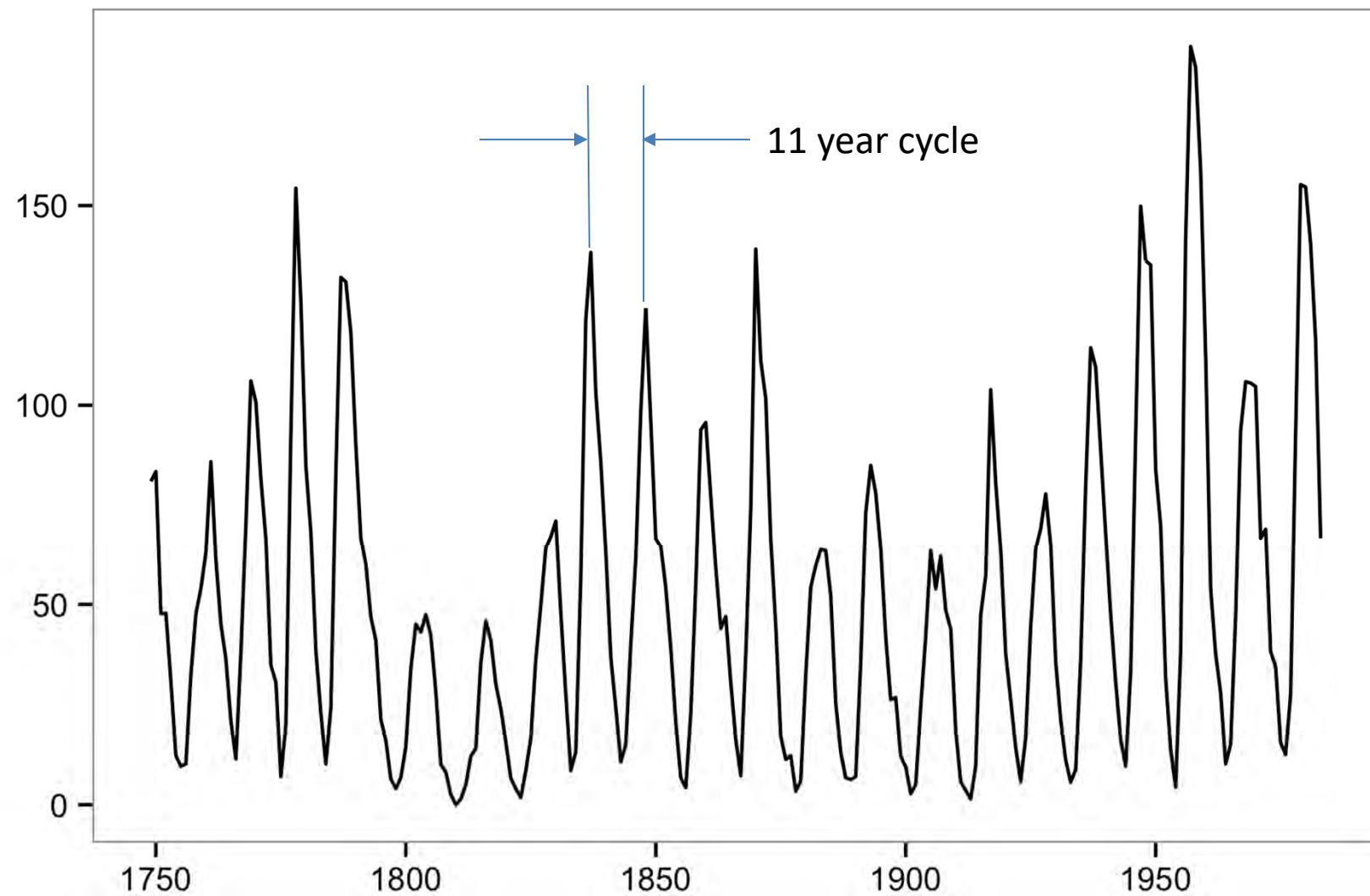
# Scales

Robbins (2013) *Creating More Effective Graphs*

Wainer (2000) Graphical failures: How to display data  
badly, in *Visual revelations*

# Fig 7.1 Sunspot Data

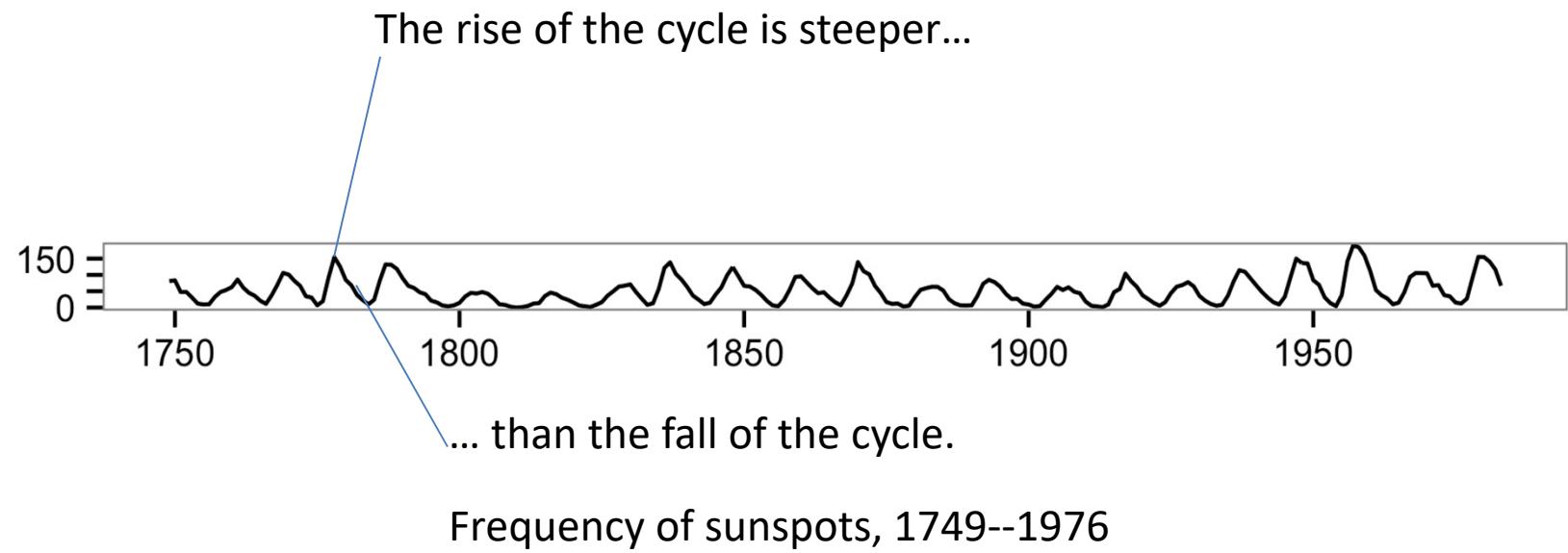
Aspect ratio



Frequency of sunspots, 1749--1976

# Fig 7.1 Sunspot Data

Aspect ratio

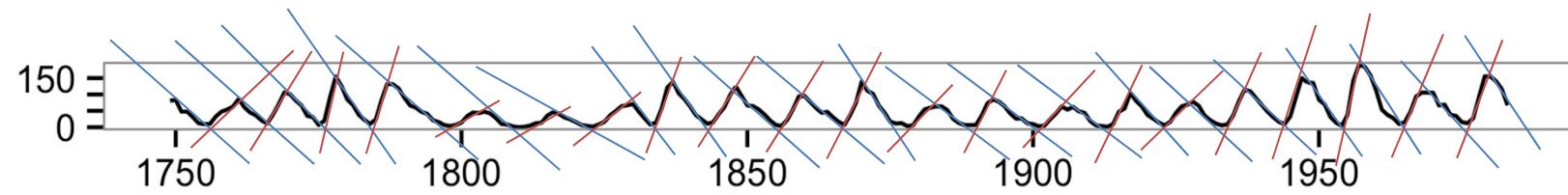


# Fig 7.1 Sunspot Data

Aspect ratio

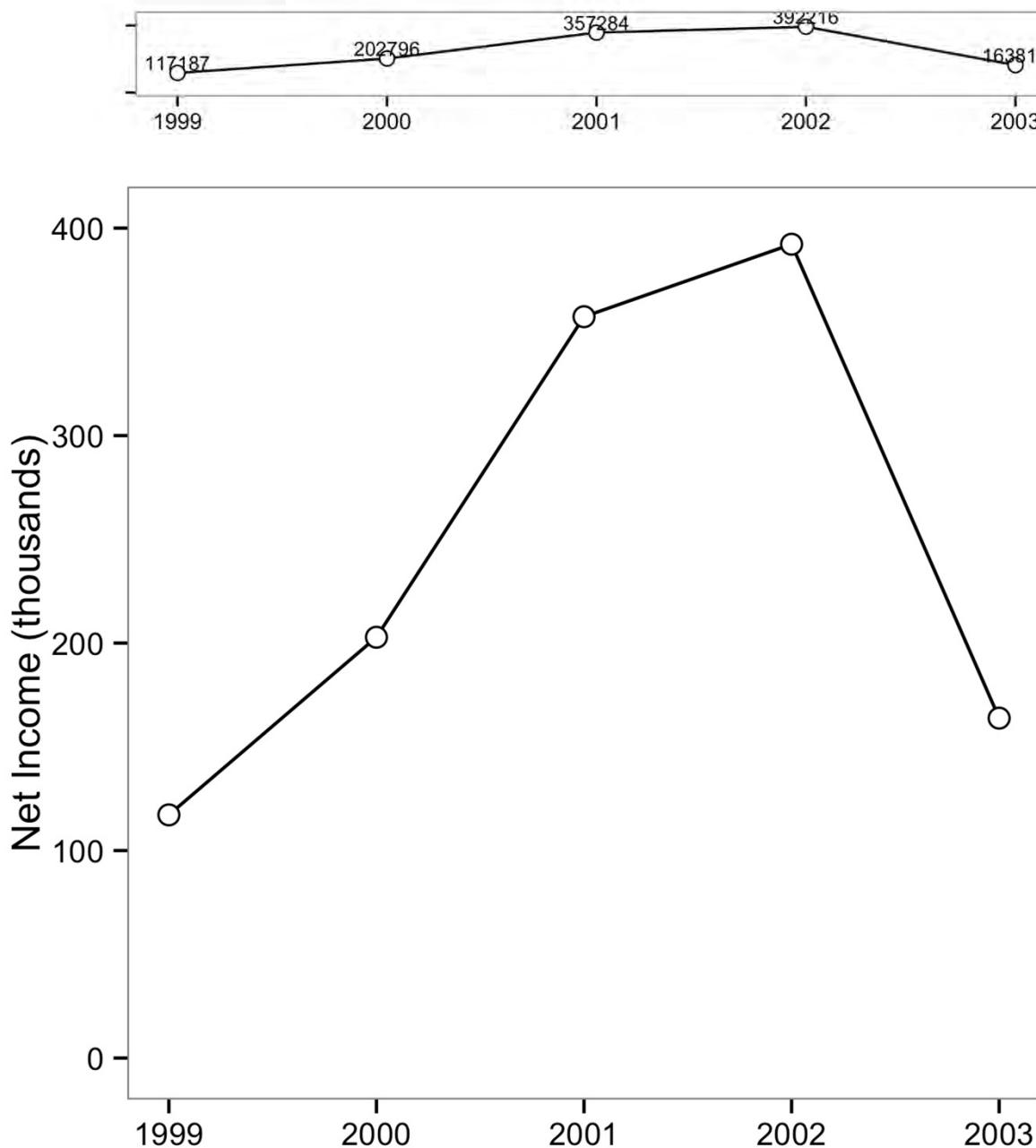
## Banking to 45

Selecting an aspect ratio such that the median (or mean) slope is approximately 45 degrees



Frequency of sunspots, 1749--1976

**Fig 7.2 Annual Report:**



**Banking to 45**

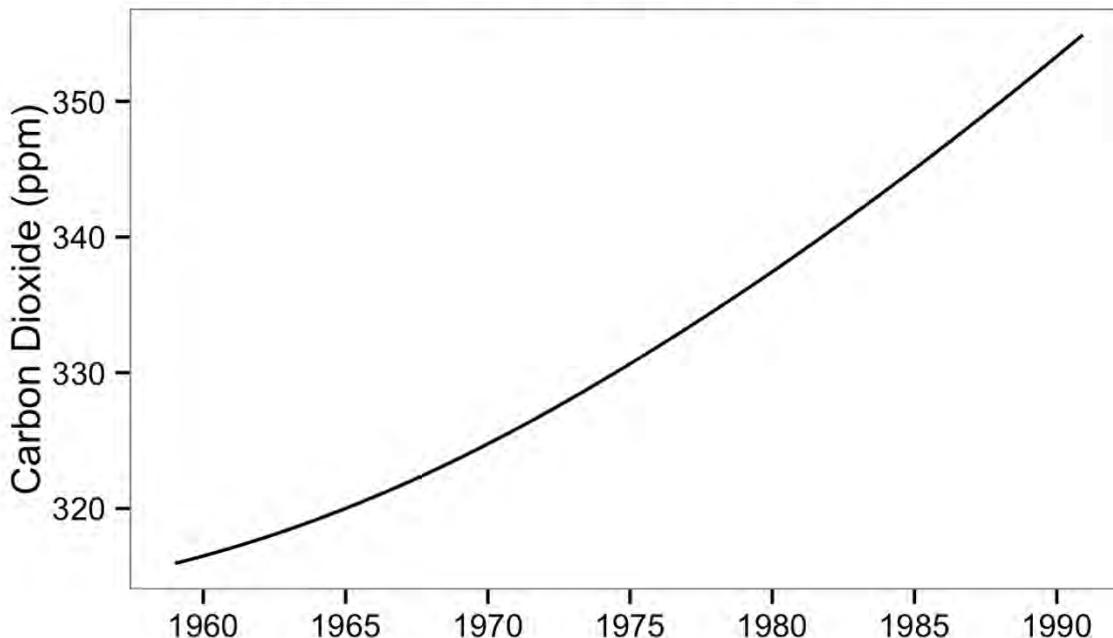
can also be misused to conceal information...

... in this case, a sharp drop in revenue

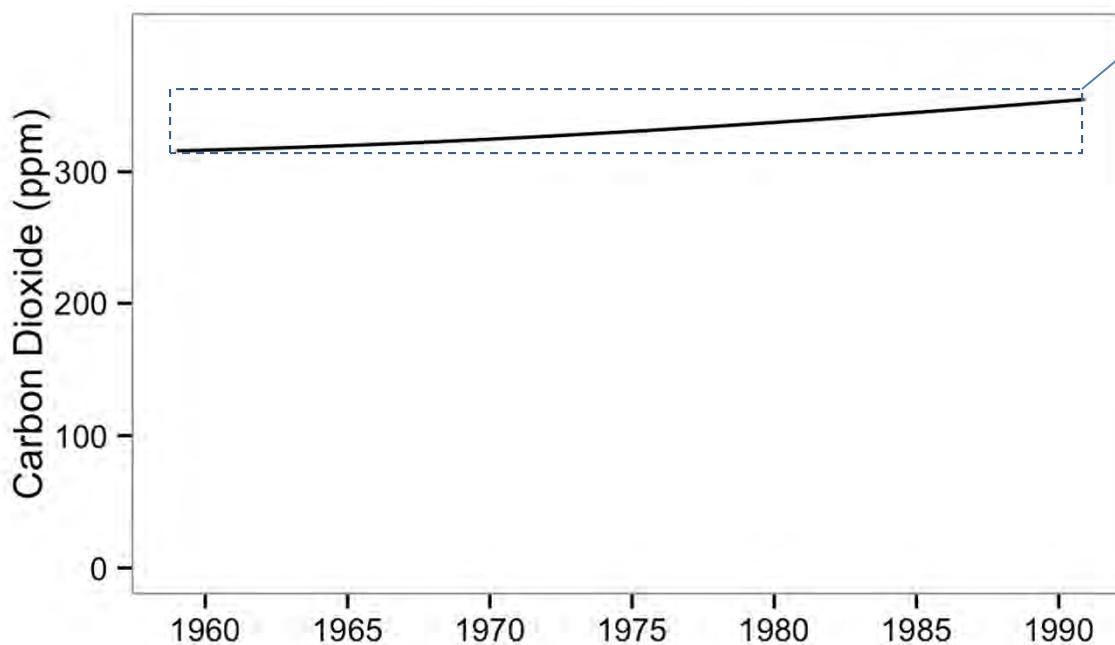
**Aspect ratio**

## Fig 7.3 Carbon Dioxide Data

Zero baseline



The need for zero is not so compelling that we should allow its inclusion to ruin the judgement of the variation in the data.



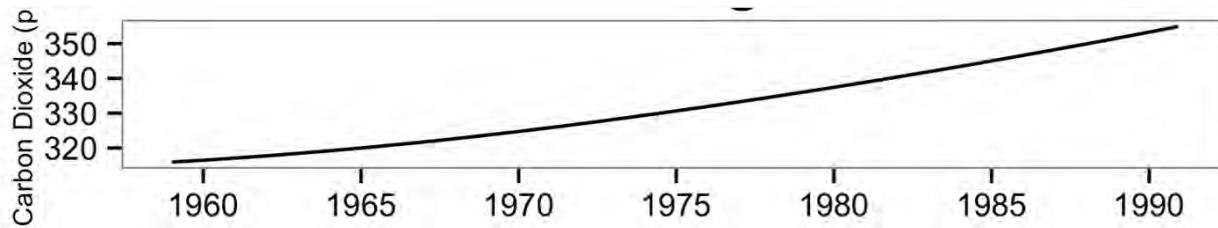
Aspect ratio is the height to width of the data rectangle

Including the zero origin conceals information

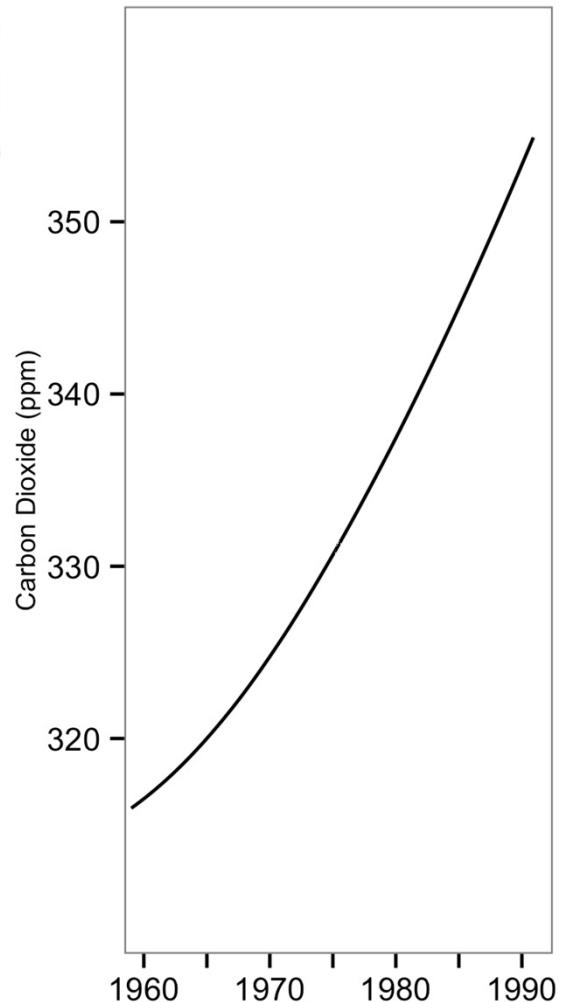
A favorite claim of climate deniers is that zero must be shown.

**Fig 7.4 Carbon Dioxide: Aspect Ratio Changed**

**Aspect ratio**



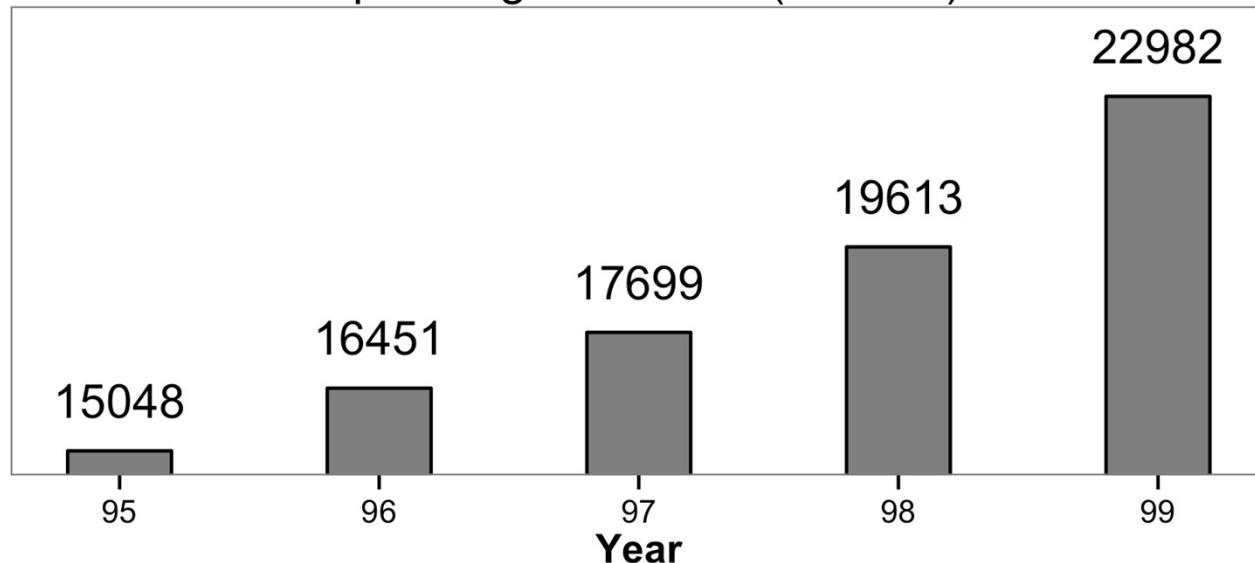
Even **without a zero** baseline,  
**aspect ratio** can be  
manipulated to spin the story



## Fig. 7.5 Annual Report Bar Chart: No Zero

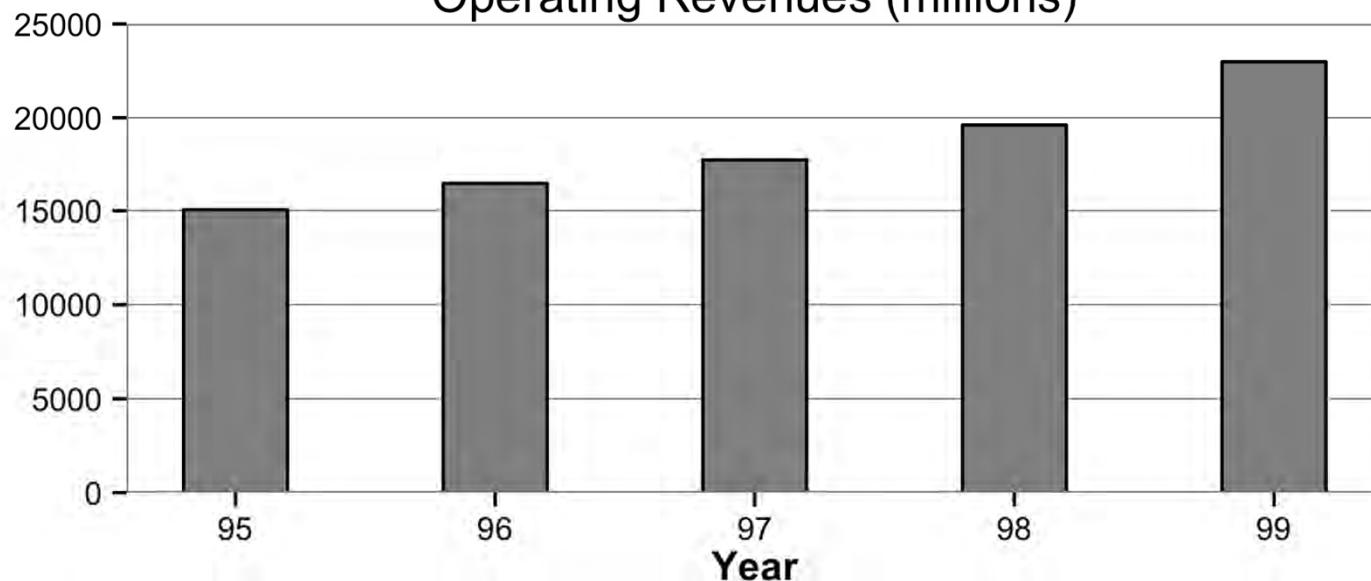
Zero baseline

Operating Revenues (millions)



No zero baseline

Operating Revenues (millions)

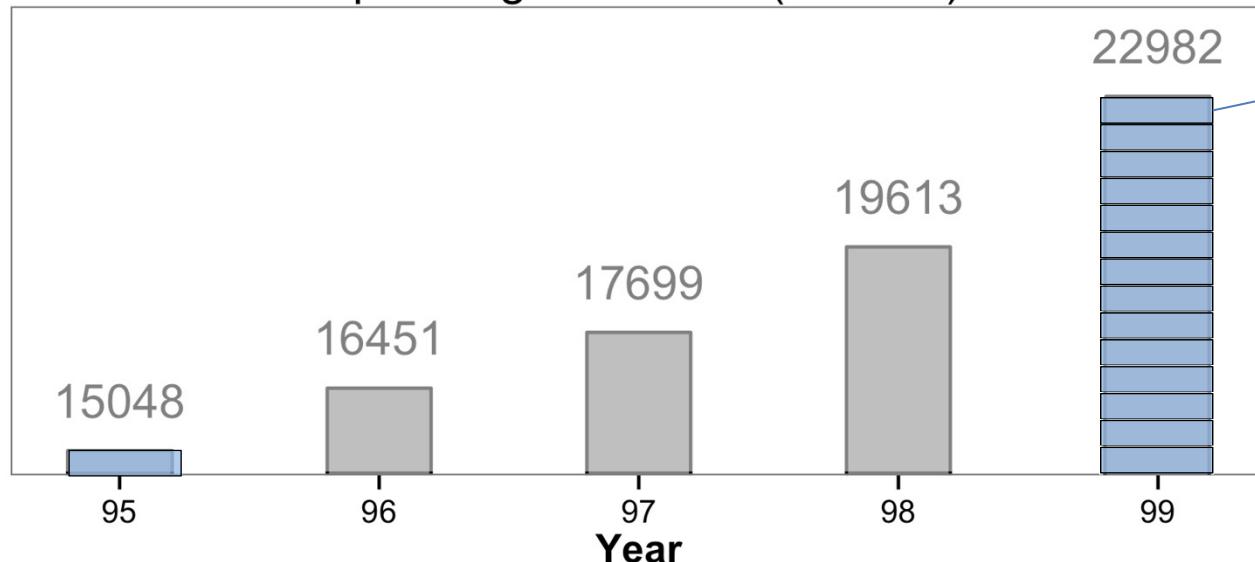


With zero baseline

## Fig. 7.5 Annual Report Bar Chart: No Zero

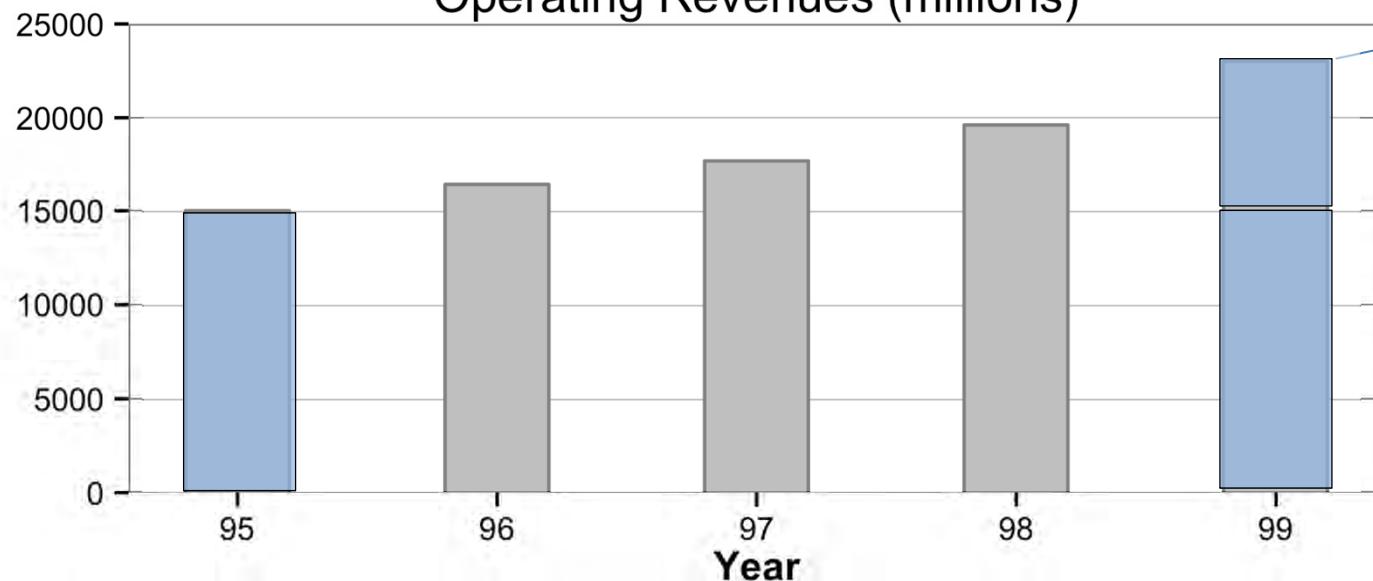
Zero baseline

Operating Revenues (millions)



Appears to be  
14x the 1995  
revenue

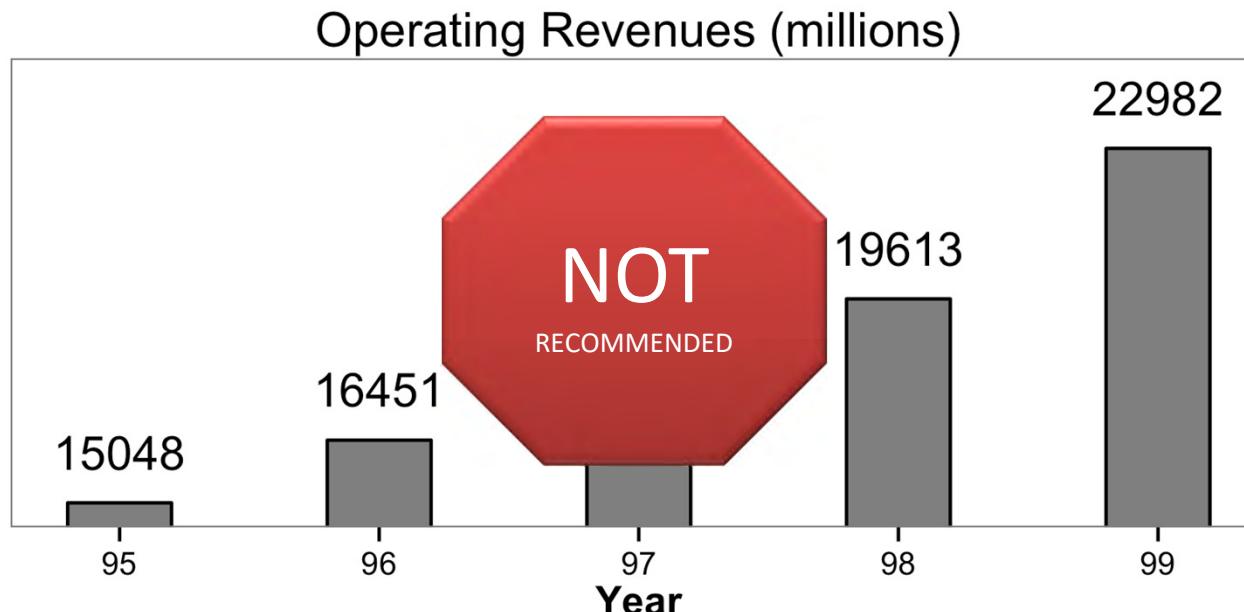
Operating Revenues (millions)



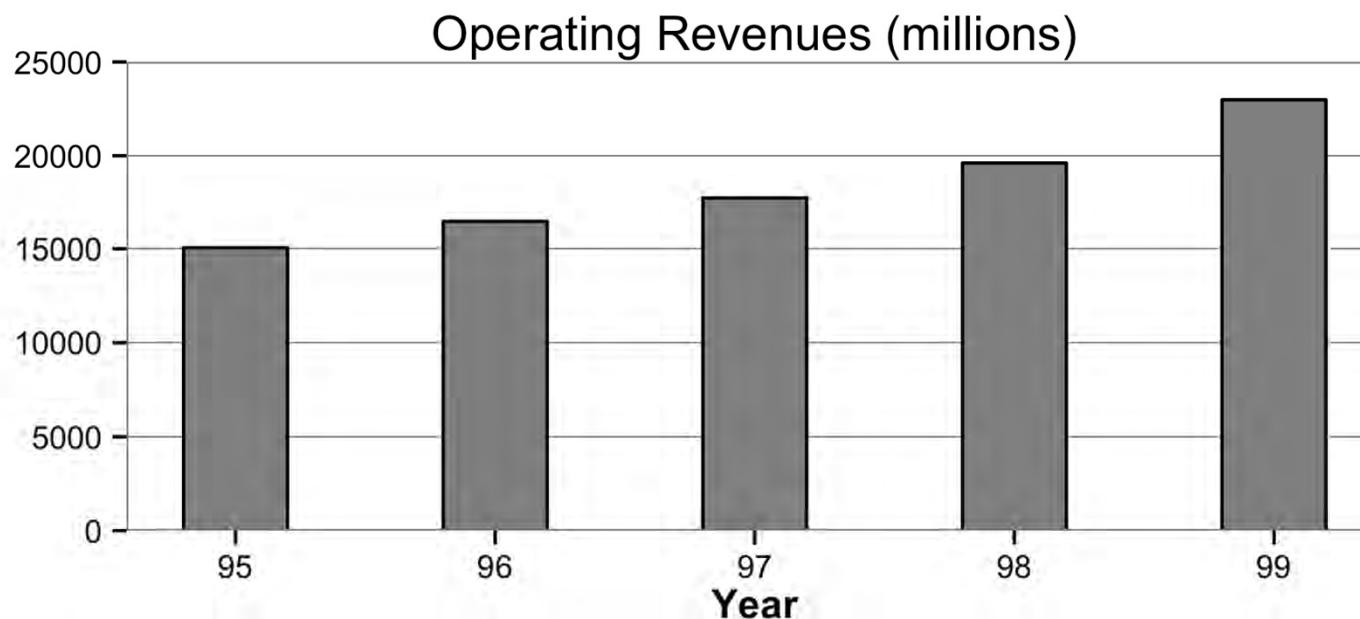
Is actually  
1.5x the 1995  
revenue

## Fig. 7.5 Annual Report Bar Chart: No Zero

Zero baseline



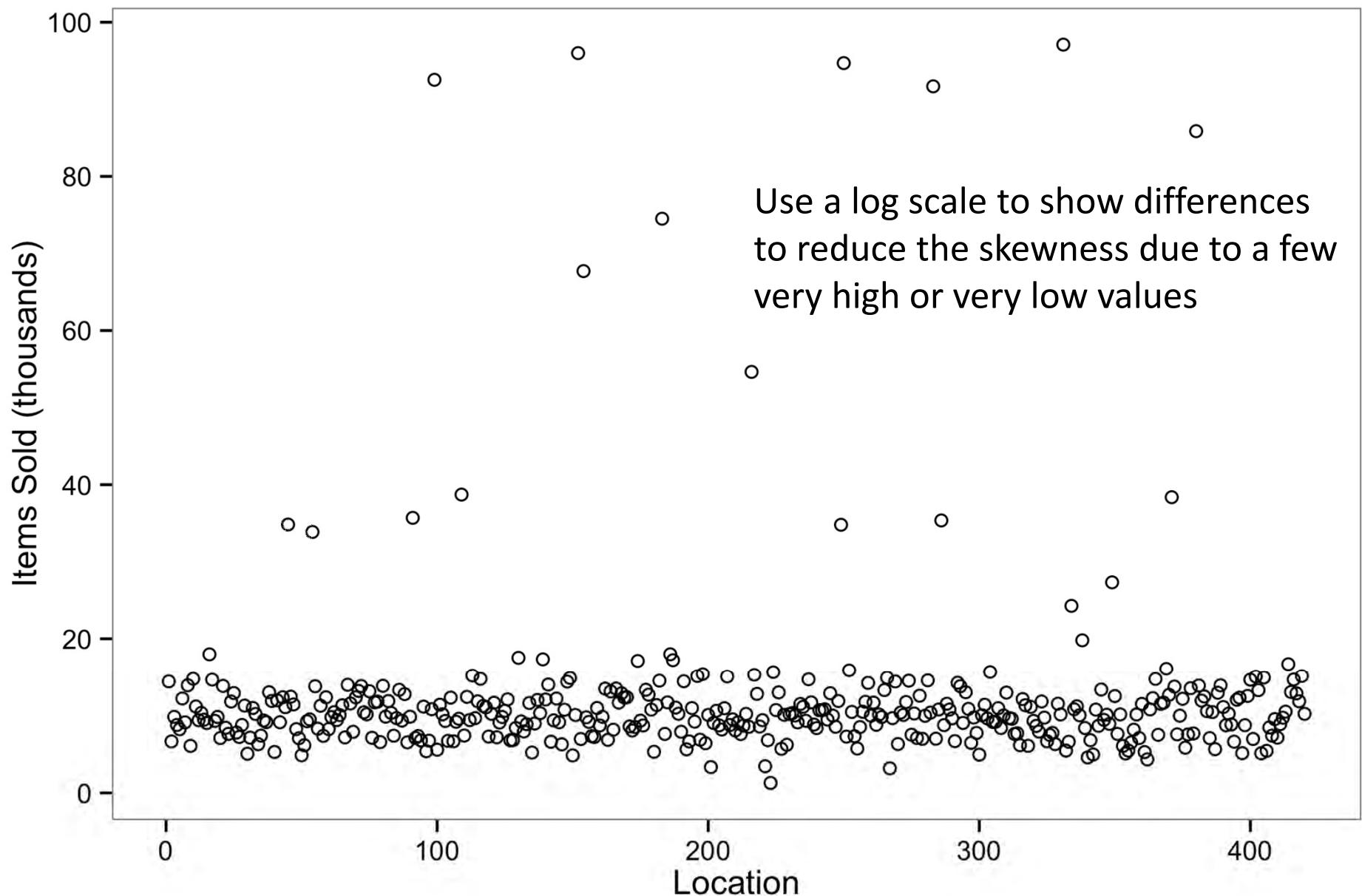
Bars without a zero distort the comparison



If you use bars, they must have a zero baseline.

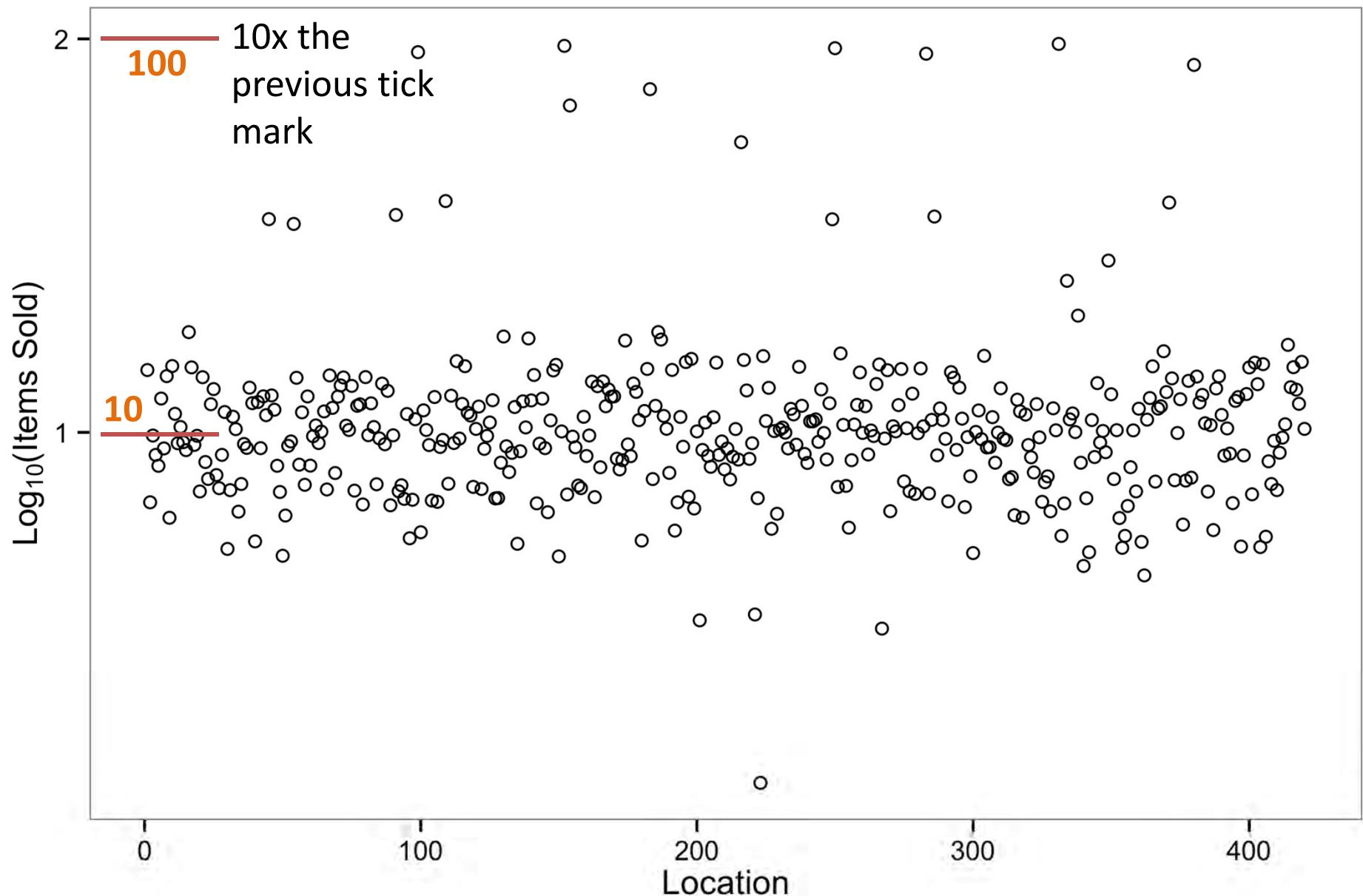
Log scale

## Fig 7.7 Sales Data



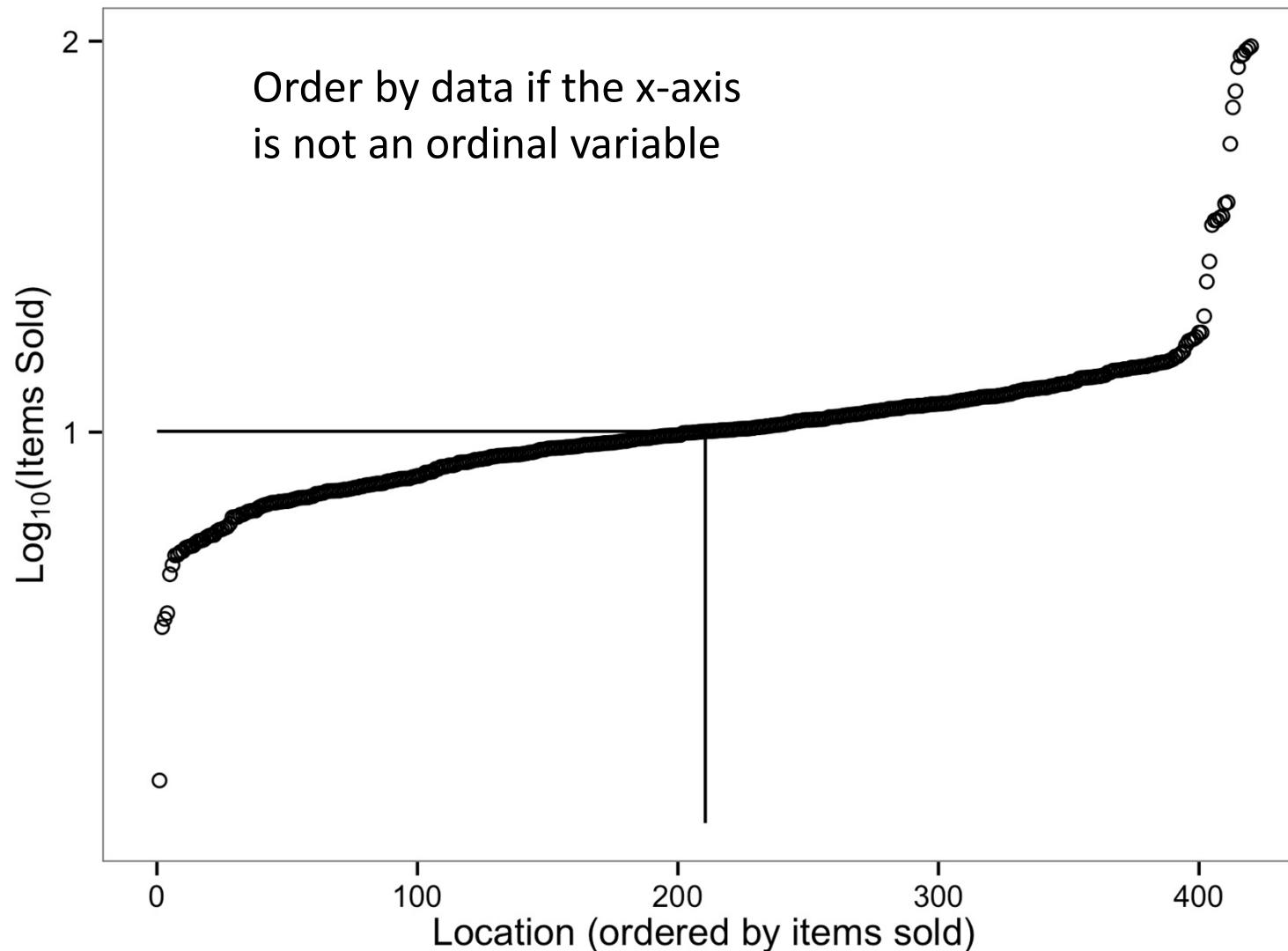
# Log scale

## Fig 7.8 Sales Data: Logarithmic Scale



Log scale &  
ordered data

**Fig 7.9 Sales Data: Ordered Data  
with Logarithmic Scale**



Linear scale with a scale-break

## 7.13 Sales Data: Full Scale Break

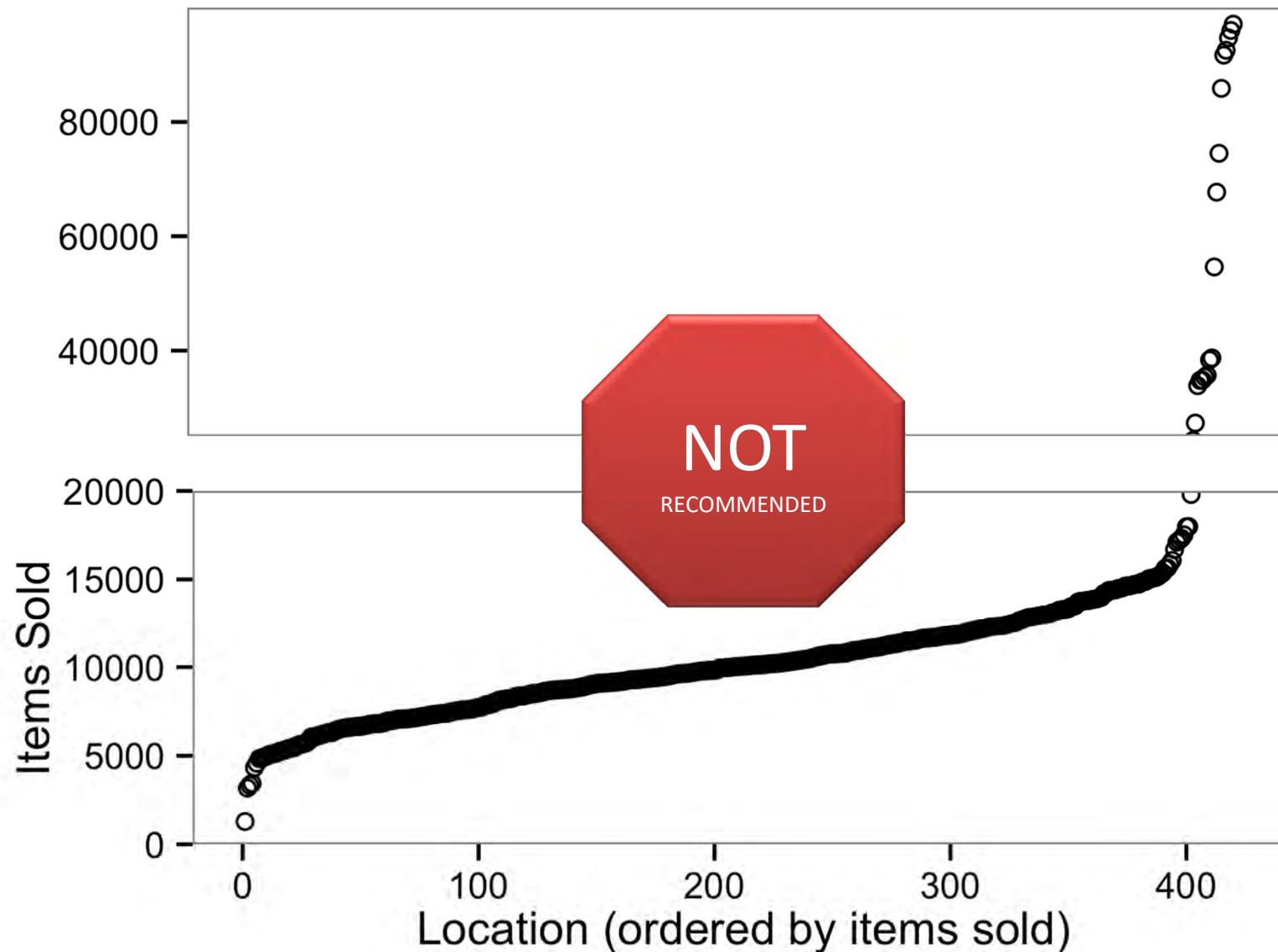
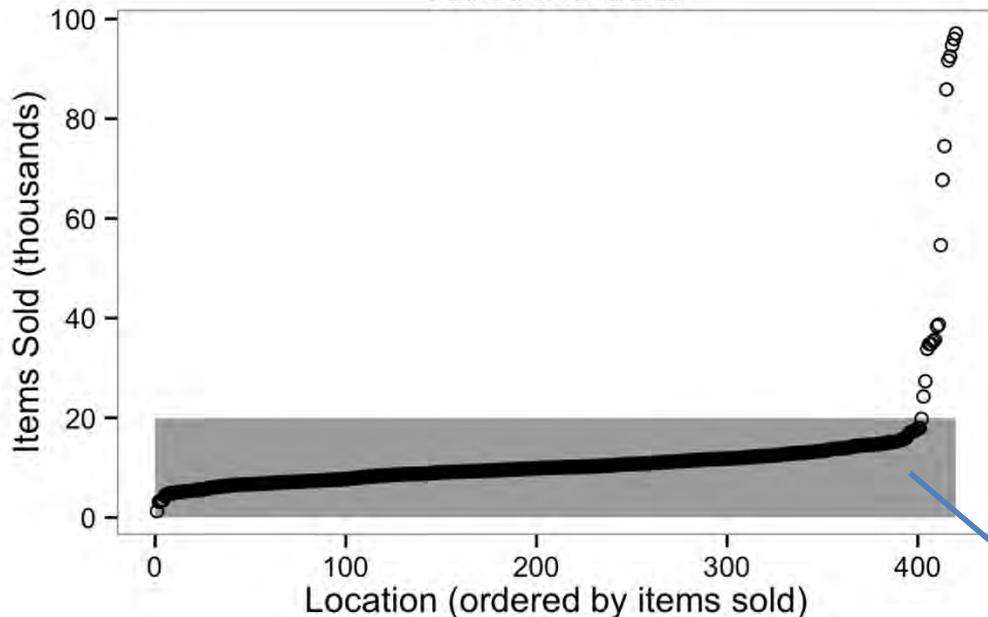


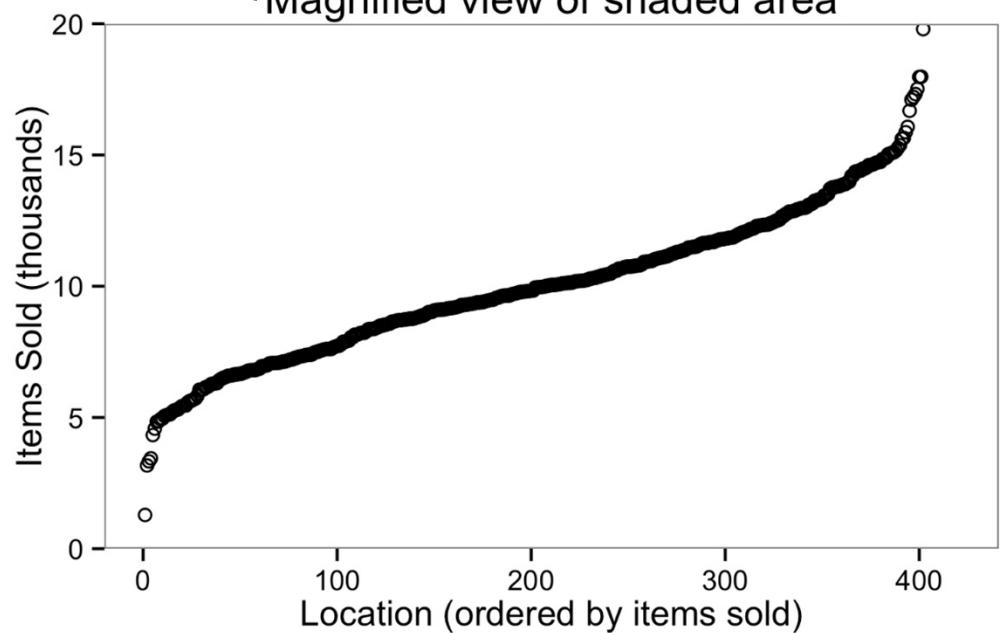
Fig 7.14 Sales Data: Avoiding a Scale Break

Linear scale with a close-up

All of the data

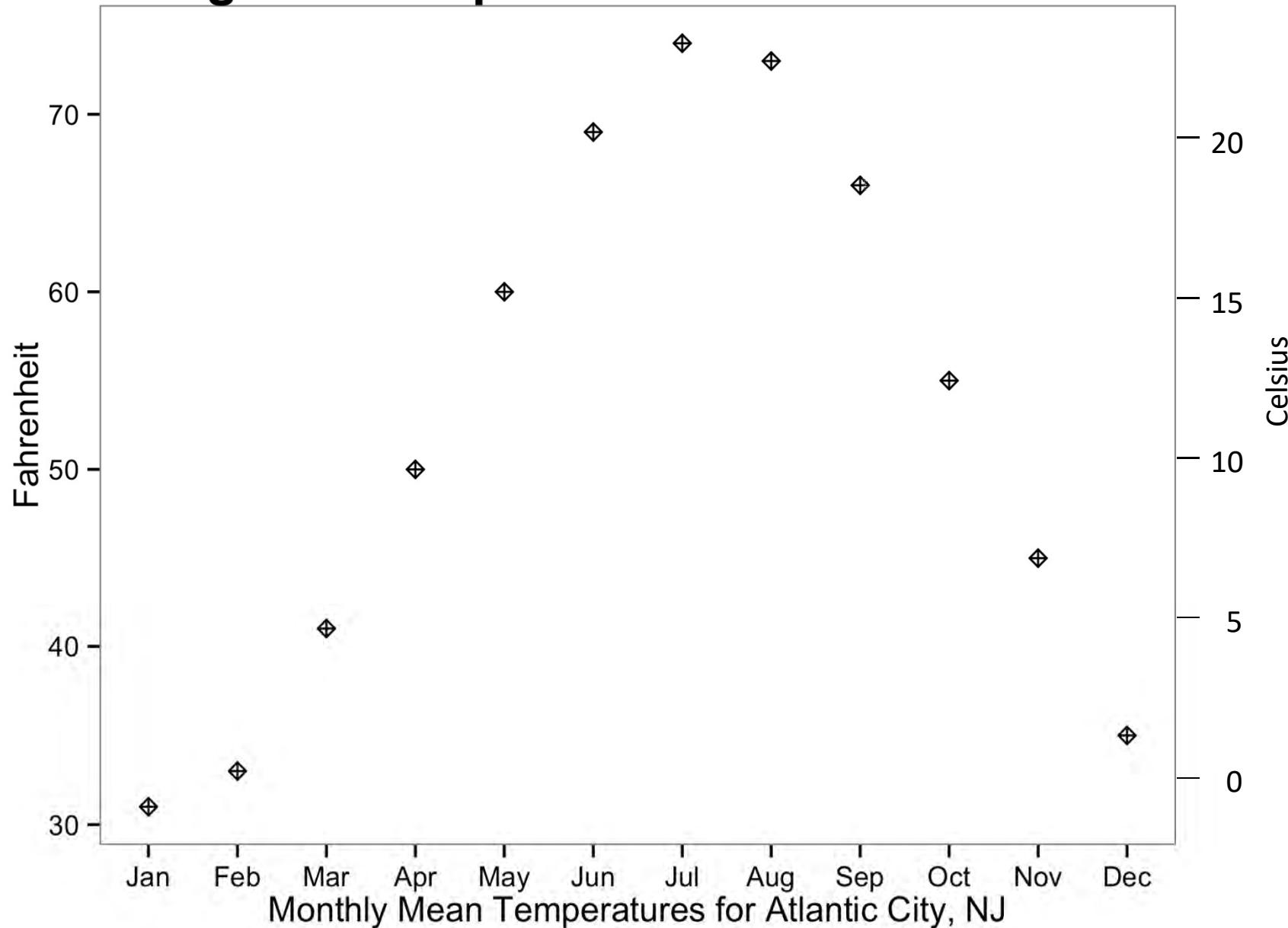


Magnified view of shaded area

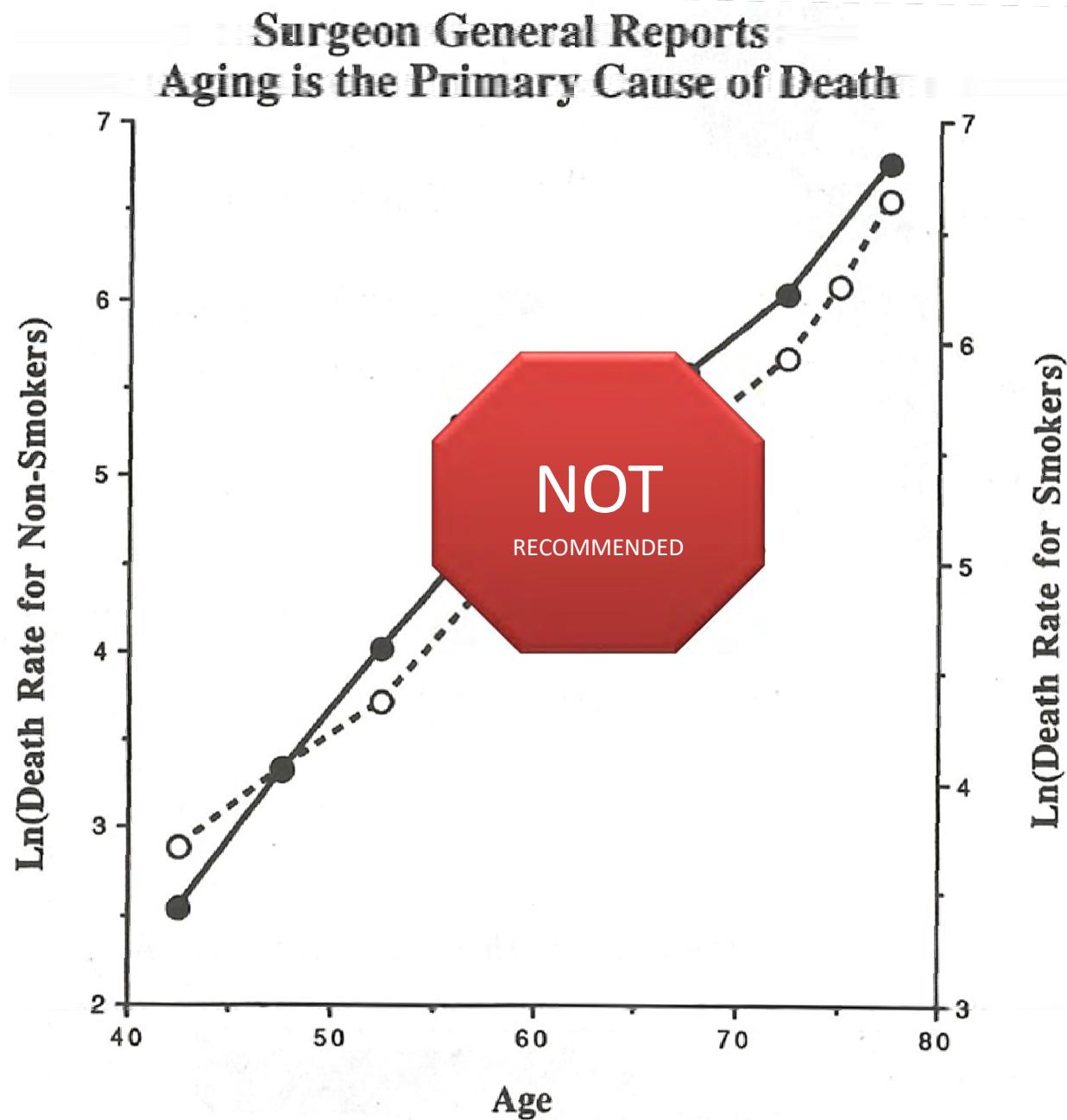


Double y-scale

Fig 7.16 Temperature Data: Two Scales

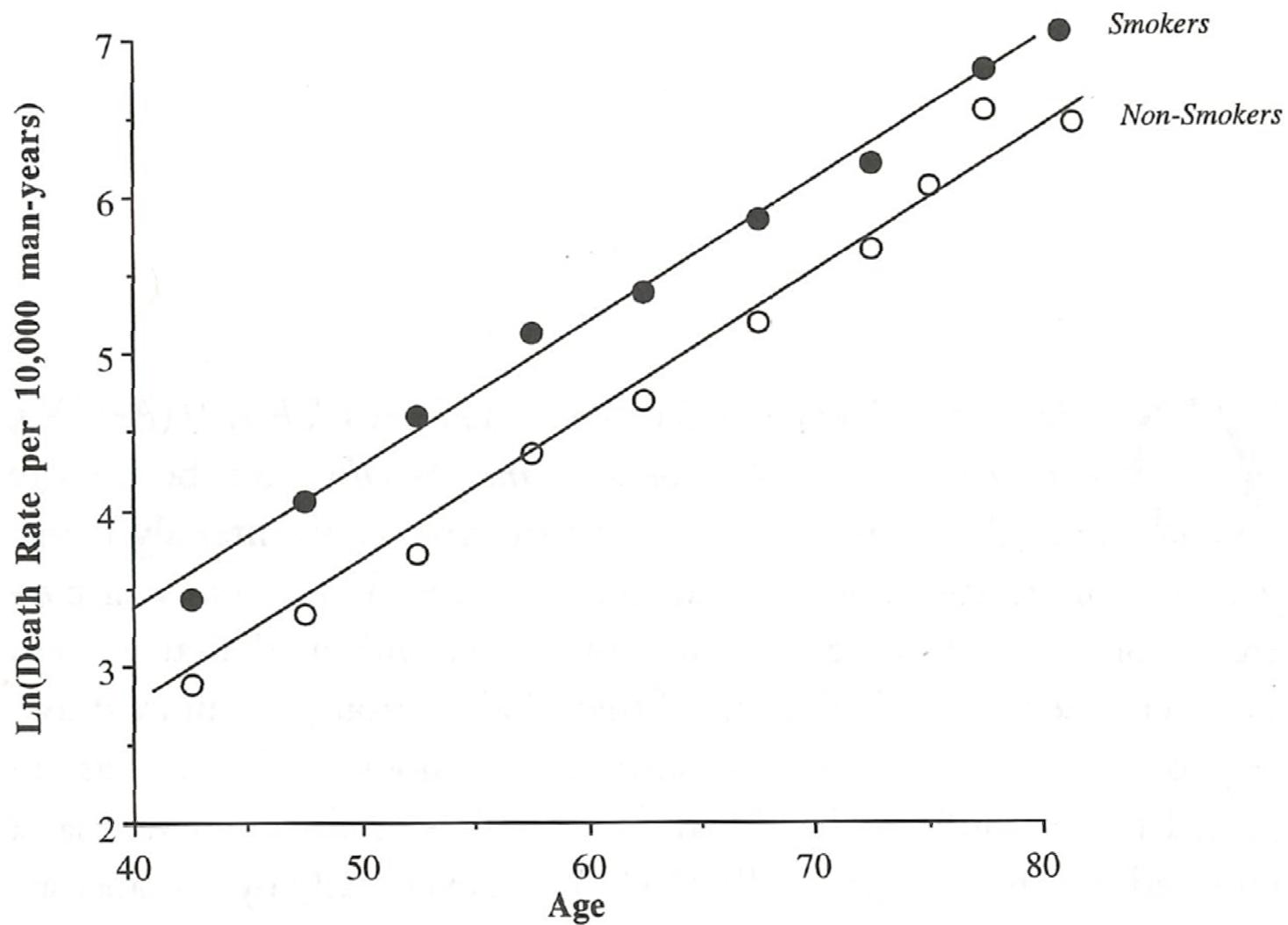


Double y-scale



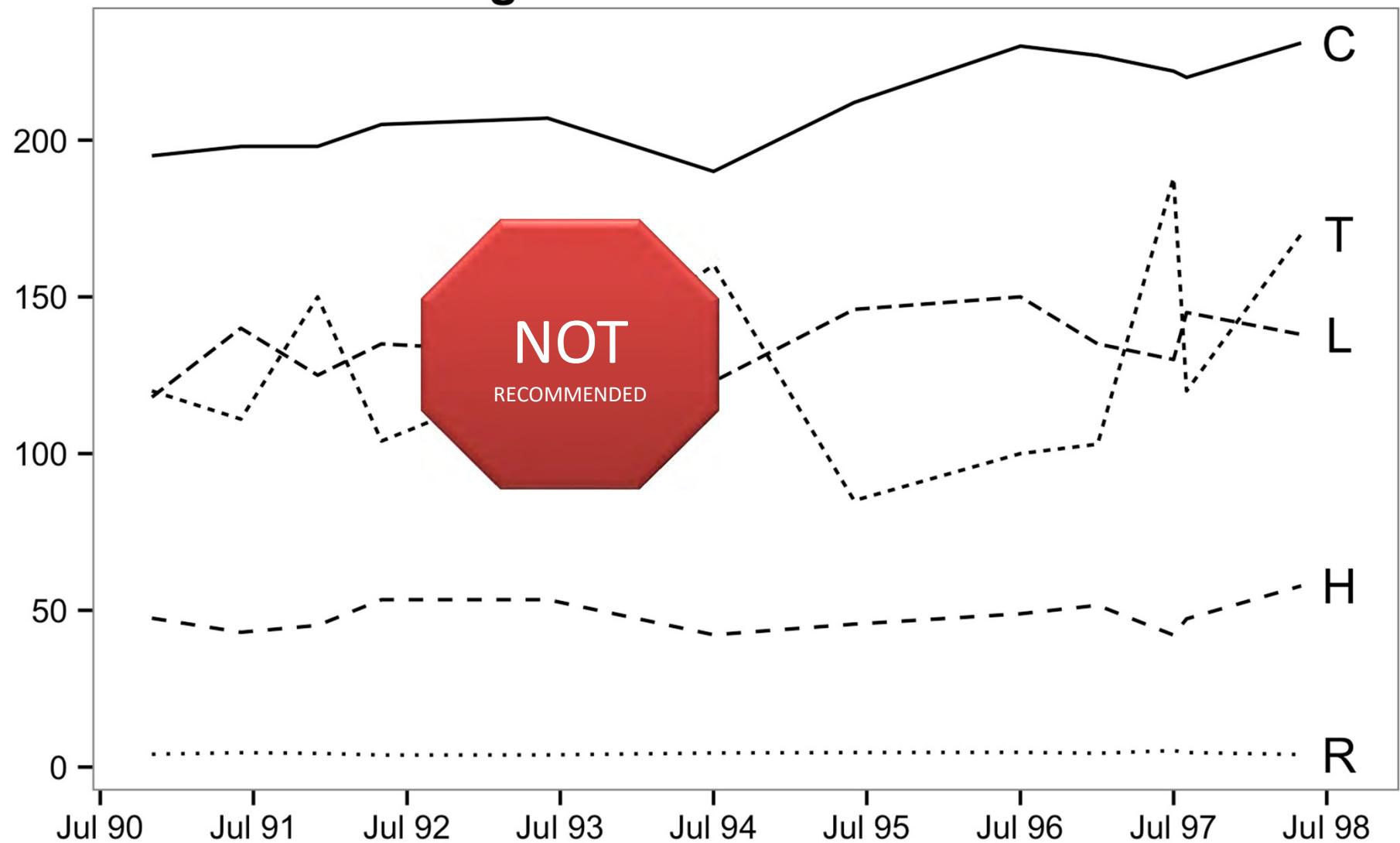
Double y-scale

Death Rate (Log Scale) Plotted Against Age  
Prospective Study of Mortality in U.S. Veterans



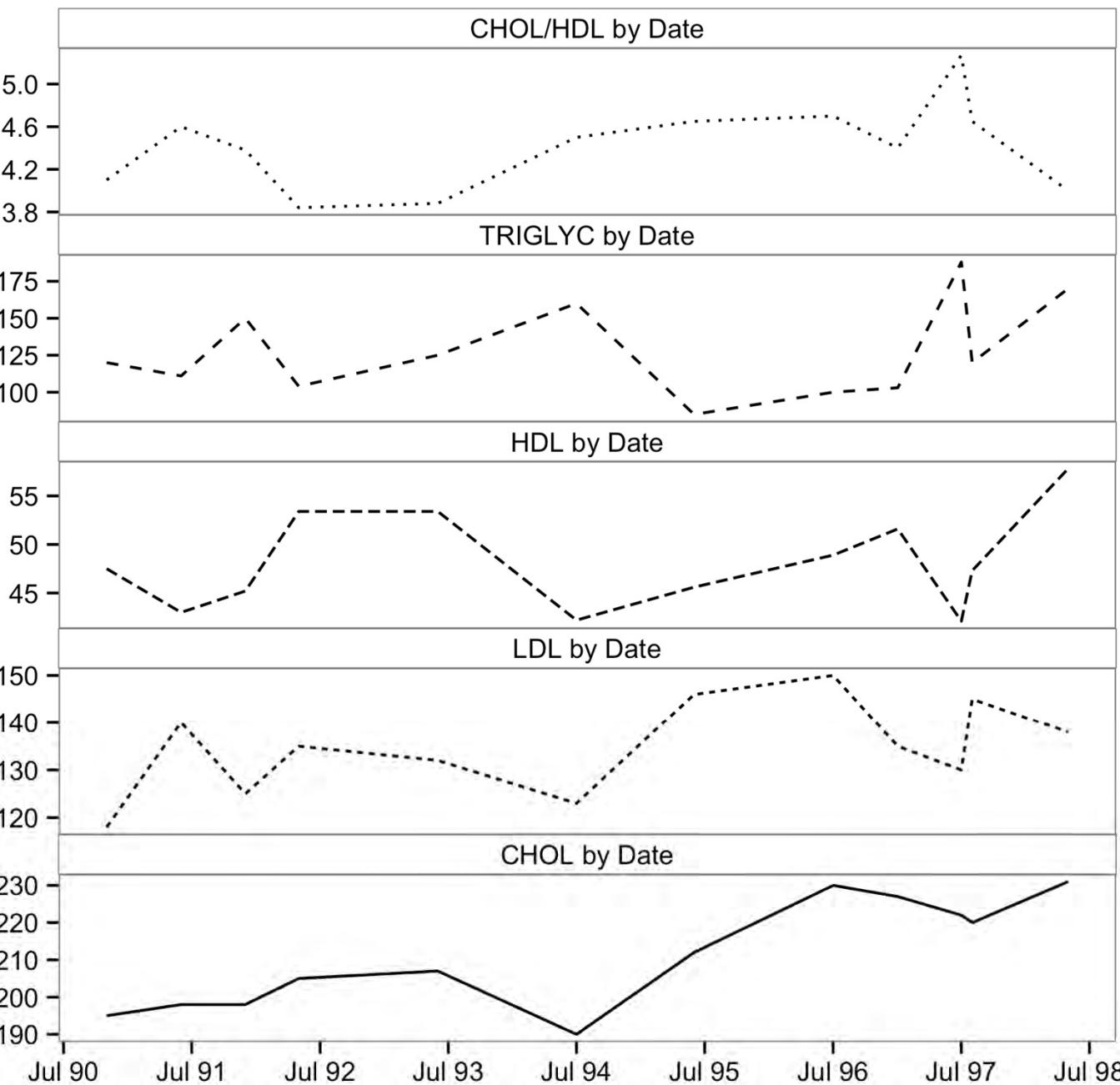
Data hidden in the scale

Fig 7.19 Blood-Level Data



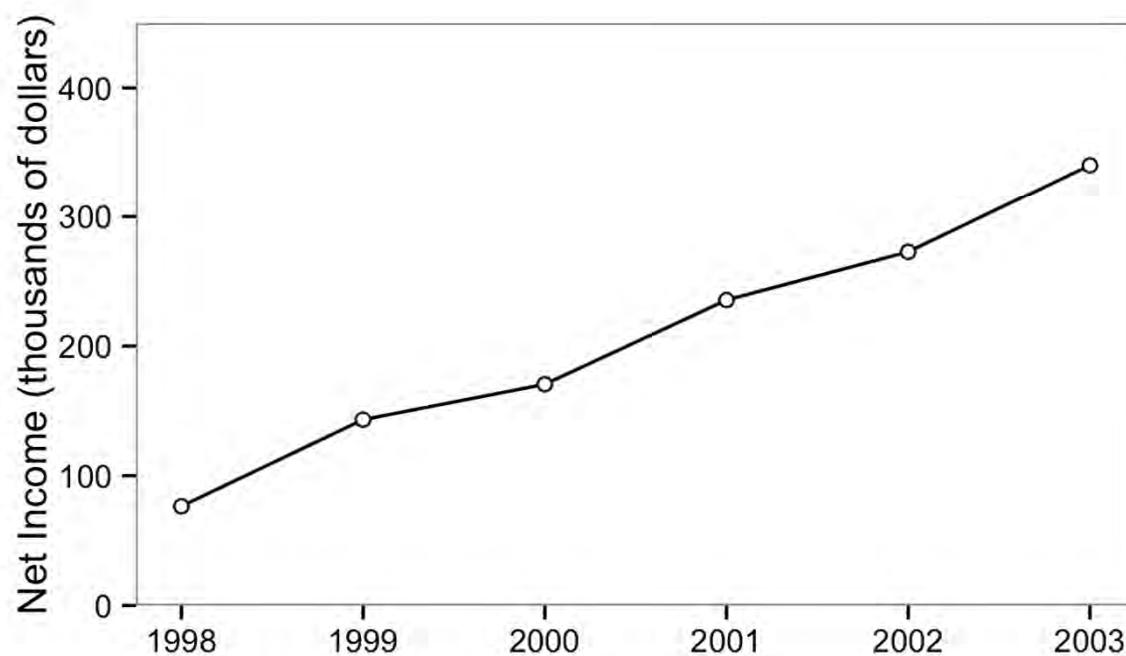
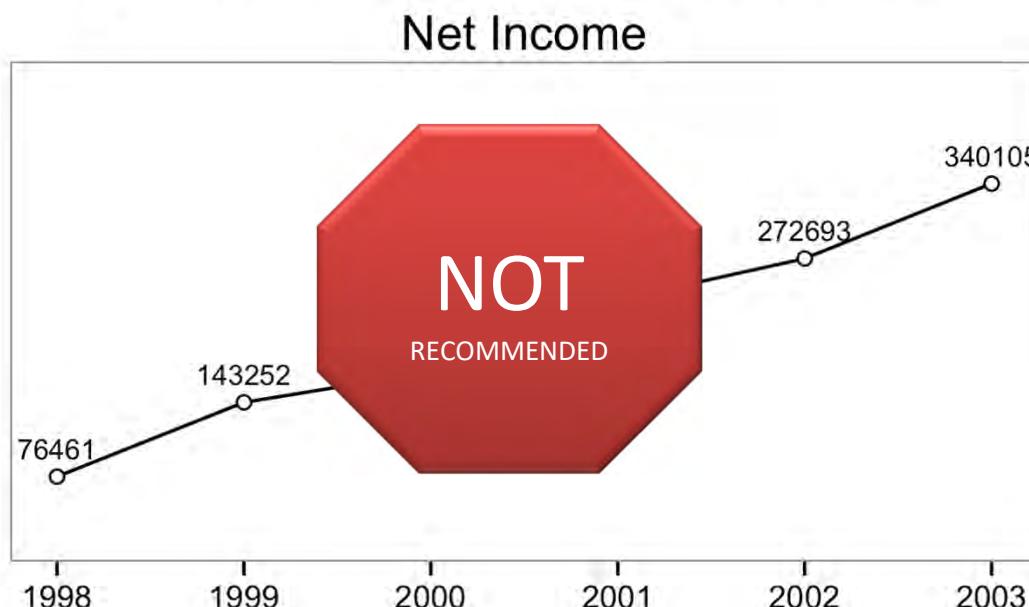
**Fig 7.21 Blood-Level Data: Multipanel Plot**

Free-y scale



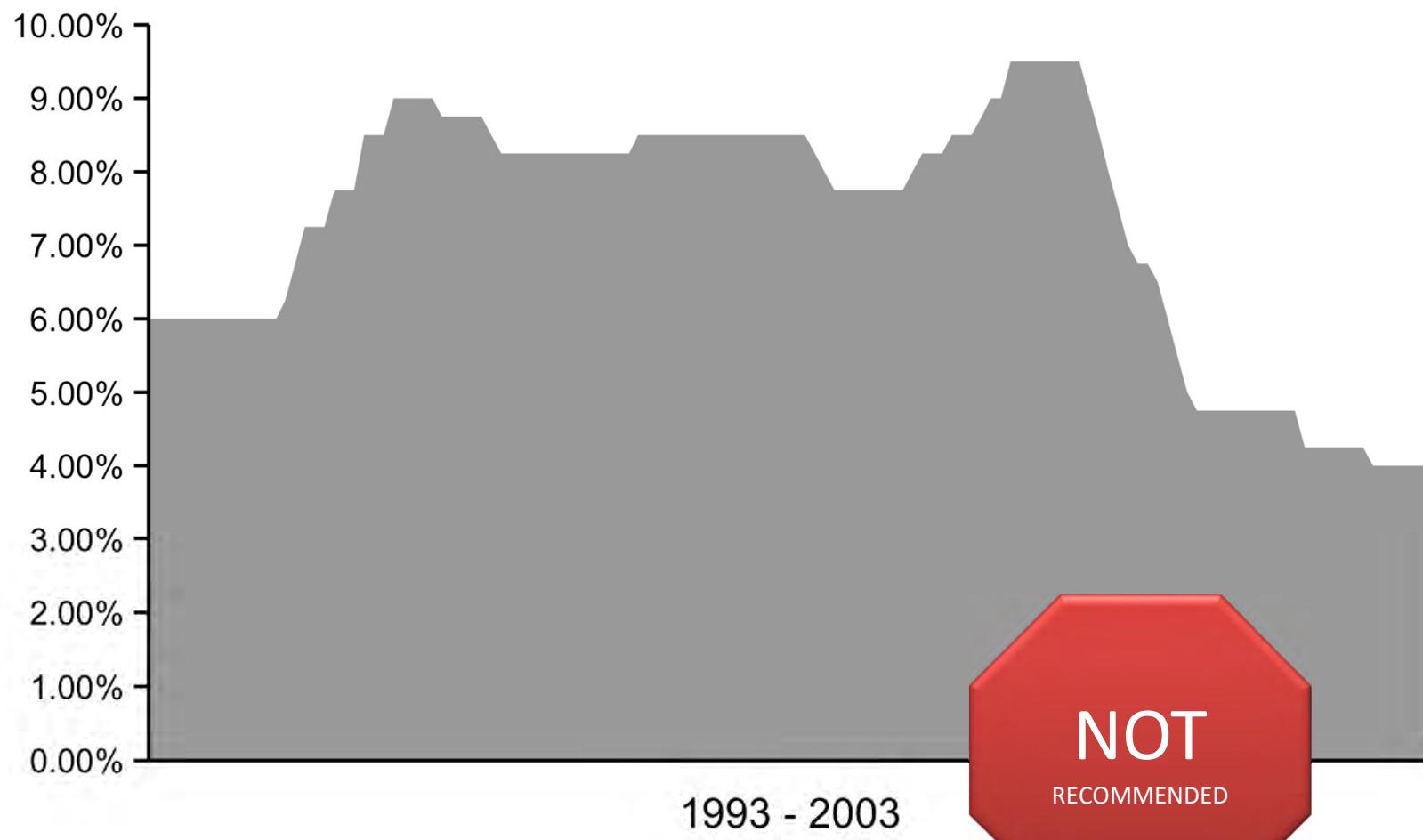
**Fig 7.23 Annual Report: No Y Scale**

All axes require scales



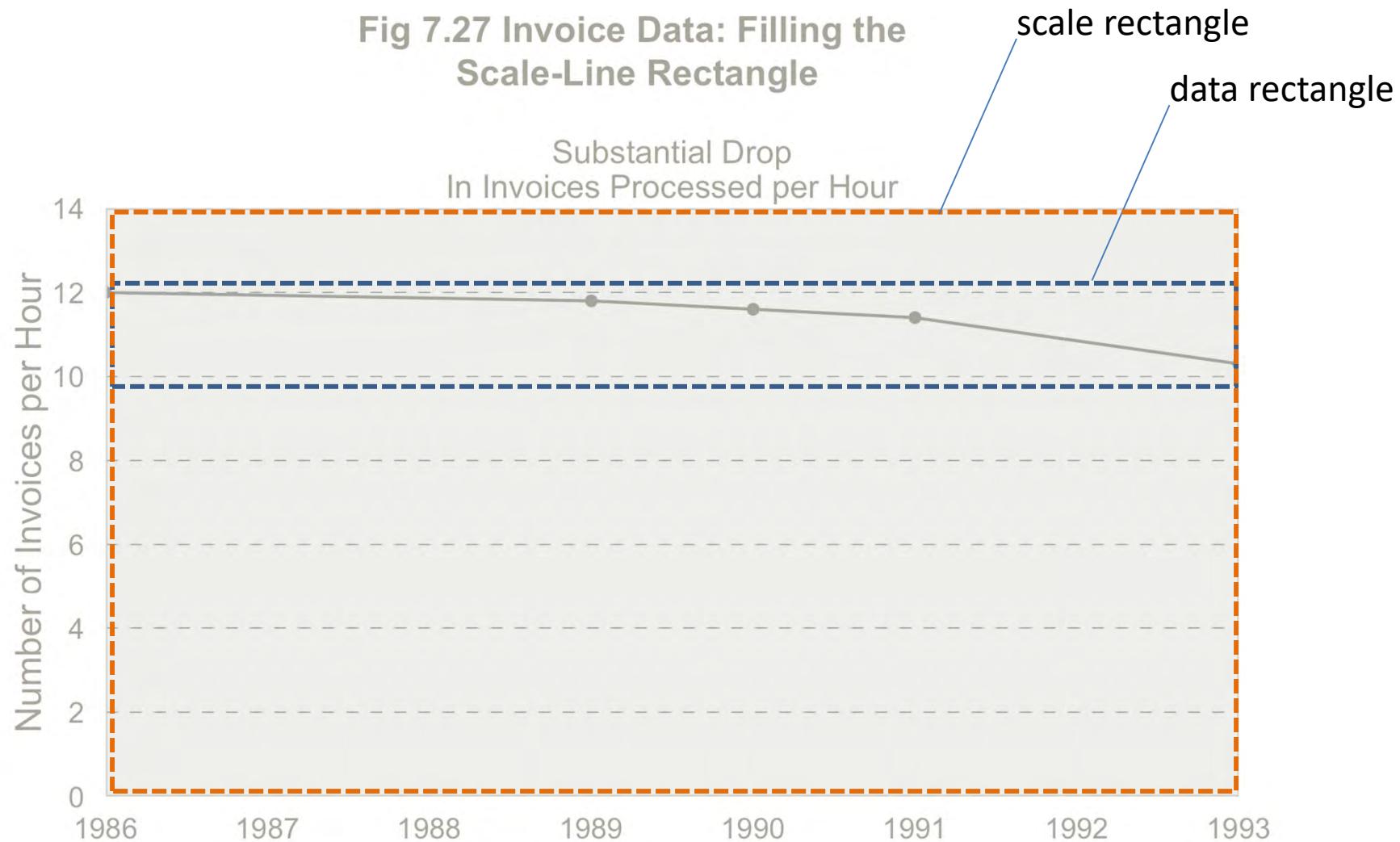
All axes require scales

**Fig 7.24 Prime Leading Rate Data:  
No X Scale**



**Data rectangle should fill  
the scale rectangle**

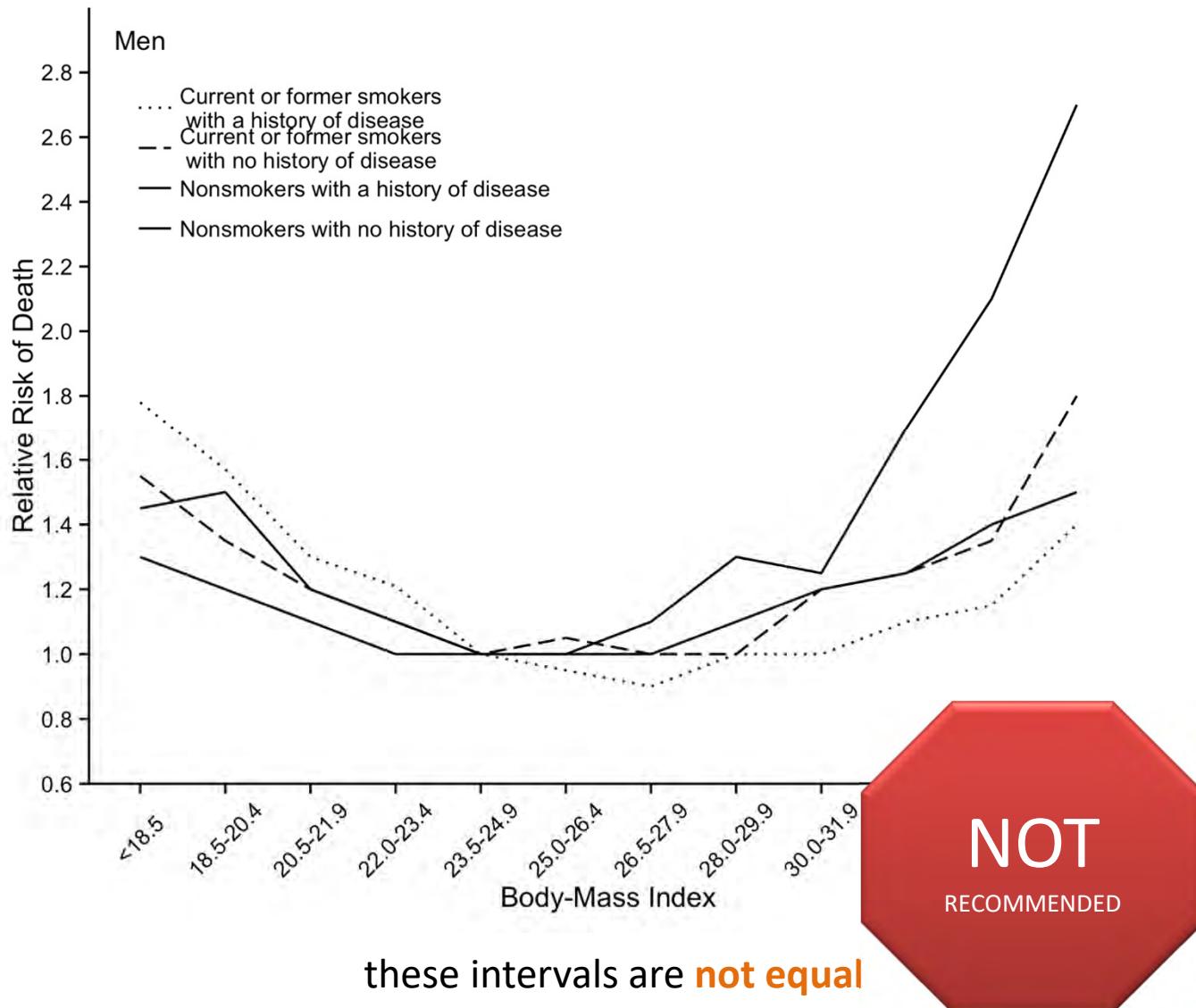
**Fig 7.27 Invoice Data: Filling the  
Scale-Line Rectangle**



Scale intervals should be constant

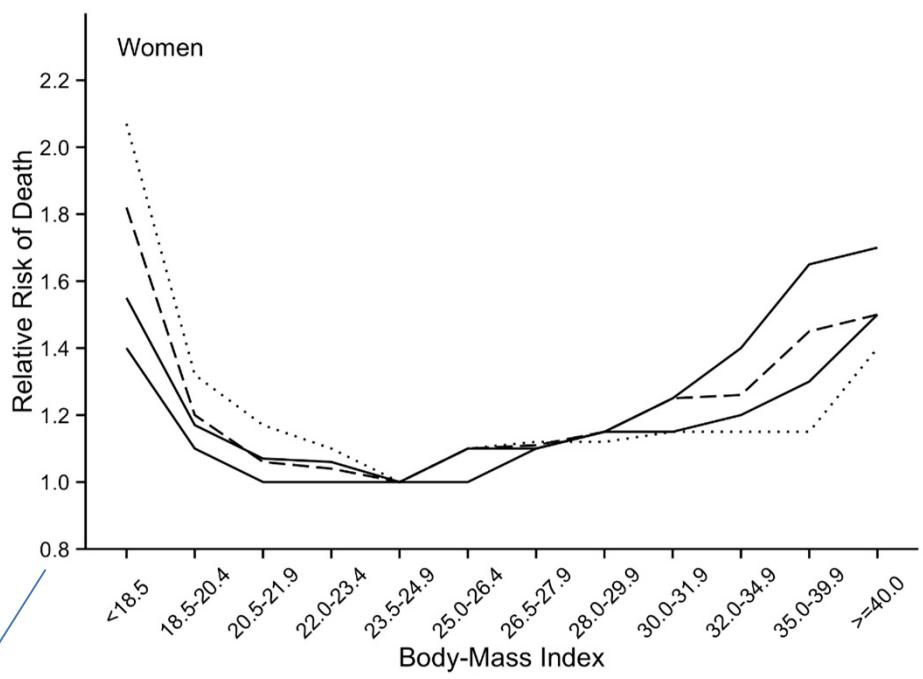
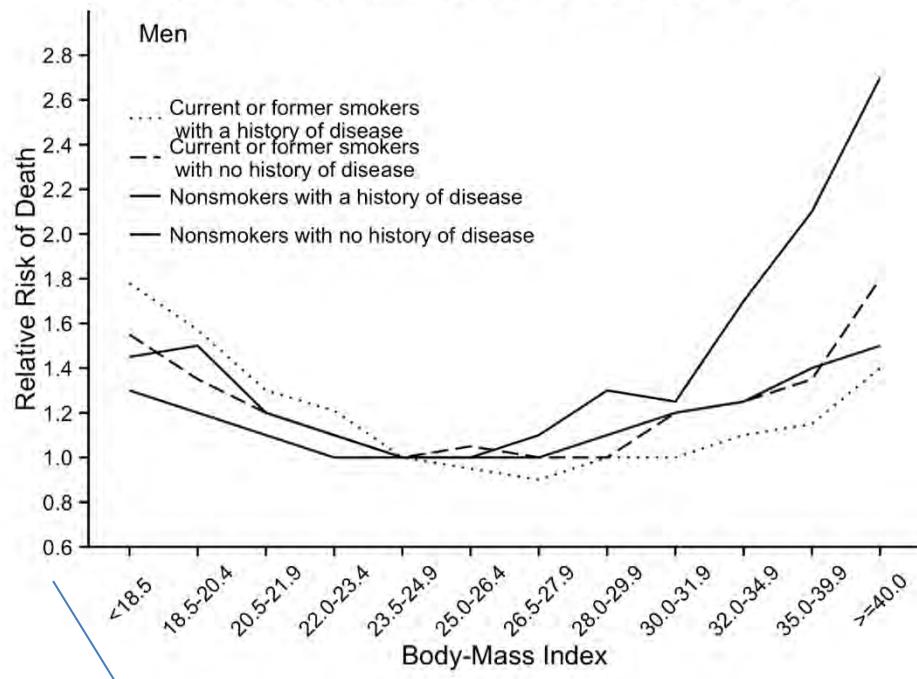
Fig 7.28 Body Mass Data: Unequal Intervals

these intervals  
are **equal**



## Equal scales for comparing between panels

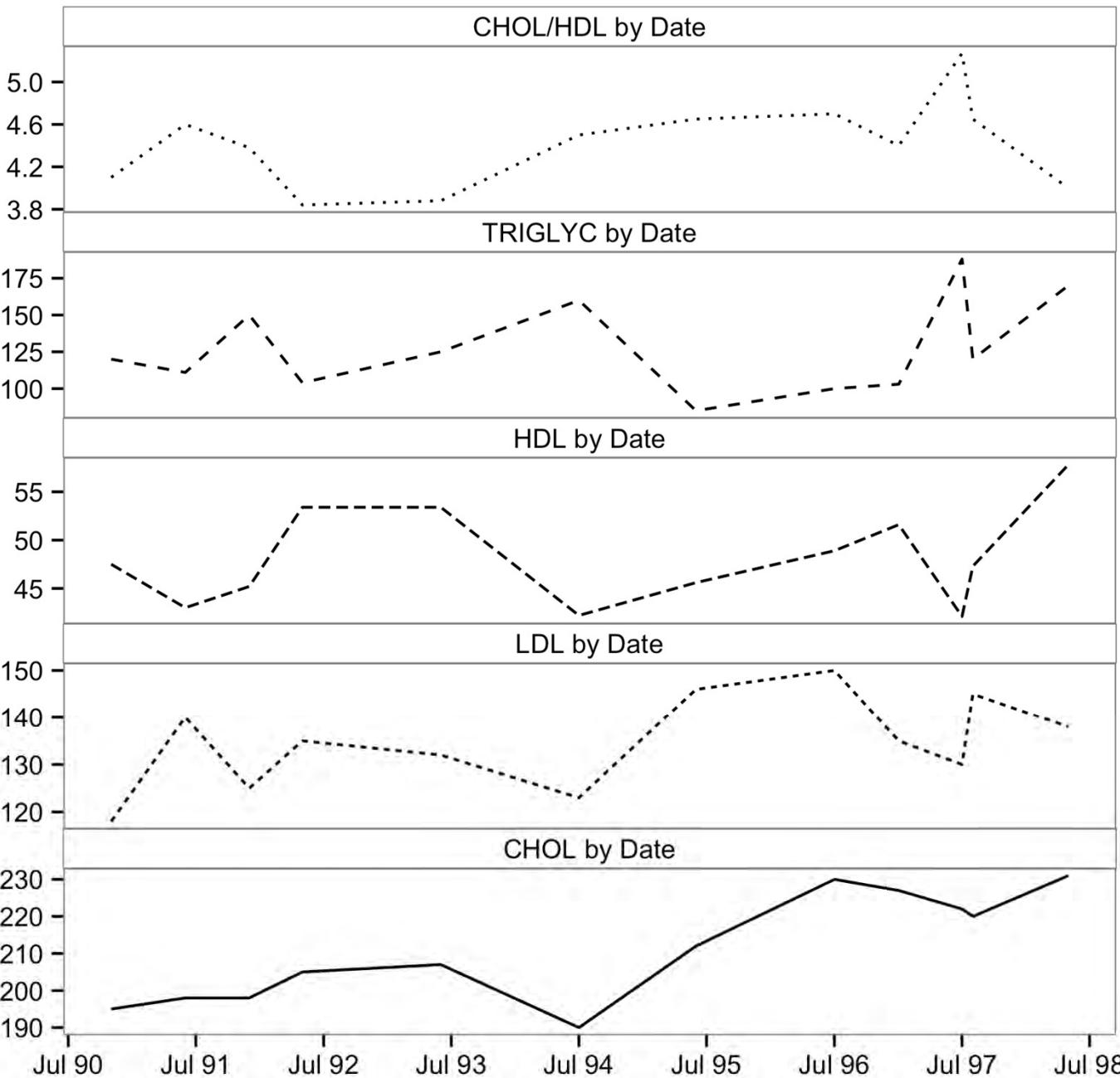
Fig 7.29 Body Mass Data: Comparing Panels



the two y-scales are different

**Fig 7.21 Blood-Level Data: Multipanel Plot**

**Free-y scale**

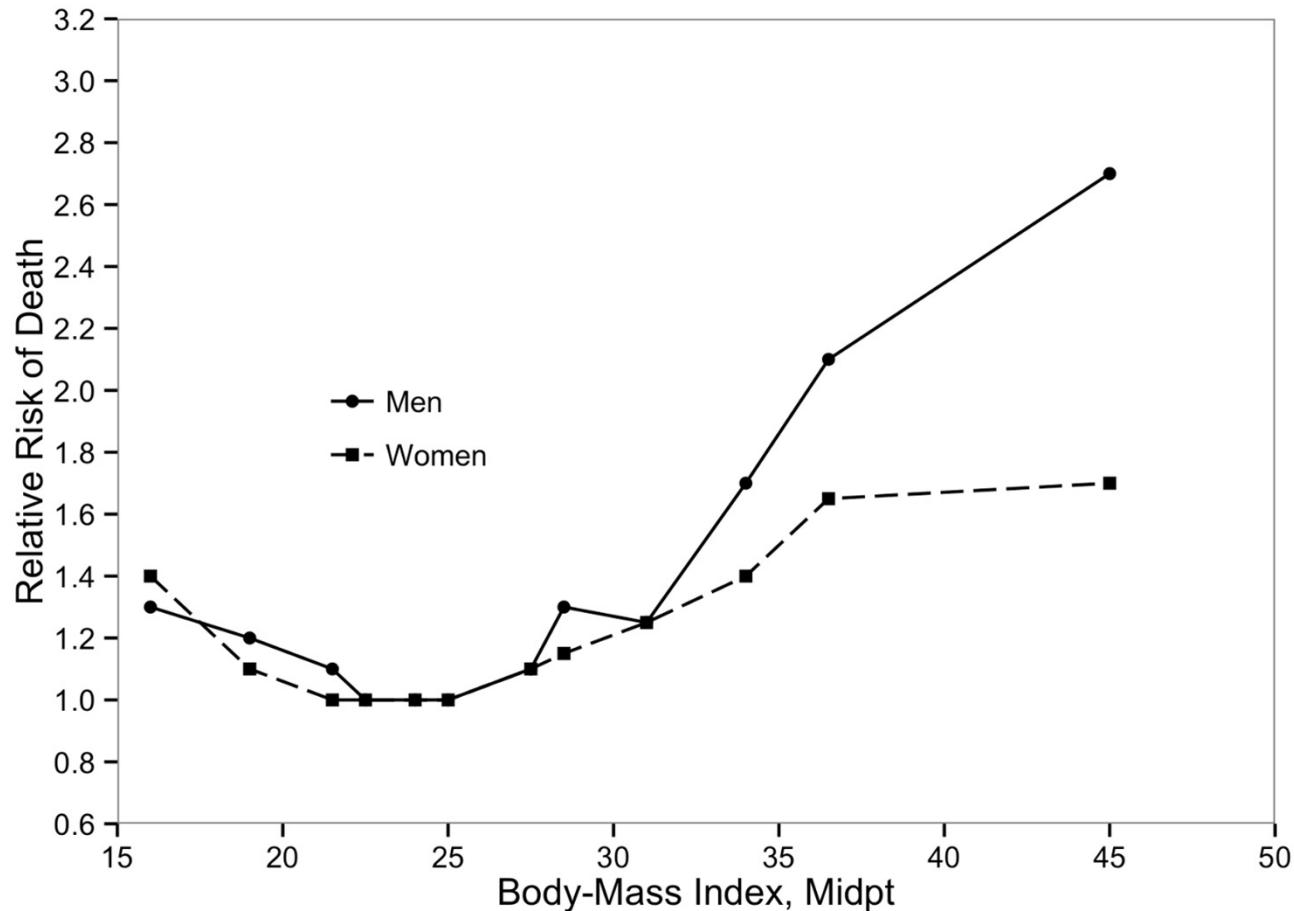


the y-scales are  
different...why is  
this OK?

One panel and one scale

Fig 7.30 Body Mass Index: Corrected

Nonsmokers with No History of Disease



Consider placing the data in the same panel if comparing between panels is the rhetorical goal