Summary of M&M Chapter 2 (Relationships)

§ 2.1

"Stimulus" and "Response"
"Independent" and "Dependent"
"Explanatory"
"Determinant"

Response (Y)

Stimulus (X)

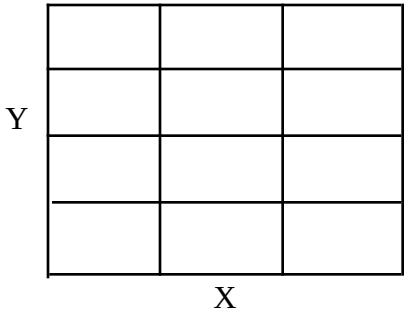
§ 2.2
Regression Lines

§ 2.4
Correlation

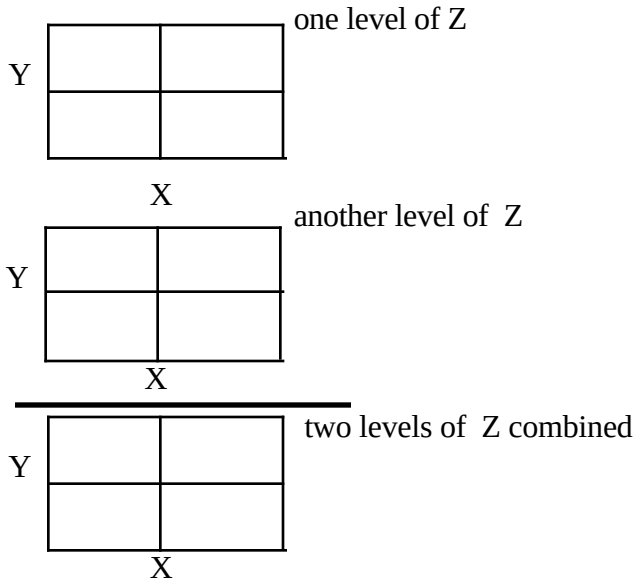
X2

X1

§ 2.5
Categorical Y



§ 2.5
Several Tables



Confounding and Lurking variables
(Simpson's Paradox)

§ 2.6 Causation

Types of Data for Stimulus and Response

§ 2.5 and §2.6 Causation : Example 1

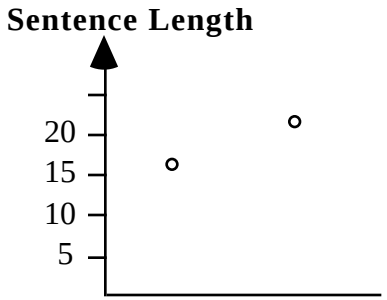
Does using a Macintosh lead to sloppier writing?

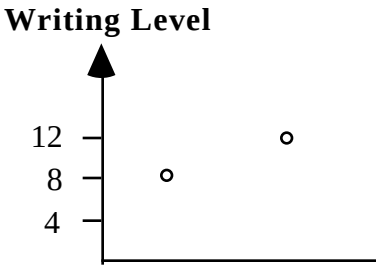
Quill or Computer?
Los Angeles Times, August 9, 1990

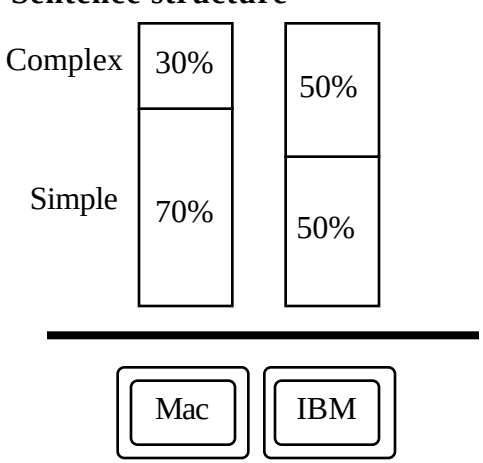
Item: Using an Apple Macintosh can lead to "sloppier writing and fluffier topics," according to research by a University of Delaware writing instructor. Analysis of a random sample found that 30% of the Mac writers used complex sentences compared to 50% of the IBM- clone writers.

Sentence length averaged 16.3 words for the Mac essays and 22.6 from those written on PCs. And the Kincaid Scale, a measure of readability, showed Mac users writing at the 8th grade level versus 12th grade for the IBM clone group. "Never before in 12 years of teaching had I seen such a sloppy bunch of papers," wrote Delaware's Marcia Peoples Halio in "Student Writing: Can the Machine Maim the Message?" "Words were misspelled; commas were placed haphazardly; semicolons were virtually non- existent or placed by means of "breath" punctuation rules, and such fine points as quotation marks, apostrophes and question marks were treated with gay abandon." The Mac's format seems to "encourage a simple sentency structure and childish vocabulary. On the other hand, the papers that the Mac class turned in were often very creatively illustrated."

Your reaction...?







§ 2.5 and §2.6 Causation : Example 2

BREAST MILK AND SUBSEQUENT INTELLIGENCE QUOTIENT IN CHILDREN BORN PRETERM

A. Lucas, R. Morley, T.J. Cole, G. Lister, C. Leeson-Payne

There is considerable controversy over whether nutrition in early life has a long-term influence on neurodevelopment. We have shown previously that, in preterm infants, mother's choice to breast milk was associated with higher developmental scores at 18 months. We now report data on intelligence quotient (IQ) in the same children seen at 7.5 - 8 years.

IQ was assessed in 300 children with an abbreviated version of the Weschler Intelligence Scale for Children (revised Anglicised). Children who had consumed mother's milk in early weeks of life had a significantly higher IQ at 7.5 - 8 years than did those who received no maternal milk. An 8.3 point advantage (over half a standard deviation) in IQ remained even after adjustment for differences between groups in mother's education and social class ($p < 0.0001$). This advantage was associated with being fed mother's milk by tube rather than with the process of breastfeeding. There was a dose- response relation between the proportion of mother's milk in the diet and subsequent IQ. Children whose mothers chose to provide milk but failed to do so had the same IQ as those whose mothers elected not to provide breast milk.

Although these results could be explained by differences between groups in parenting skills or genetic potential (even after adjustment for social and educational factors), our data point to a beneficial effect of human milk on neuro-development.

Lancet 1992; 339: 261-64.

TABLE I - CHARACTERISTICS OF STUDY POPULATION

Characteristics	No mother's milk (group I) (n = 90)	Mother's milk (group II) (n = 210)
Mean (SEM) birthweight (g)	1420 (30)	1440 (20)
Mean (SEM) gestation (wk)	31.4 (0.3)	31.4 (0.2)
% males (no)	42 (38)	55 (116)*
Days in study: median (quartiles)	30 (22,45)	28 (20,40)
Days to full enteral feeds: median (quartiles)	8 (6,11)	7 (6,9)
% ventilated > 5 days (no)	12 (11)	12 (26)
% in social class I and II (no)	11 (10)	30 (63)+
% mothers with higher educational status (no)@	24 (22)	52 (109)+

*p < 0.05. +p < 0.001 @ GCE O levels or above (see text).

Table II - IQ AT 7.5 - 9 YEARS IN THE TWO GROUPS

	Mean (SEM) scores Group I	Group II	Advantage for group II babies (95% CI)
Abbreviated WISC-R			
Verbal scale	92.0(2.0)	102.1(1.3)	10.1 (4.7, 15.5)*
Performance scale	93.2(1.7)	103.3(1.2)	10.1 (6.0, 14.2)*
Overall IQ	92.8(1.6)	103-0(1.2)	10.2 (6.3, 14.1)*

*p < 0.001, group 1 vs group II CI = confidence interval

Do you agree?

In chapter 9, we will be touching on some of the ways to (partially!) correct for imbalances in the compared groups

§ 2.5 and §2.6 Causation : Example 3
Better Service from Canada Post ? *Do you agree?*

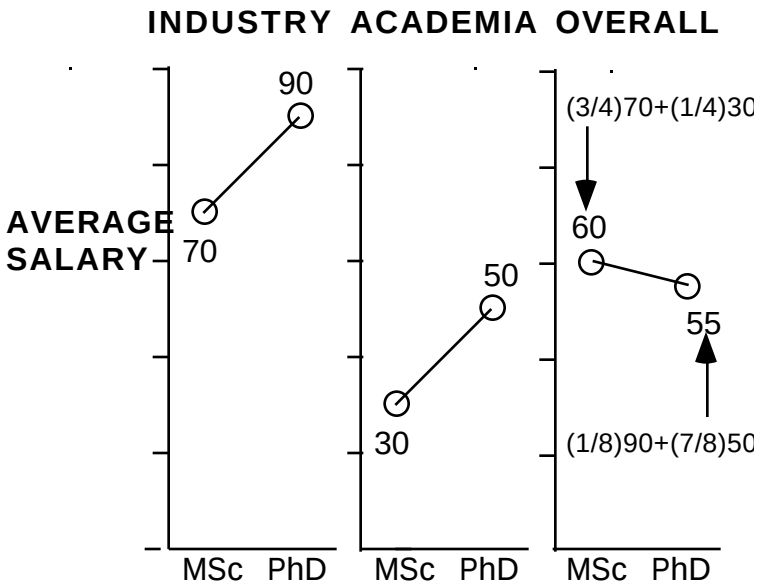
In 1989, after a major 1988 restructuring, Canada Post delivered a pamphlet to every mailbox in Canada:

"We promised you better service and we are living up to that committment. Independent auditors make ongoing measurements of our delivery performance"

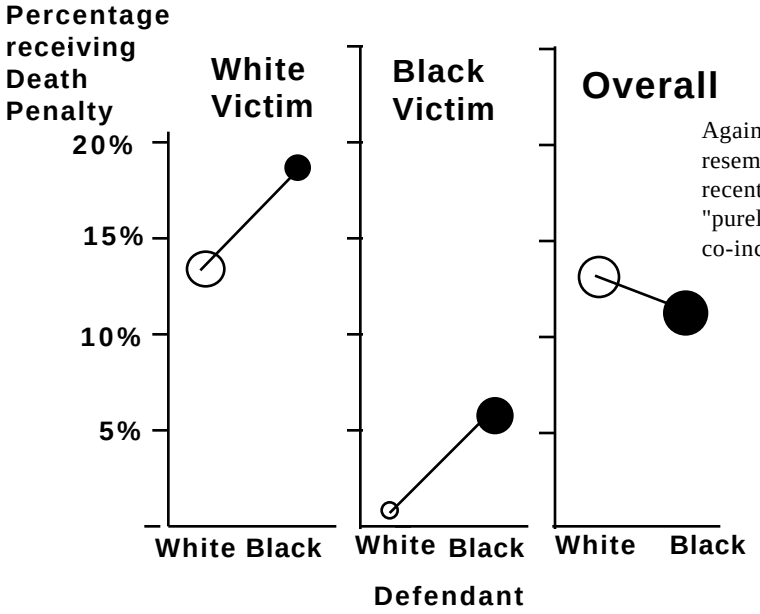
		% of letters delivered on time Oct–Dec'87*	**Jan–Mar'89***
Delivery	Our Promise		
Same city	2 DAYS	83%	**94%**
Same prov.	3 DAYS	79%	**95%**
B/w prov.	4 DAYS	85%	**96%**

* pre & ***post** restructuring programme.

§2.5 Simpson's Paradox e.g. 1
[earlier Simpson, no relation to "OJ"]

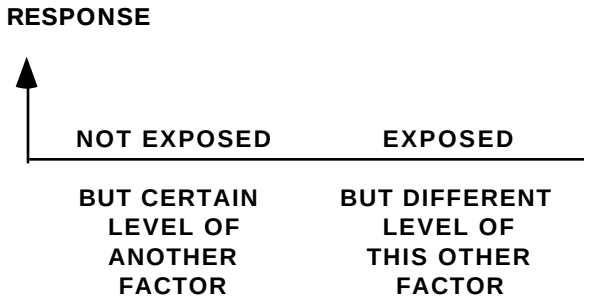


§2.5 Simpson's Paradox eg 2 (source: M&M page 197)

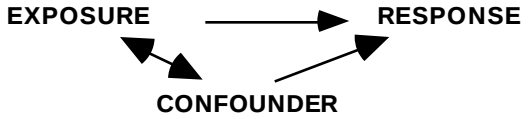


Again, any resemblance to recent events is "purely co-incidental"

or...



or...



§ 2.5 and §2.6 Causation : Example 4

DAYLIGHT SAVINGS TIME AND TRAFFIC ACCIDENTS

To the Editor: It has become increasingly clear that insufficient sleep and disrupted circadian rhythms are a major public health problem. For instance, in 1988 the cost of sleep related accidents exceeded $56 billion and included 24,318 deaths and 2,474,430 disabling injuries.[1] Major disasters, including the nuclear accident at Chernobyl, the *Exxon Valdez* oil spill, and the destruction of the space shuttle *Challenger*, have been linked to insufficient sleep, disrupted circadian rhythms, or both on the part of involved supervisors and staff.[2,3] It has been suggested that as a society we are chronically sleep deprived[4] and that small additional losses of sleep may have consequences for public and individual safety.[2]

We can use noninvasive techniques to examine the effects of minor disruptions of circadian rhythms on normal activities if we take advantage of annual shifts in time keeping. More than 25 countries shift to daylight savings time each spring and return to standard time in the fall. The spring shift results in the loss of one hour of sleep time (the equivalent in terms of jet lag of traveling one time zone to the east), where as the fall shift permits an additional hour of sleep (the equivalent of traveling one time zone to the west). Although one hour's change may seem like a minor disruption in the cycle of sleep and wakefulness, measurable changes in sleep pattern persist for up to five days after each time shift.[5] This leads to the prediction that the spring shift, involving a loss of an hour's sleep, might lead to an increased number of "micro sleeps," or lapses of attention, during daily activities and thus might cause an increase in the probability of accidents, especially in traffic. The additional hour of sleep gained in the fall might then lead conversely to a reduction in accident rates.

We used data from a tabulation of all traffic accidents in Canada as they were reported to the Canadian Ministry of Transport for the years 1991 and 1992 by all 10 provinces. A total of 1,398,784 accidents were coded according to the date of occurrence. Data for analysis were restricted to the Monday preceding the week of the change due to daylight savings time, the Monday immediately after, and the Monday one week after the change, for both spring and fall time shifts. Data from the province of Saskatchewan were excluded because it does not observe daylight savings time. The analysis of the spring shift included 9593 accidents and that of the fall shift 12,010. The resulting data are shown in Figure 1.

STANLEY COREN, PH.D. University of British Columbia
Vancouver, BC V6T 1Z4,Canada, NEJM 334(14):924, 1996 Apr 4

1. Leger D. The cost of sleep-related accidents: a report for the National Commission on Sleep Disorders Research. Sleep 1994;17:84-93. 2. Coren S. Sleep thieves. New York: Free Press, 1996. 3. Mitler MM, Carskadon MA, Czeisler CA, Dement WC, Dinges DF, Graeber RC. Catastrophes, sleep, and public policy: consensus report. Sleep 1988;11:100-9. 4. Webb WB, Agnew HW Jr. Are we chronically sleep deprived? Bull Psychonom Soc 1975;6:47-85. Monk TH, Folkard S. Adjusting to the changes to and from daylight savings time. Science 1976:261;688-9..

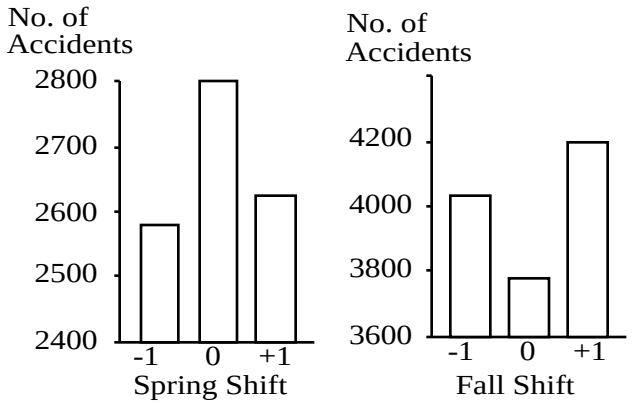


Figure 1. Numbers of Traffic Accidents on the Mondays before(-1wk), immediately after (0) and 1 week after (+1) the Shifts to and from Daylight Savings Time for the Years 1991 and 1992. There is an increase in accidents after the spring shift (when an hour of sleep is lost) and a decrease in the fall (when an hour of sleep is gained).

The loss of one hour's sleep associated with the spring shift to daylight savings time increased the risk of accidents. The Monday immediately after the shift showed a relative risk of 1.086 (95 percent confidence interval, 1.029 to 1.145, $x^2 = 9.01$, 1 df, $P<0.01$). As compared with the accident rate a week later, the relative risk for the Monday immediately after the shift was 1.070 (95 percent confidence interval, 1.015 to 1.129; $x^2=6.l9$, 1 df; $P<0.05$). Conversely, there was a reduction in the risk of traffic accidents after the fall shift from daylight savings time when an hour of sleep-was gained. In the fall, the relative risk on the Monday of the change was 0.937 (95 percent confidence interval, 0.897 to 0.980; $x^2=8.07$, 1 df; $P<0.01$) when compared with the preceding Monday and 0.896 (95 percent confidence interval, 0.858 to 0937; $x^2=23.69$, $P<0.001$) when compared with the Monday one week later. Thus, the spring shift to daylight savings time, and the concomitant loss of one hour of sleep, resulted in an average increase in traffic accidents of approximately 8 percent, whereas the fall shift resulted in a decrease in accidents of approximately the same magnitude immediately after the time shift.

These data show that small changes in the amount of sleep that people get can have major consequences in everyday activities. The loss of merely one hour of sleep can increase the risk of traffic accidents. It is likely that the effects are due to sleep loss rather than a nonspecific disruption in circadian rhythm, since gaining an additional hour of sleep at the fall time shift seems to decrease the risk of accidents.