

550.400: Mathematical Modeling and Consulting

Lecture Notes

Instructor:
Dr. N. H. Lee

JHU AMS 2013 Spring

Last Compiled on February 4, 2013

Outline

Guessing Ages

Where are the cancers?

Handedness inventory

What's in the news?

How to Play

Guessing ages. For each card your group is given, estimate the age of the person on the card and write your guess in the table below in the row corresponding to that numbered card. Later, you will be told the true ages and you can compute your errors. The error is defined as estimated minus actual age.

Card	Estimated age	Actual age	Error
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Example



Sample output

Group	Card										Avg. abs. error	Students in group	
	1	2	3	4	5	6	7	8	9	10		#	Sex
A	+14	-6	+5	+19	0	-5	-9	-1	-7	-7	7.3	3	F
B	+8	0	+5	0	+5	-1	-8	-1	-8	0	3.7	4	F
C	+6	-5	+6	+3	+1	-8	-18	+1	-9	-6	6.1	4	M
D	+10	-7	+3	+3	+2	-2	-13	+6	-7	-7	6.0	2	M/F
E	+11	-3	+4	+2	-1	0	-17	0	-14	+3	5.5	2	F
F	+13	-3	+3	+5	-2	-8	-9	-1	-7	0	5.1	3	F
G	+9	-4	+3	0	+4	-13	-15	+6	-7	+5	6.6	4	M
H	+11	0	+2	+8	+3	+3	-15	+1	-7	0	5.0	4	M
I	+6	-2	+2	+8	+3	-8	-7	-1	+1	-2	4.0	4	F
J	+11	+2	+3	+11	+1	-8	-14	-2	-1	0	5.3	4	F
Truth	29	30	14	42	37	57	73	24	82	45			

Fig. 2.2 Errors in age guesses from a class of eighth graders, as displayed on the blackboard. For the first two cards, we wrote the guessed and true ages, then we switched to writing the true age and the estimation error for each group. At the end, the groups were compared using the average of the absolute values of the errors. The sexes and group sizes are shown because one of the students in the class commented that the girls' guesses were, on average, more accurate.

What do you notice?

Highest kidney cancer death rates

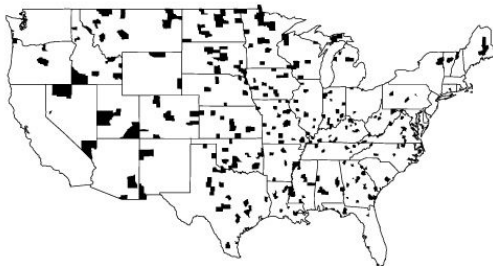


Fig. 2.3 The counties of the United States with the highest 10% age-standardized death rates for cancer of kidney/ureter for U.S. white males, 1980-1989. Hand this map out to the students and ask why most of the shaded counties are in the center-west of the country. See Section 2.2 for discussion.

What do you notice?

Lowest kidney cancer death rates

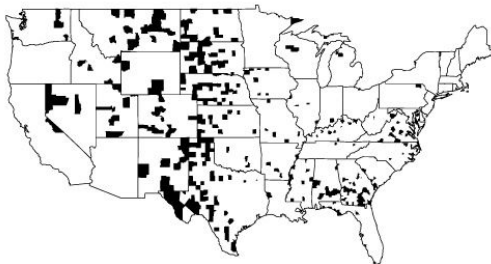


Fig. 2.4 The counties of the United States with the *lowest* 10% age-standardized death rates for cancer of kidney/ureter for U.S. white males, 1980-1989. Surprisingly, the pattern is somewhat similar to the map of the highest rates, shown in Fig. 2.3. Hand this map out to the students only after they have discussed the previous map.

Are you left-handed or right-handed?

Please indicate which hand you use for each of the following activities by putting a + in the appropriate column, or ++ if you would never use the other hand for that activity. If in any case you are really indifferent, put + in both columns. Some of the activities require both hands. In these cases the part of the task, or object, for which hand preference is wanted is indicated in parentheses.

Task	Left	Right
Writing		
Drawing		
Throwing		
Scissors		
Toothbrush		
Knife (without fork)		
Spoon		
Broom (upper hand)		
Striking match (hand that holds the match)		
Opening box (hand that holds the lid)		
Total		

Right - Left: Right + Left: $\frac{\text{Right} - \text{Left}}{\text{Right} + \text{Left}}$

Create a Left and a Right score by counting the total number of + signs in each column. Your handedness score is $(\text{Right} - \text{Left})/(\text{Right} + \text{Left})$: thus, a pure right-hander will have a score of $(20 - 0)/(20 + 0) = 1$, and a pure left-hander will score $(0 - 20)/(0 + 20) = -1$.

The first topic

New York Times, March 1, 1995

A8 *San Francisco Chronicle* ★★★★★

Infant Deaths

Low weights not solely to blame

New York Times

A new study of more than 7.5 million births has challenged the assumption that low birth weights per se are the cause of the high infant mortality rate in the United States. Rather, the new findings indicate, prematurity is the principal culprit.

Being born too soon, rather than too small, is the main underlying cause of stillbirth and infant deaths within four weeks of birth.

Each year in the United States about 31,000 fetuses die before delivery and 22,000 newborns die during the first 27 days of life.

The United States has a higher infant mortality rate than those in 19 other countries, and this poor standing has long been attributed mainly to the large number of babies in this country who are born too small, including a large proportion who are born "small for date," or weighing less than they should for the length of time they were in the womb.

The researchers found that American-born babies, on average, weigh less than babies born in Norway, even when the length of pregnancy is the same. But for a given length of pregnancy, the lighter American babies are no more likely to die than are the slightly heavier Norwegian babies.

The researchers, directed by Dr. Allen Wilcox of the National