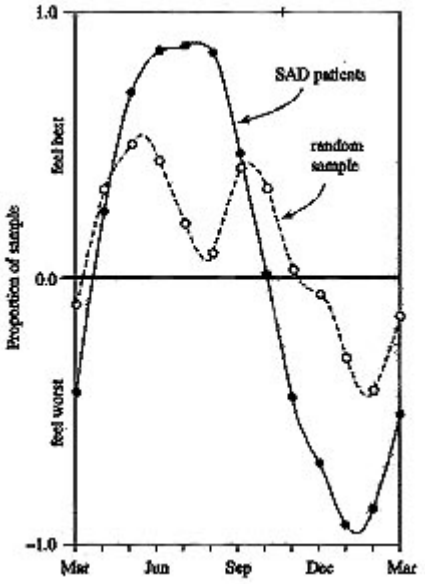
The Cycle of the Seasons 6: Daylight and SAD

Part 6: Seasonal Affective Disorder

The seasons affect everyone's moods to some degree, but some people are so strongly affected by the amount of daylight that they experience severe depression during that part of the year when the hours of daylight are shortest. Many magazine articles have been written about this condition, which has been termed seasonal affective disorder, or SAD. A typical person with SAD feels depressed for two or three months, sometime between the end of October and late February. She (women are affected more often than men) may experience a lack of energy and a craving for carbohydrates, and she may respond by oversleeping, overeating, and withdrawing from society. An estimated 6% to 8% of the population of New England suffers from full-blown SAD.

Unlike the traditional treatments for other forms of depression, an effective therapy for SAD has the patient sit in front of bright lights every morning. If we assume that one hour of light therapy is equivalent to an hour of natural daylight, approximately how many hours of light therapy might a person with SAD require on a day in early January, if she wanted to make up for the "missing" hours of natural daylight (compared to March 21, the first day of spring)?

The graph that follows represents results from a study of SAD patients and a group selected at random from the New York City telephone book, in which they were asked to specify the months in which they felt best or worst. Each point shows the proportion of people feeling at their best or worst in a particular month. "Feeling worst" is counted as a negative value.



If the seasonal mood fluctuations of SAD patients could be approximated by a sine function, would the function be in phase with the length-of-day function or out of phase? Explain.

Notice that the effect is reversed during spring and summer: SAD patients may, in fact, feel better than the average person. They are full of energy and usually lose the extra weight they put on during the winter.

SAD appears to be even more prevalent farther north. Compile data (at least 45 dates) for Nome, Alaska (latitude 67' N) and determine an equation for their length-of-day function.

Writing such a function, $A \sin[B (x - C)] + D$, won't involve much more work than you've already done. Think about what features of the graph remain substantially the same. Which constants (*A*, *B*, *C* or *D*) control those features? What features of the Nome graph make it different from the Hartford graph? Which constants control those features? Calculate new values for those constants, and try out your new mathematical model.

Part 7: Final Report

Your final report should explain how you decided on the value of each constant in the Coventry length-of-day function, and how you modified that function to write one for Reykjavik. Mention any difficulties you encountered in attempting to fit a sine curve to the data. Explain what information these functions might provide about seasonal affective disorder, including (among other things) the effect of latitude. Include any observations you made about the graph of seasonal mood fluctuations and its relationship to the length-of-day function. Illustrate your report with appropriate graphs.

On the light side . . .

From 1948 until 1951 Japan practiced Daylight Savings Time. From April to September there was a summer time schedule of an additional hour of sunlight. This system was abolished because of the following reasons:

1. The sun set too late. An additional meal was required because the day was so long.
2. Longer hours for laborers.
3. Lack of sleep.

More information is available on request.

-Japanese Embassy Information and Culture Center publication reprinted in The New York Times.