Seasonal Variations in Conception Rates and Delivery Patterns: Environmental Influences on Reproductive Behavior in a Temperate Climate

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Abstract

Anecdotal evidence suggested a significant variation in monthly delivery patterns at a Southwestern United States hospital that serves as the primary teaching hospital of an Ob/Gyn Residency Program. The objectives of the present study were to confirm the existence of seasonal variability and to determine if there might be a relationship between the deliveries observed and local weather patterns (external temperatures, day lengths ... etc.) at the time of conception. Restrospective delivery data were collected over a ten year period from 1992-2001 and compared to the average monthly weather conditions from the National Weather Service. A cyclic pattern to delivery numbers (P < .02) was confirmed and correlated with the fewest conceptions taking place in July and August, the hottest months with the longest daylight hours. While data only suggest a correlation between temperature patterns and deliveries, they do confirm a cyclic pattern correlating with time of year which can be used in staffing of the labor and delivery unit.

INTRODUCTION

In nature, many species appear to have developed reproductive schemes specifically around the seasonal weather patterns to maximize the success of ther offspring (REFERENCE). Humans in industrialized nations tend to think of themselves as separate from their natural environment. However it is well established that day length and weather conditions can affect sleep patterns, activity and even mood (REFERENCE). As might be expected, previous studies have demonstrated that birth weights in developing countries are often correlated with the season of harvest (1,2). Yet other studies have demonstrated that even children born in developed countries exhibit lighter birth weighs in late spring and early summer when compared to children born in other seasons (3). Further, others studies have concluded the seasonal effects of birth weight may predispose individuals for significant health complications in later life (4, 5).

While it is not surprising that birth weights can be correlated with season of birth, especially in developing nations, it raise the question if conception rates in humans, as in some animal species, might also show cycling environmental influences. Such a phenomenon has been described in both natural and assisted conceptions in a few geographic locations (6) throughout the world, but has not been well defined in the United States.

It has been observed that beginning in with the most noticeable decline inHowever, anecdotal evidence of cycling delivers pattern at a regional hospital in the Southwestern U.S. suggested a environmental influence on conception rates within the region. It had been observed that delivery rates tended to fall off significantly during April, May and early June of each year and then numbers rebounded in late June to July. Further, the region, with a heavily based agricultural community, demonstrates significant shifts in weather patterns and day length on an annual basis, suggesting it as a potentially ideal location for demonstrating the influences of the environment on conception and delivery rates. well defined Therefore, the objective of our study was to determine if there is a relationship between weather patterns or other seasonal phenomena could be correlated with time of conception and subsiquent delivery patterns.

MATERIALS AND METHODS

Using a retrospective review of the delivery log, term-gestation delivery patterns were correlated to weather conditions (extreme heat loads) at the time of conception (IRB exempt, category 4). Term delivery data (term being defined as gestations of ≥ 37 weeks) were collected for a ten-year time-period from 1992-2001. Monthly average temperature conditions were obtained from the National Weather Service for each year of the same ten-year period.

Data were then subjected to correlative analysis using the Statistical Program for Social Sciences Version 12.0 Software (SPSS, Inc.; Chicago, IL). Differences in delivery patterns were determined using ANOVA and Tukey's Mean Separation.

Initial comparison of the data over the 10-year period suggested no difference in delivery rates. However, delivery numbers had varied widely over the period, so the data were reanalyzed correcting for the length of month to establish an average number of deliveries per day and the months ranked from 1-12 (lowest to highest) to remove the effects of changing delivery patterns over the ten-year period.

RESULTS

Data from the National Weather Service demonstrates that, on average, the hottest temperatures at this location occur in the months of July and August (Figure 1). Alternatively, the coldest months on average are in December and January.
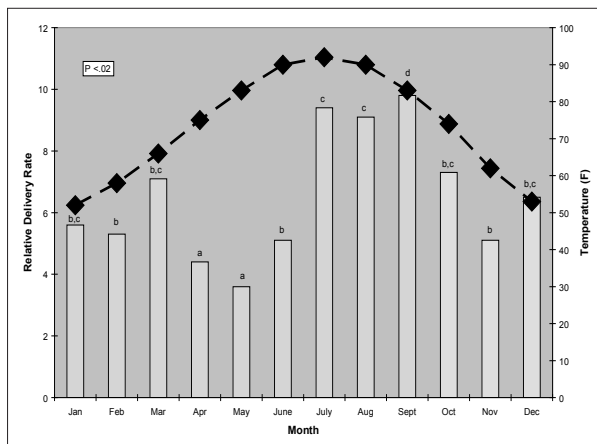

Fig 1. *Average monthly high and low environmental temperatures at a southwestern teaching hospital as reported by the National Weather Service for the ten-year period from 1991-2001.*

Analysis of the data suggests that there was a cyclic pattern to delivery numbers (Figure 2; P<0.02). Further, if conception time was established based upon full term gestation, fewer conceptions were taking place in July and August (the hottest average monthly temperatures) than any other time of the year (Figure 3; P < 0.02).
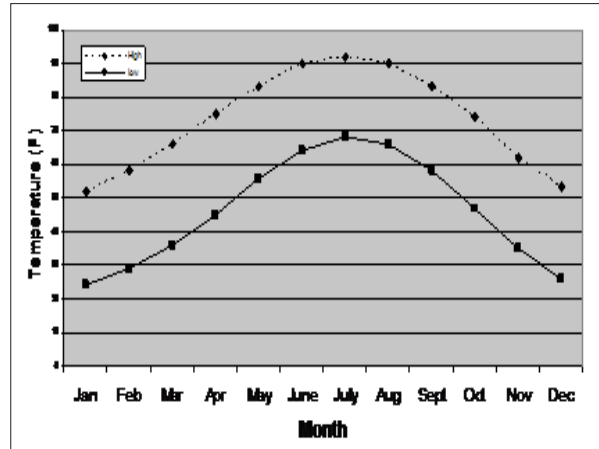

Fig 2. *Relationship between the delivery pattern and monthly high temperatures at a southwestern teaching hospital. Mean followed by the same character are not significantly different (P< .002).*

Further, statistically the program's busiest month for delivery during the ten-year period was September (Figure 2). This correlated with conceptions taking place in late December or early January, the region's coldest period of the year (Figure 3).
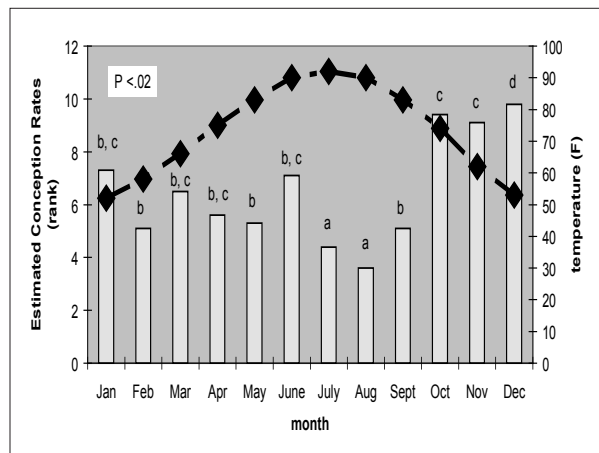

Fig 3. *Relationship between the estimated time of conception and monthly high temperatures at a southwestern teaching hospital. Mean followed by the same character are not significantly different (P< .002).*

Discussion

While a series of studies have suggested that the season of delivery might be associated with birth weights (1-3) and health outcomes (4,5), few studies are available on the effect of weather on natural conception rates in humans (6).

Data from the present study suggests that weather patterns may cause shifting patterns in conception rates on a regional basis. Although the shift does correlate with temperature extremes, it is unclear if the pattern changes are due solely to temperature variations as much as associated day length or social behaviors (ie. outside activities). Further, it recognized that not all conceptions too place in the immediate location of the delivering hospital. However, the regional weather patterns were relatively similar (times of high and low temperature) throughout the hospital's catchment basin, most locations varying only a few degrees in day time high and night time low temperatures. Further, the region averages 290 days of sunshine per year, encouraging outdoor activity almost year round., but more so in the summer months with there extended daylight hours and warmer temperatures

However, understanding the shifting patterns of conception and delivery would be extremely useful to hospitals in establishing staffing, regulating staff time off and budgeting concerns. Further study is warranted to determine if this cyclic pattern is strictly a local phenomenon or might be a useful wide ranging tool for forecasting patient census in the delivery wards.

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