Trends In Reproductive Performance In Dairy Cows: What Do The Numbers Tell Us?

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Introduction

There is concern that today's high producing dairy cows are less fertile than cows 10 to 20 years ago [9]. Although reproductive performance seems to be getting worse, there are only a few studies that report quantitative data that show this decline. The objective of this paper is to summarize the trends in reproductive performance in some of these studies, with a focus on the Southeastern US. In addition, we present some of our new results that show the decline in reproductive performance in dairy herds in Florida and Georgia between 1980 and 2000.

Days to First Service

In a study of 1772 Ohio dairy herds enrolled in DHIA between 1992 and 1998 [10], the days to first service in all cows slightly increased from 90 days (1992) to 94 days (1998). For cows in their first lactation, days to first service was approximately 92 days and had not significantly changed between 1992 and 1998.

Washburn and coworkers [13] studied the reproductive performance in 532 Holstein and 29 Jersey herds in 10 Southeastern states that were enrolled in DHIA between 1976 and 1999. Nine Holstein herds from Florida and 47 from Georgia were included in this study (see Table 1). The researchers used data from DHIA Herd summary records.

Table 1. Total number of herds in the study of reproductive performance in 10 Southeastern states. Adapted from Washburn and coworkers [13].

State	FL+GA	AL+MS+LA	KY+TN	NC+SC	VA
Holstein	56	537	84	127	212
Jersey	0	7	10	8	4

Washburn and coworkers [13] found an increase in days to first service from 84 days in five 3-year periods beginning in 1985-'87 to 100 days in 1997-'99 in Holstein herds. Half of the 16 days increase occurred in the last three years of their study. Days open in Jersey herds in the same 12 years increased from 78 days to 92 days.

Estrus Detection Rate

Washburn and coworkers [13] found estrus detection rates for the five 3-year periods from 1985-'87 through 1997-'99 of 51%, 46%, 47%, 45%, and 42% in 10 Southeastern Holstein states, a decline of 9% in 14 years. The decline in Jersey herds was similar, but the estrus detection rates were 5 to 10% higher.

Conception Rate

First service conception rate in New York dairy herds decreased from approximately 65% in 1961 to 40% in 1996 [4]. In Kentucky, conception rates (conceptions / services) in 49 to 73 herds enrolled in DHIA decreased from 62% in 1972 to 34% in 1996 [11]. Conception rates decreased from approximately 55% in 1970 to 33% in 1999 in 143 herds that were continuously enrolled in the DHIA record system [9]. In the Ohio study [10], conception rates (conceptions / services of cows that eventually conceived) decreased from 52% (1992) to 50% (1998).

Figure 1 shows the conception rates in five regions (FL+GA, AL+MS+LA, KY+TN, NC+SC, and VA) of the study of Washburn and coworkers [13]. The researchers found a similar decrease in conception rates (all conceptions / all services in the herd) from approximately 53% in 1976-1979 to 34% in 1997-1999 in all five regions. The decrease started in the late 1980s and appears to have leveled off somewhat in the late 1990s. At 32%, conception rates in 1997-'99 were the lowest in Florida and Georgia.

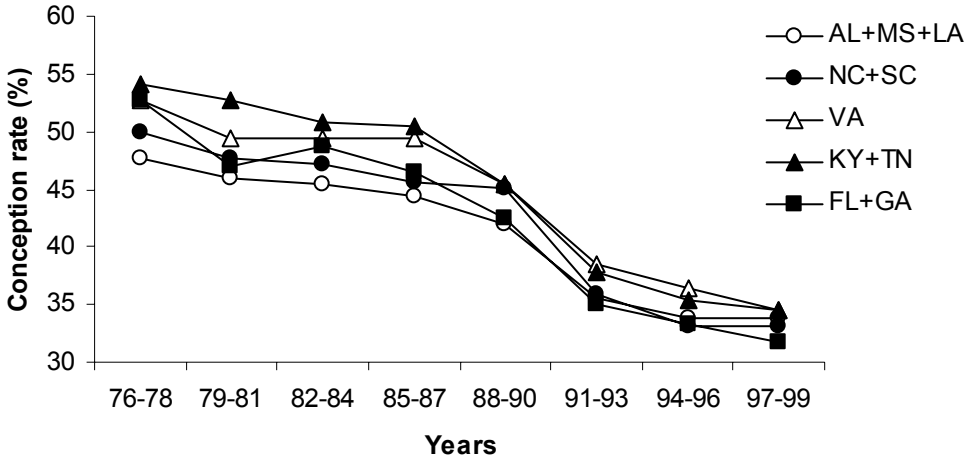

Figure 1. Conception rates from 561 herds in 10 Southeastern states in 1976 to 1999. Adapted from Washburn and coworkers [13].

Days to Conception and Days Open

Washburn and coworkers [13] also studied the trend in days open. Days open was calculated by Dairy Records Management Systems (Raleigh, NC) and included actual days to conception for pregnant cows, plus days open estimates for open cows. Days open from open cows were based either on the most recent insemination dates or the number of days from calving to test date for cows at least 60 days after calving but without insemination dates. Figure 2 shows how days open in Holstein herds has increased in all 5 regions from approximately 126 days in 1976-'78 to 172 days in 1997-'99. Days open in FL and GA were approximately 184 days in 1997-'99.

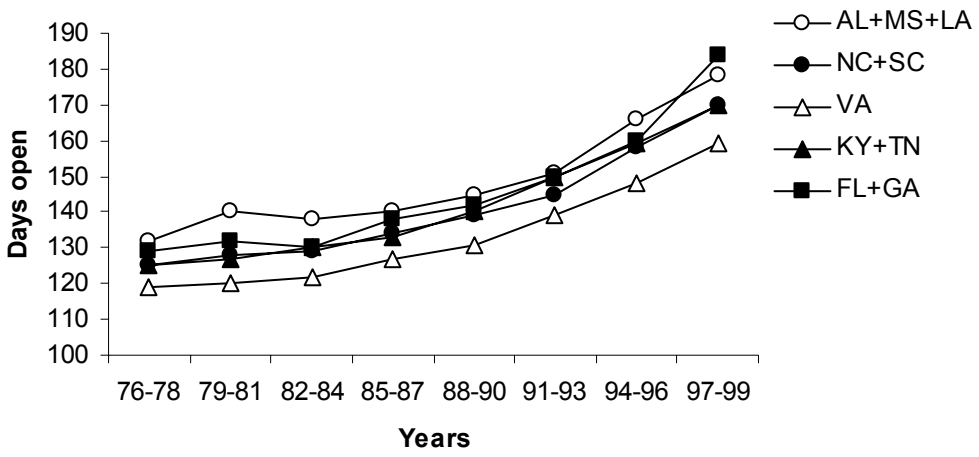

Figure 2. Days open from 561 herds in 10 Southeastern states 1976-1999. Adapted from Washburn and coworkers [13].

In the Ohio study by Rajala-Schultz and Frazer [10], the days to conception in all cows increased from 136 days in 1992 to 151 days in 1998, but it remained constant at approximately 142 days in first lactation cows.

In our study, we used over 1.4 million lactation records obtained from Dairy Records Management Systems (DRMS) in Raleigh, NC, from all Holstein herds in Florida and Georgia that submitted data to DHIA between 1980 and 2000. We calculated days to conception, calving interval, and pregnancy rates for seven 3-year time periods: from 1980 to 1982 through 1998 to 2000. The number of herds included in this study decreased from 583 in 1980-'82 to 337 in 1998-'00. For days open and calving interval, we defined four seasons based on the month of calving: winter (January through March), spring (April through June), summer (July through September), and fall (October through December). In our study, we calculated days to conception as days to calving minus 280 days for completed lactations and days to pregnancy for lactations that were not completed.

We found average increases in days to conception from 121 days in 1980-‘82 to 158 days in 1998-‘00. Cows calving in the spring took the longest to conceive (from 145 to 189 days), cows calving in the fall the shortest (from 110 to 144). The largest increase in days to conception was for winter calvings (from 130 to 177 days) and the shortest increase was for summer calvings (from 118 to 150 days).

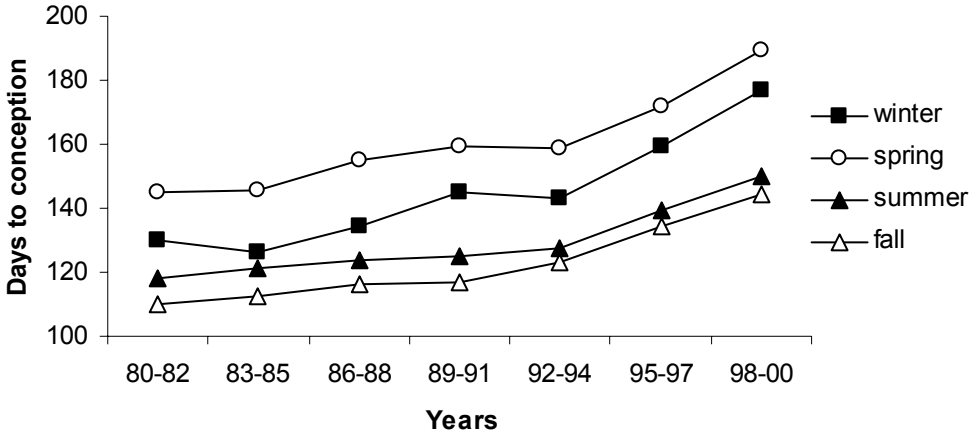

Figure 3. Days to conception from 1980 to 2000 in all Florida and Georgia Holstein herds that submitted data to DHIA by season of calving (winter: Jan-Mar, spring: Apr-Jun, summer: Jul-Sep, fall: Oct-Dec).

Calving Interval

Rajala-Schultz and Frazer [10] reported an increase of about 15 days in calving interval from 13.6 months in 1992 to 14.1 months in 1998. In our study, the results for the average calving interval follow those of our days to conception results. The average calving interval in Florida and Georgia herds has increased by 37 days from 13.2 months in 1980-‘82 to 14.4 months in 1998-‘00.

Pregnancy Rate

We calculated pregnancy rates as the number of pregnancies divided by the total number of days open times 21 in a period. One pregnancy rate calculation used all days open in cows between 60 and 270 days in milk and the number of pregnancies established in those 210 days. The other pregnancy rate calculation used only days open between 70 to 91 days in milk and the number of pregnancies established in those 21 days. This may be a better measure of reproductive performance during a time when most dairy producers try to get cows pregnant. Pregnancy rates in the four seasons were based on the number of pregnancies established and the total number of days open in each 3-month period.

We found that that average pregnancy rates for days 60 to 270 in lactation in Florida and Georgia herds remained at approximately 23% from 1980-‘82 through 1992-‘94, but then decreased to 20% in 1995-‘97 and 17% in 1998-‘00 (Figure 4). Seasonal effects are large, with approximately a 16% higher pregnancy rate in the winter compared to the summer. In the period 1998-‘00, winter pregnancy rates were 25% while summer pregnancy rates were 9%. Spring and fall pregnancy rates were approximately 18% in that period. Figure 5 also shows the decline in pregnancy rates calculated per month between 1980-’82 and 1998-’00. Pregnancy rates for days 71 to 91 were similar to pregnancy rates for days 60 to 270.

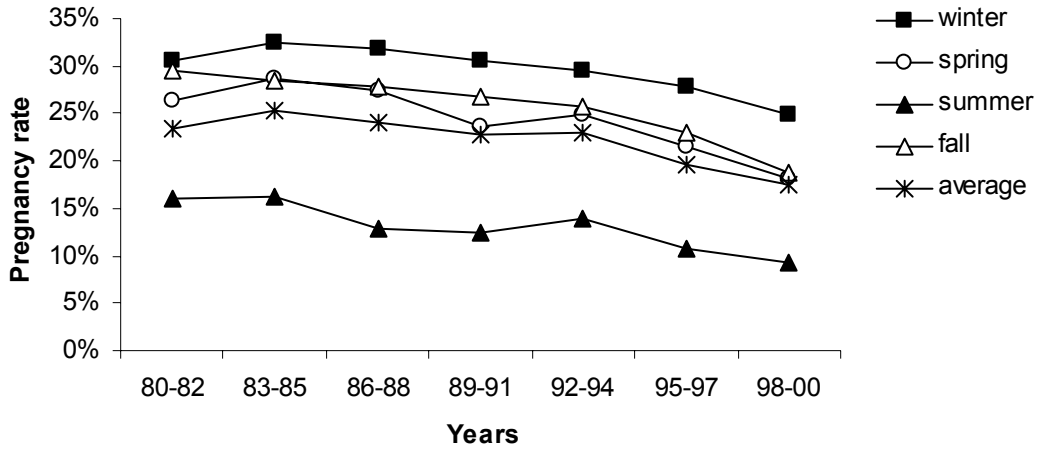

Figure 4. Pregnancy rates from 1980 to 2000 in all Florida and Georgia Holstein herds that submitted data to DHIA by season (winter: Jan-Mar, spring: Apr-Jun, summer: Jul-Sep, fall: Oct-Dec) and annual average. Pregnancy rates were calculated for days open between 61 and 270 days.

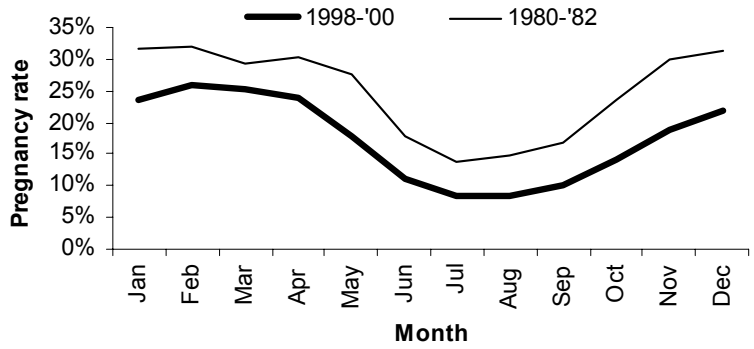

Figure 5. Pregnancy rates in 1980-‘82 and 1998-‘00 in all Florida and Georgia Holstein herds that submitted data to DHIA by month. Pregnancy rates were calculated for days open between 61 and 270 days.

Reasons for the Decline in Reproductive Performance

An overview of the available data shows that dairy herd reproductive performance in the Southeast and the US has worsened significantly in the last 20 years. Lucy [9] presented a discussion of the causes of this decline in fertility and found that the root cause is probably a combination of a variety of management and physiological factors.

As far as management factors go, it is generally assumed that a calving interval of 12 to 13 months is economically optimal. Several studies support this idea [6,7], but some studies have found that a longer calving interval could be economically advantageous [2,12]. For example, there is experimental data from 19 dairy farms in Israel that suggest that intentional delayed breeding may be economically feasible in using modern Holsteins in year-round calving herds [2]. Washburn and coworkers [13] suggested that some of the increases in days to first service and average days open in Southeastern herds may be due to the increasing popular idea that delayed breeding can be economically advantageous. However, they also found that the number of days open *after* the first breeding still increased in the last 20 years, suggesting that it takes longer to get cows pregnant after the start of breeding.

Delayed breeding might be advantageous only in certain times of the year. Some Florida dairy producers choose not to breed cows in the fall because they do not want their cows to calve in the summer due to the heat stress. Cows that calve in the summer have lower milk peaks and are more at risk for involuntary culling.

The use of bST since 1994 has led to more persistent lactation curves [3], which decreases the cost of additional days open [6]. Consequently, open cows should have more breeding opportunities before they become reproductive culls. More persistent lactation curves also increase the likelihood that delayed first service is economically advantageous. A result of the changes in management of more persistent lactation curves is that some measures of reproductive performance, such as days to first service, days open, and calving interval, have worsened. Yet the decline in reproductive performance started well before 1994 and is also evident in countries where bST is not used [13].

Dairy geneticists found that there is a negative genetic correlation between milk production and fertility [1,5]. Figure 6 shows how the mature equivalent milk yield has increased more than 5400 lbs between 1980 and 1990 in our Florida and Georgia study. This increase is both a result of improved management and genetics. It appears therefore that the physiological basis of fertility has weakened. However, higher producing herds do not necessarily have a lower reproductive performance [10,13]. Better management in these higher producing herds probably compensates for the negative effect of milk production on fertility. For cows in the same herds, Gröhn and Rajala-Schultz [8] reported that milk yield in the first 60 days of lactation did not have a significant effect on conception rate. A more important factor was the negative effect of

disease on conception rate. Some other factors that may explain the decline in fertility are a more negative energy balance and increased levels of inbreeding [9].

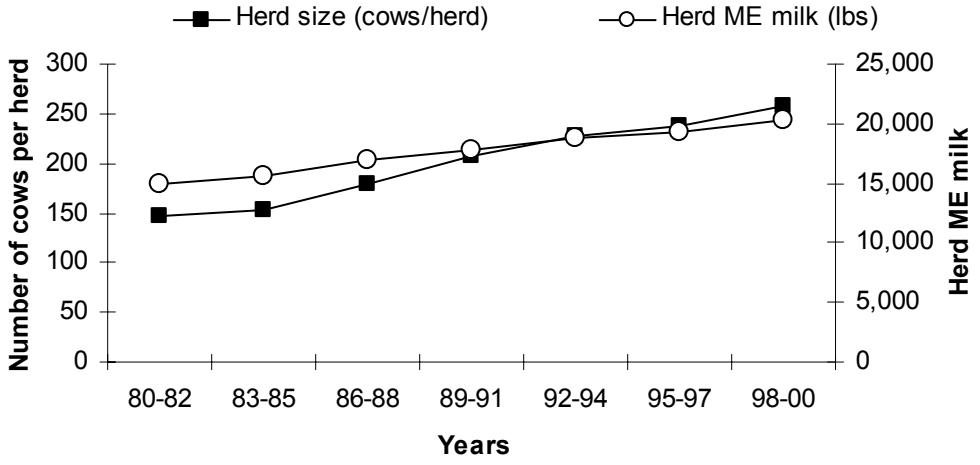

Figure 6. Average number of cows and herd mature equivalent (ME) milk from 1980 to 2000 in all Florida and Georgia Holstein herds that submitted data to DHIA.

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