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Changes in First Lactation Dairy Herd Improvement Records¹

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ABSTRACT

Dairy Herd Improvement Association records for all first lactation Holstein and Jersey cows from Pennsylvania were analyzed for DHIA production years 1985 to 1990. A total of 504,411 Holstein and 15,847 Jersey records were used. Average age at first calving across all years was 26.64 mo for Holsteins and 25.36 mo for Jerseys. During the 6-yr period, age at first calving decreased .6 and .3 mo for Holsteins and Jerseys, respectively. Actual first lactation milk production and milk fat and milk protein yields increased by 661, 20, and 6 kg and 418, 19, and 7 kg for Holsteins and Jerseys, respectively. Average BW at first calving did not change during the 6-yr period for either breed. The distribution of age at first calving was skewed toward older calving ages for both breeds. The decrease in average age at first calving resulted in a greater percentage of the population calving at 24 mo of age in later years. In most cases, the difference in 305-d milk production by Holsteins calving for the first time at 24 versus 30 mo was less than 100 kg. Jerseys showed no advantage in 305-d milk production by calving later than 22 mo.

(**Key words:** age at calving, heifers, Holstein, Jersey)

Abbreviation key: AFC = age at first calving.

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INTRODUCTION

Breeding heifers at an earlier age by accelerating their growth reduced feed costs and allowed an earlier return on investment (1, 5, 11). Although actual first lactation production was decreased, cows calving earlier produced more milk per day of herd life (4, 11, 15). Other reports (5) show no difference in production of heifers calving at 22.2 or 24.6 mo. Gill and Allaire (6) reported that the optimal age at first calving (AFC) for peak total lifetime performance was 22.5 to 23.5 mo. Studies (16) showed the beneficial effects of decreasing AFC, unless dystocia is a problem because of reduced size with younger calving. Weight at calving was correlated positively with milk production (11) and must, therefore, be considered when reducing AFC.

No long-term trends of change were evident in AFC in the US from 1960 to 1982 (12, 13). Powell (13) found that AFC in Holsteins ranged from 28.00 mo in 1976 to 27.16 mo in 1960 and in Jerseys from 26.54 in 1976 to 25.93 mo in 1982. Results of Nieuwolf et al. (12) were similar using records from the same period. Lin and Allaire (10) estimated that the economic value of a 1-mo decrease in AFC equaled an increase of 138 kg of milk production in the first lactation. This change could have an important economic impact on the dairy industry. Despite recommendations (2, 9) of calving replacements at or near 24 mo, previous reports have shown that commercial dairy farmers were not decreasing their AFC toward this optimum. The objectives of this study were to investigate trends of mean AFC for Holsteins and Jerseys in Pennsylvania from 1985 to 1990 and to describe the variation in DHIA production variables during that 6-yr period.

MATERIALS AND METHODS

First lactation records from Pennsylvania DHIA for 504,411 Holstein and 15,847 Jersey

TABLE 1. Overall summary of Pennsylvania DHI first lactation data from 1985 through 1990 for Holstein and Jersey cows.

Variable	1985	1986	1987	1988	1989	1990
Holstein						
Number of cows	82,886	76,881	81,819	80,395	93,745	88,685
Age at calving, mo	26.9	26.9	26.8	26.6	26.4	26.3
Milk, kg/yr	6129	6534	6660	6735	6738	6739
Fat, kg/yr	225	233	238	243	252	245
Protein, kg/yr	NA ¹	204	207	212	211	211
BW, kg	509	511	510	513	514	513
Jersey						
Number of cows	2179	2198	2409	2635	3146	3280
Age of calving, mo	25.5	25.4	25.4	25.3	25.3	25.2
Milk, kg/yr	4087	4337	4441	4463	4873	4505
Fat, kg/yr	195	203	207	208	215	214
Protein, kg/yr	NA	157	162	164	165	165
BW, kg	423	431	428	434	433	426

¹Data not available for 1985.

cattle were summarized by year of calving. Records were for DHI summary years 1985 to 1990 inclusive. Body weight was estimated using a heart girth measurement taken at the first DHIA testing date for each cow and converted to live weight using the DHIA standard conversion (3). A first lactation was defined as the first available record initiated between 19 and 35 mo of age (13). A small number of very young or very old cows may have been excluded by this definition of AFC. The AFC was expressed to the nearest month, and calculations also were on that basis. Regressions of calving age by year used standard procedures (14), and effects were significant at $P < .01$.

RESULTS AND DISCUSSION

A summary of the overall data used in the analysis (Table 1) shows that 76,000 to 94,000 Holsteins and 2100 to 3200 Jerseys were included each year. Mean AFC decreased over the 6-yr period. Mean AFC by calving year for Holsteins and Jerseys are shown in Figure 1. Linear regressions of average age at calving on year were significant for Holsteins ($R^2 = .87$) and Jerseys ($R^2 = .98$). These data are similar to those by Nieuwolf (12) and Powell (13) from inspection of the last 6 yr (1976 to 1982) of long-term data sets. Those studies (12, 13) concluded, however, that no long-term trends existed in AFC for any breed from 1960 to 1982. In all cases, the linear regressions were more significant than higher order curves. Regressions showed annual decreases of .083 mo for Holsteins and .050 mo for Jerseys, which is similar to data of Powell (13): .075 to .111 for the period of 1976 to 1982. The current data set shows that the trend noted by Powell (13) by inspection from the data in the last 6-yr period is continuing. Because of the high costs related to raising heifers, small decreases in AFC will be important to dairy farmers. Although these changes are in the right direction to decrease replacement costs, great potential remains for more improvement. Both breeds showed significant linear increases in milk production and for fat and protein yields over the period. Body weights

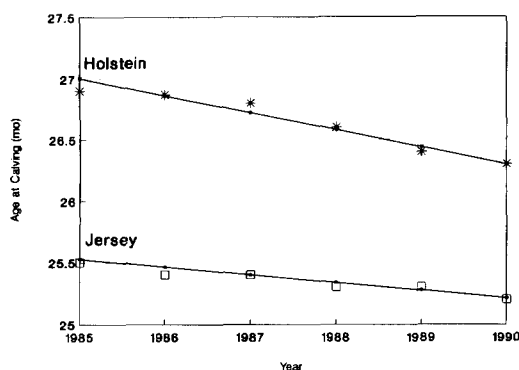


Figure 1. Average age at calving for Pennsylvania DHI Holsteins and Jerseys from 1985 to 1990.

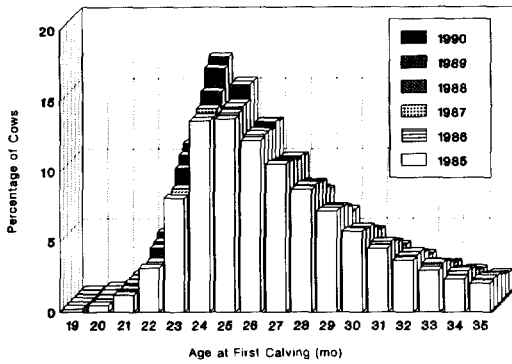


Figure 2. Population distribution (percentage of the total per month) of Pennsylvania DHI Holsteins by average age at calving from 1985 to 1990.

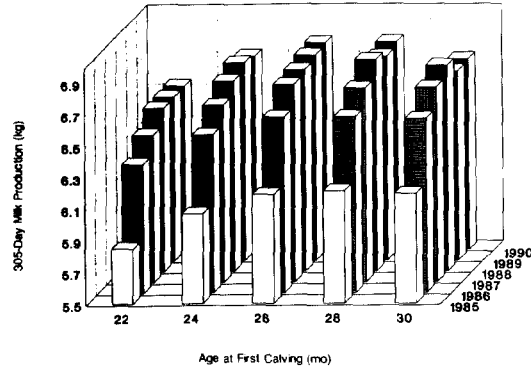


Figure 4. The 305-d milk production of Pennsylvania DHI Holsteins by age at calving (in months) for 1985 to 1990.

were similar for cows for each year of the analysis.

The distribution of percentage of cows calving by AFC for Holsteins and Jerseys is shown in Figures 2 and 3. Distribution of AFC was skewed for both data sets. Values for skewedness increased linearly from .56 to .76 for Holsteins and .96 to 1.03 for Jerseys over the 6-yr period. The population mode shifted from 25 to 24 mo in 1988 for Holsteins (Figure 2) and remained at 24 mo for Jerseys during the 6-yr period. The median for Holsteins remained at 25 mo throughout the period, whereas the median for Jerseys was at 25 mo from 1985 to 1989 and was 24 mo in 1990. Figure 2 shows that in the later years (1988 to

1990), a greater percentage of cows calved from 22 to 26 mo but that fewer calved from 28 to 35 mo. The data for the Jerseys (Figure 3) do not show a clear trend. Fewer data points for Jerseys than for Holsteins do not permit conclusive evaluation of trends for Jerseys.

The average yearly 305-d milk production by month of age at calving is shown for Holsteins and Jerseys in Figures 4 and 5. The Holstein data show that cows calving at 26 mo and beyond produce similar amounts of milk, as do primiparous cows that calve at 24 mo. In most cases, the difference in 305-d milk production by cows calving for the first time at 24 versus 30 mo is less than 100 kg. The data for Jerseys (Figure 5) are more variable be-

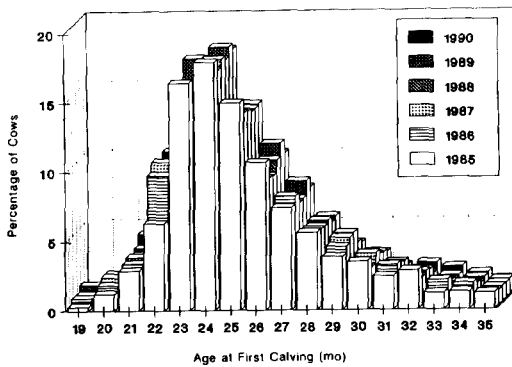


Figure 3. Population distribution (percentage of the total per month) of Pennsylvania DHI Jerseys by average age at calving from 1985 to 1990.

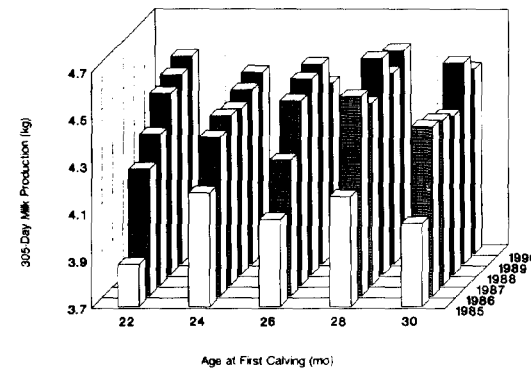


Figure 5. The 305-d milk production of Pennsylvania DHI Jerseys by age at calving (in months) for 1985 to 1990.

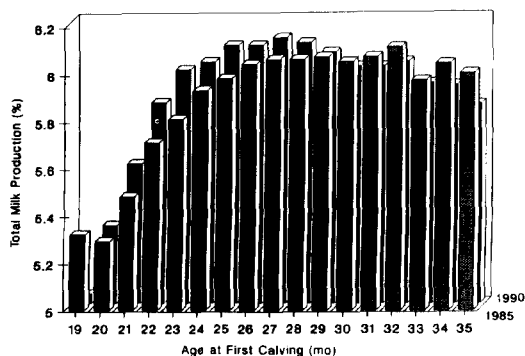


Figure 6. Proportion of the total milk produced by Pennsylvania DHI Holsteins by age at calving (in months) for 1985 and 1990.

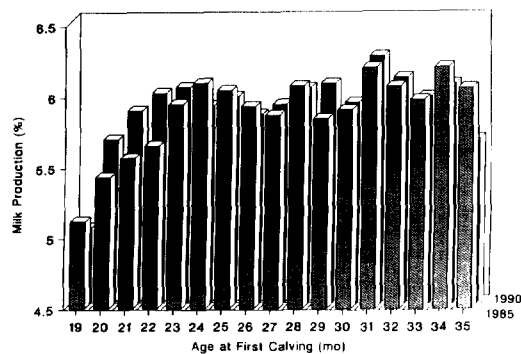


Figure 7. Proportion of the total milk produced by Pennsylvania DHI Jerseys by age at calving (in months) for 1985 and 1990.

cause of a much smaller population. Jerseys calving at 22 mo apparently produce amounts of 305-d milk similar to those of cows calving older. These type of production data is confounded by herd.

In a further analysis of the data, the percentage of the total yearly supply of actual milk that was produced by each group of cows by AFC was computed. The 305-d first lactation data for the first and last years of the current study are shown in Figure 6 for Holsteins and in Figure 7 for Jerseys. Both data sets show that a larger proportion of the total milk produced by the population of first lactation cows was produced by the younger cows in 1990 compared with 1985. The data from Jersey cows (Figure 7) do not show a strong trend as do the data from Holsteins (Figure 6). These figures reveal that cows first calving at younger ages produced as much or more actual milk than cows first calving at older ages. The changes in production of these cows occurred when AFC decreased, but BW at calving did not change. These production data agree with population studies for Holsteins (7) and Jerseys (8) showing that heifer growth rates from 2 to 24 mo increase as age at calving decreases, resulting in decreased AFC with similar BW at calving. These findings indicate that this trend results in a net increase in milk production from the population of cows calving at younger ages. The dairy farmers for which heifer data were used in these analyses apparently follow recommendations for reducing calving age. Although this reduction occurs

slowly, AFC appears to decrease steadily. Data on a regional or national basis should be investigated for similar trends.

CONCLUSIONS

The distribution of AFC was skewed toward older calving ages for both Holstein and Jersey first lactation cows; however, mean AFC decreased significantly for both breeds in Pennsylvania DHIA herds over the preceding 6 yr. Body weights at calving did not change over the 6-yr period; however, milk production increased. Cows calving at younger ages produced a greater proportion of the total milk for all first lactation cows. These data indicate that dairy farmers are progressing their first lactation cows toward recommended AFC.

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