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Using nonlinear quantile regression to describe the milk somatic cell count of Iranian Holstein cows

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The main objective of this study was to compare the performance of different 'quantile regression' (QR) models evaluated at the τth quantile (0.25, 0.50, and 0.75) of somatic cell count (SCC) in Iranian Holstein dairy cows. Mathematical models used in fitting the lactation curve contribute towards better management, physiological and breeding decisions. QR is a flexible tool that allows a specific lactation curve at anyquantile of the trait and can be applied on data with non-normal distributions. Therefore, using QR can be more appropriate, for instance, where the pattern of lactation curve of the trait differs between high and low quantiles. This is more pronounced in trait SCC, where the distribution is not normal and cows with high levels of SCC are suspected to be mastitic cows. Data were collected by the Animal Breeding Center of Iran from 1991 to 2011, comprising 101,147 monthly milk yields of 13,977 cows in 183 herds. An exponential (Wilmink) and a polynomial (Ali & Schaeffer) functions were implemented in the quantile regression. The results showed that all parameters for SCC at the three quantiles Wilmink (*a,b* and *c,* parameters) and Ali & Schaeffer function (*a, b, c, d* and *g,* parameters) were significantly different from zero ($P<0.01$) and not significant, respectively. Parameters *b* (increasing slope parameter) and *c* (declining slope parameter) in Wilmink function had increased at the across quantiles and parameter *a* (SCS level at the beginning of lactation) was not similar. QR with Ali and Schaeffer function fitted the data better than the one with Wilmink function based upon Akaike information criterion and log-likelihood. Among quantiles, 0.25th quantile showed best model fit with both functions. QR analysis of SCC, which is a non-normal trait with mixture distribution, provides more insight into the management decisions in dairy farms.

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Connections between register-based and animal-based indicators for an assessment of animal welfare

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Milk production is a multifactorial system, where a variety of factors have an influence on animal welfare. In results of Scholz *et al.* and Wallenberg, a significant correlation has been observed between register-based and animal-based indicators of animal welfare. So, both sources of information are useful to describe animal welfare. From this point of view, 26 register-based indicators and 11 animal-based indicators were recorded in 31 dairy farms with an herd size from 80 to 1,134 dairy cows. Then, the 37 indicators were reduced to 10 main indicators with the highest informative value and practical application for the stockman in terms of self-monitoring. Between the index of the six register-based (culling, mortality, culling of first-lactation dairy cows, culling till the first 30 days p.p., proportion of udder healthy cows, rate of mastitis of the first-lactation cows) and the four animal-based indicators (cleanliness of hindquarter and udder, swelling of tarsal joint, lameness, integument alterations), there was a significant correlation of 0.45. Especially, in the group of lactating cows, the indicator of lameness was significantly correlated with the index of register-based indicators ($r=0.40$). The group of non-lactating cows showed a significant correlation ($r=0.41$) between the indicator of swelling of the tarsal joint and the index of register-based indicators. Similar results were found by using a ranking system instead of an index calculation. The study showed that, in the group of 0-15% compared to the group of 16-20% of culling of first-lactation dairy cows, a 24% higher proportion of cows was without lameness. Also, there was a 27% higher proportion of cows without any swellings of tarsal joint in the group with less than 15% of culling of first-lactation dairy cows as in the group with more than 25%. Generally, the 10 register-based and animal-based indicators can be used by the stockman for a self-monitoring and further as an analysis of critical points of the milk production.