

# Multiple imputation of missing predictor values in analysis of reproductive efficiency

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## Aim

Using multiple imputation to evaluate the effect of non-response for VWP on the estimates in analyses of calving interval.

## Conclusion

Multiple imputation of missing values did not affect the estimate of VWP, even though missing value patterns were not random.

## Introduction

We studied how the milk yield, herd size, do-it-yourself yourself (DIY) AI and voluntary waiting period (VWP) affected the calving interval. VWP was obtained from the herds by a questionnaire. We used milk records to obtain data for the other three herd factors. We had a 35% non-response for the VWP. Herds using DIY AI responded to a larger extent. To see how the non-response affected the outcome of the model, we used Markov Chain Monte Carlo (MCMC) multiple imputation method to simulate missing predictor values.

## Results

Parameter Estimates with non-response				
Variable	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	386.3	11.43	33.80	<.0001
VWP	0.49	0.08	5.92	<.0001
DIY AI	2.84	2.96	0.96	0.34
Milk yield	-0.0015	0.0012	-1.29	0.198
Herd size	0.003	0.028	0.12	0.91

Multiple Imputation Parameter Estimates				
Variable	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	391.7	9.27	42.27	<.0001
VWP	0.50	0.08	6.34	<.0001
DIY AI	4.19	2.53	1.66	0.098
Milk yield	-0.0019	0.001	-1.99	0.046
Herd size	-0.006	0.024	-0.24	0.81

## Material & Methods

### Survey

- ❖ 472 dairy herds with >45 cows and data in milk recording were mailed a questionnaire on reproductive reproductive management – 167 non-responders.
- ❖ 445 herds with complete milk records, 152 herds had had non-response for VWP.

	Overall distribution	Distribution among responders
DIY	33%	37%
No-DIY	67%	63%

### Multiple imputation - MCMC

- ❖ Multiple imputation with MCMC of missing VWP with with SAS 9.1 software PROC MI and subsequent analyses with PROC MIANALYZE
- ❖ Single chain, 5 imputations with 200 burn-in iterations and 100 iterations between imputations

Histograms showing distribution of VWP for datasets with missing values and imputed values

