

# AN OBSERVATIONAL STUDY OF LAMBS PERINATAL MORTALITY IN TWO DIFFERENT AGROECOLOGICAL AREAS IN SENEGAL

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Perinatal mortality is a major constraint in African sheep-farming systems<sup>1</sup>. Though sheep is an important animal production in Senegal (4.3 10<sup>6</sup> heads in 1999, FAO estimate), few information is available on this topic. As a part of a broader study on sheep-farming systems in Senegal, a prospective survey was conducted to assess lambs perinatal mortality in 2 extensive systems. Because nutrition was a limiting factor for sheep productivity, 3 nutritional risk factors were evaluated: ewes body-condition score at lambing (BCS), ewes-postpartum weight (PPW) and litter size.

## Materials and methods

The first selected area was Ndiagne (Northern Senegal), with a hot, dry climate. The system consisted in an association of peanut and millet cropping, and small ruminants farming. The dominant breed was the Peul-Peul sheep, reared for meat and milk<sup>2</sup>. The second site was Kolda (Southern Senegal). In this sub-humid area, production system combined rice, maize and peanut cropping with ruminants farming. Djallonke sheep - a West African dwarf trypanotolerant breed reared for meat, was the most frequent ovine<sup>3</sup>. In both places, sheep farming was based on natural grasslands, with poor housing conditions and rare supplemental feeding.

A follow-up survey was undertaken from July 1992 to June 1996. A convenience sample involved 15 villages and 119 herds (Ndiagne), and 24 villages and 107 herds (Kolda). Median herd sizes on 1<sup>st</sup> July 1992 were 16 [9; 26] and 7 [4.5; 10] in Ndiagne and Kolda, (1<sup>st</sup> and 3<sup>rd</sup> quartiles in brackets). Sheep were ear-tagged and farms were visited fortnightly. As an incentive measure, all sheep were vaccinated against peste des petits ruminants (PPR) virus, a *Morbillivirus* widespread in Sub-Saharan Africa<sup>4</sup>.

Perinatal mortality was defined as any case of mortality before 1 week of age, including stillbirths but excluding abortions. Three risk factors were considered: PPW, BCS, and litter size. For BCS, a condition scoring scheme (0 to 5, by 0.5 increments) was adapted for Senegalese sheep breeds<sup>5</sup>.

Data analysis was achieved in 3 steps. (1) Non parametric regressions<sup>6</sup> of mortality against a loess smoother of PPW were fitted. BCS was categorised into 3 equal-range classes. Fitted curves were plotted conditionally on BCS and litter size. The shape of curves and pattern comparisons across the BCS-by-litter-size combinations, were

used to code PPW. (2) Ordinary logistic regressions (OLR) were fitted with the 3 main effects (coded PPW, categorised BCS and litter size) and all interactions. A more parsimonious model was selected with a backward stepwise procedure, according to Akaike's information criterion. (3) Remaining effects were included in a multilevel logistic model<sup>7</sup> to account for data-clustering by ewe, herd and village.

## Results

Variable	Parameter	Std Err	P (t test)
<i>Kolda: Djallonke sheep</i>			
Intercept	-4.13	0.20	-
Ppw1 <sup>a</sup>	-0.42	0.08	< 10 <sup>-3</sup>
Birth <sup>b</sup>	1.28	0.30	< 10 <sup>-3</sup>
<i>Ndiagne: Peul-Peul sheep</i>			
Intercept	-3.83	0.14	-
Ppw1	-0.26	0.05	< 10 <sup>-3</sup>
Ppw2 <sup>c</sup>	-0.13	0.13	0.31
Birth	2.05	0.38	< 10 <sup>-3</sup>
Ppw2*Birth <sup>d</sup>	-0.52	0.37	0.15

Table 1. OLR estimates for lambs perinatal mortality in Kolda and Louga (Senegal).

<sup>a</sup> ewes-postpartum weight, see text for explanations on coding.

<sup>b</sup> Birth: litter size, coded single (ref. categ.) or multiple (litter size > 1).

<sup>c</sup> ewes-postpartum weight, see text for explanations on coding.

<sup>d</sup> Ppw2\*Birth: interaction between Ppw2 and Birth

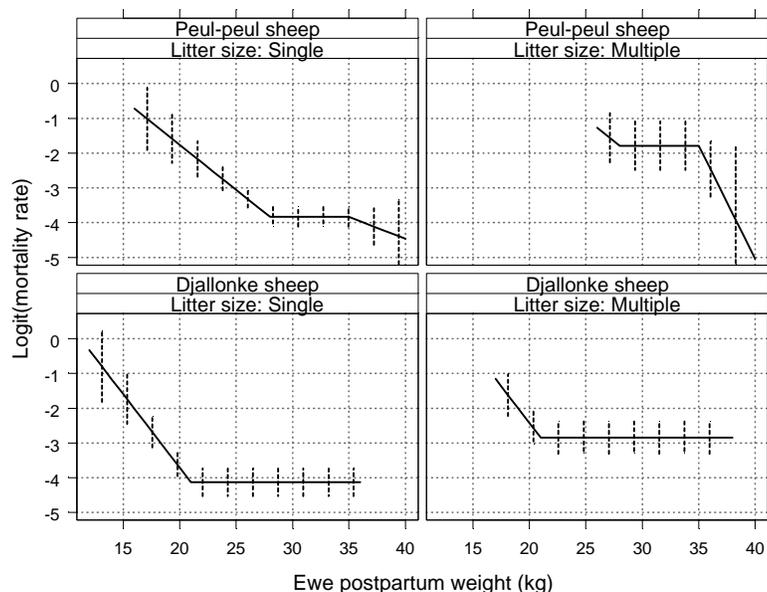


Fig. 1. Relationship between mortality (logit scale), litter size and ewes-postpartum weight for Djallonke and Peul-Peul lambs in Kolda and Louga (Senegal). The solid broken line is the mean mortality. Vertical dashed lines are pointwise 95% confidence intervals.

on perinatal mortality in Ndiagne and Kolda. Though they were retained in the final OLR model, parameters for Ppw2 and Ppw2-by-litter-size interaction were not significant ( $p = 0.31$  and  $0.15$ , respectively).

Perinatal mortality rates were 3.0% and 3.5% in Ndiagne and Kolda ( $n = 3,352$  and  $2,279$  lambs). Non parametric analysis showed a broken-line relationship between mortality and PPW on the logit scale.

Postpartum weight was coded on this basis. For Kolda data, a new variable was created: Ppw1 = PPW - 21 kg, and 0 otherwise. For Ndiagne data, PPW was split into 2 variables: (1) Ppw1 = PPW - 28 kg if PPW < 28 kg, and 0 otherwise, and (2) Ppw2 = PPW - 35 kg if PPW ≥ 35 kg and 0 otherwise.

Because multilevel models did not show any significant ewe-, herd- or village-random effects, we report here the OLR results (Table 1 and Fig. 1).

This study did not reveal a BCS effect

Perinatal mortality was higher ( $p < 10^{-3}$ ) under a PPW threshold of 28 kg in Ndiagne and 21 kg in Kolda (80% of ewes mature weight). Under these thresholds, an increase of 1 kg in PPW was associated with odds ratios of 0.77 [0.71; 0.85] and 0.66 [0.57; 0.76], in Ndiagne and Kolda respectively (95% CI in brackets). Litter size was an important risk factor for perinatal mortality: odds ratios for multiple litters were 7.73 [3.69; 16.18] and 3.61 [2.01; 6.47], in Ndiagne and Kolda ( $p < 10^{-3}$  in both places).

### Discussion and conclusion

Observed perinatal mortality was low in this study, the lowest we found in the West African literature. Two elements might explain this situation. Firstly, because a great care was given to record mortality cases, farmers' attention was drawn to perinatal mortality and they became more careful with ewes in late pregnancy, thus reducing perinatal mortality. It would be a typical case of interaction between the observed and the observer<sup>8</sup>. Secondly, all sheep were vaccinated against PPR. This disease is highly prevalent in Senegal<sup>9</sup>, and mass vaccination had probably an impact on ewes-health status, and positive, indirect effect on lambs survival.

The lack of BCS effect might be due to a confounding effect between PPW and BCS. Further studied are needed to assess this question.

A possible improvement measure would be to provide pregnant ewes with supplemental feeding. The low perinatal mortality rates observed here give little support for the extension of this measure. However, other studies - beyond perinatal period, demonstrated the importance of ewes-nutritional status on suckling-lambs survival and growth<sup>10</sup>. Therefore, it is likely that pregnant-ewe supplemental feeding should improve sheep productivity. The important question is the profitability – for the farmers, of this measure. This should be addressed in future field studies.

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