



## Clarifying VPS's PIM and PRISM Scores

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PIM and PRISM mortality models use logistic regressions [Altman DG, Practical Statistics for Medical Research, Chapman & Hall, Boca Raton, FL, 1991]. In this approach the so-called **logit** of the probability of the event (i.e. mortality) is equal to a sum of risk factors multiplied by the appropriate coefficients. If you look in Straney's PIM3 paper (Straney L et al, *Pediatr Crit Care Med* 2013; 14: 673-681), the risk factors are given in Table 3. The coefficients, and odds ratios, are also given in Table 3. The higher the odds ratio the higher that risk factor contributes to the probability of the event (mortality).

In Straney's paper, there is an actual example on the last page. They build a function called PIM3 for a 6-year-old female patient. Some have **erroneously** started to call this function the PIM3 score. It can be positive or negative. In summary, the more positive the logit, the higher the probability of death. Similarly, the more negative the logit, the lower the probability of death. In this sense, one could associate some sort of scoring with the value of the logit. However, it is only a mathematical function. In contrast, for the PRISM III score [https://www.cpcrn.org/calculators/prismiicalculator], there is an actual algorithm to create a numeric score. The meaning of this score is clinically justified. A specific value of the score can be traced down to an actual clinical state of the patient in terms of the patient's specific ranges of clinical measures. This is not the same as the logit with PIM3.

In VPS's data, the median PIM3 logit of all the data is negative five (-5). This corresponds to a mortality rate of 0.0067, or a probability of death of 0.67%. Note that this terminology also leads to confusion created by different practitioners. In statistics, one does not make a distinction between rate or probability. For example, 0.0067 is understood as a probability, but in medicine some practitioners call probability the rate (0.0067) multiplied by 100, 0.67%.

With respect to PIM2, the same arguments for PIM3 apply. However, PIM2 coefficients are not recalibrated by VPS anymore, and users should be aware that the model may have drifted from its original calibration.

If you have any questions, please contact VPS via the Help Desk: [helpdesk@myvps.org](mailto:helpdesk@myvps.org)

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