

# **Benchmarking PICUs**

## **Detection Of Outliers Depends On The Risk-adjustment Tool Used**

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and the PICE study group**



# Caring without Borders

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# Dutch Pediatric Intensive Care Evaluation



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## Dutch Pediatric Intensive Care Evaluation (PICE)

- National data registry of all admissions to all PICUs
- Clinical database for multi center studies
- Reporting / Benchmarking
  - Metrics on population, diagnoses, severity of illness, PICU capacity, refusals, referrals, adverse events, parental satisfaction, outcome
  - **One of the aims: comparing PICU mortality**
  - Adjustment for risk of mortality: PIM(2) and PRISM(3)

Focus here on PIM2 and PRISM3

- Both validated and used worldwide
- Differences in risk items & data inclusion time
  - PIM 1<sup>st</sup> measurement, PRISM min/max 12(24)hrs
  - PIM2 less items (10) than PRISM3 (25)
- Good performance in our validation study

## Validation study PICE 2006-2009 (ICM 2013 May)

- Both PIM2 and PRISM3 suitable as risk adjustment tools
- Recalibration is needed and possible
- PRISM3 discriminates better than PIM2
  - Overall and in most subgroups
- Mortality prediction becomes harder the longer the stay
- But practical use for benchmarking PICUs on adjusted mortality was not part of the study

Risk adjustment tools for benchmarking PICUs

Does it matter which one we choose?

- We could make a choice, based on:
    - ease-of-use, number of risk items, data inclusion period,
    - most up-to-date, use in our region,
    - best discrimination, least variation
- Do they detect same outlying centers?

Study population: PICE cohort 2006-2009 (ICM 2013)

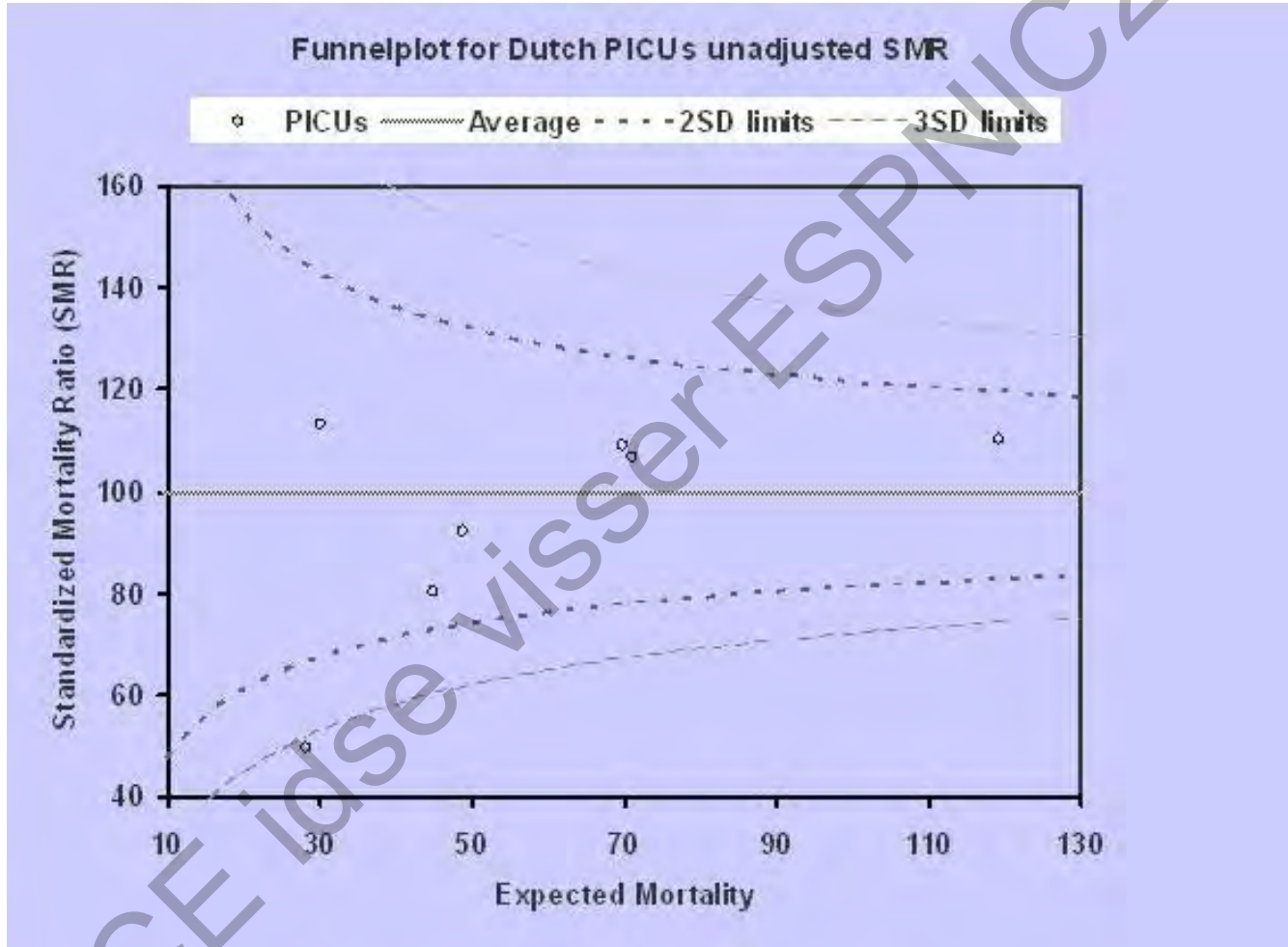
- 12,040 admissions
- 412 deaths (3.4% average mortality rate)
- 7 PICUs (mortality rates: 1.7% - 3.9% )

PICUs	PICU1	PICU2	PICU3	PICU4	PICU5	PICU6	PICU7
number of admissions	825	2040	1425	1312	2078	3481	879
crude mortality rate	1.7%	3.7%	3.2%	2.7%	3.7%	3.8%	3.9%



# Dutch Pediatric Intensive Care Evaluation: risk adjustment

## Benchmarking before risk adjustment



Unadjusted for risk of mortality → one outlier

- Outlier maybe due to low-risk population

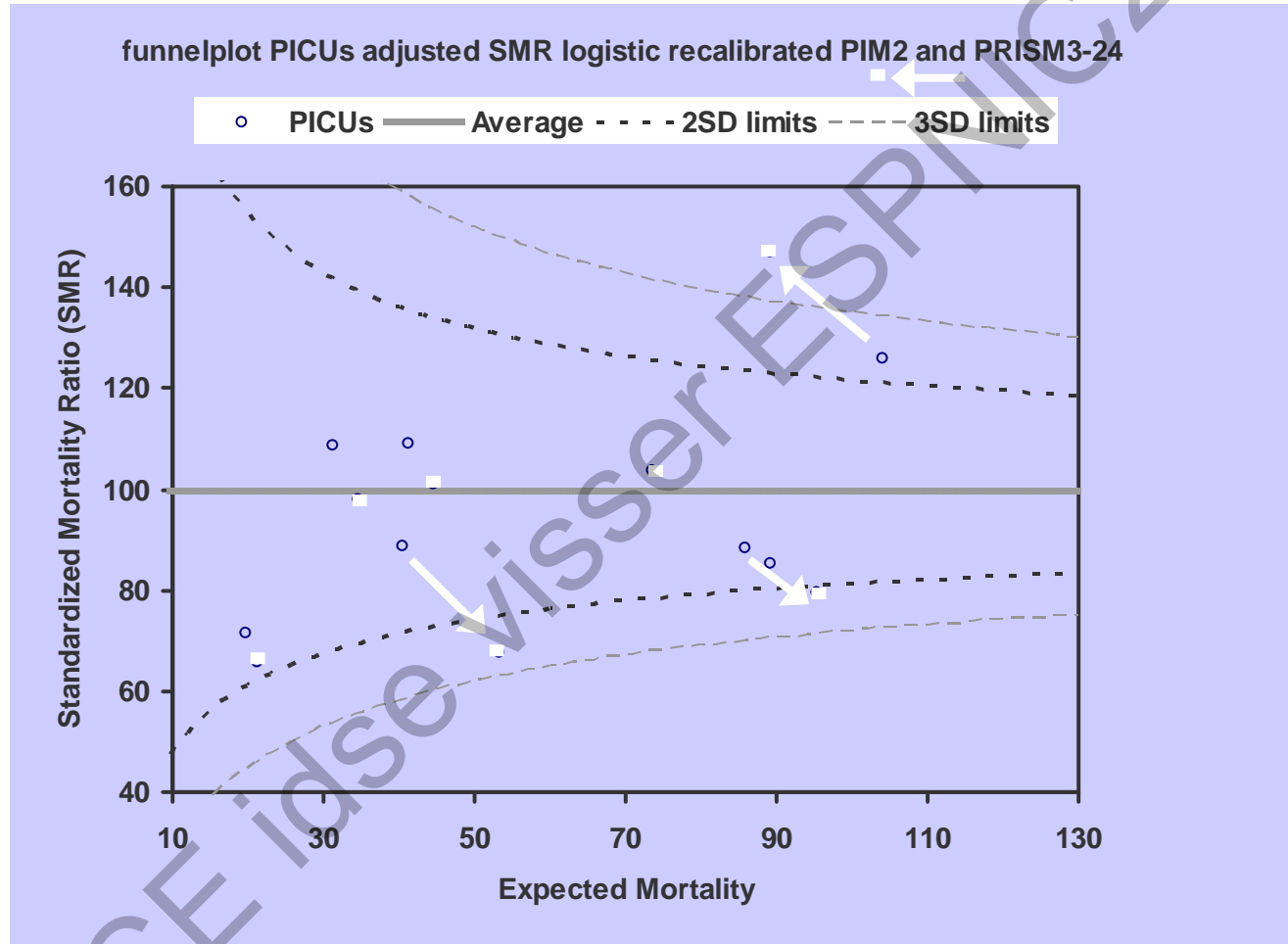
→ Compare risk adjusted PICU mortality

- With recalibrated PIM2 and PRISM3-24

Both predicting exactly overall observed mortality

# Dutch Pediatric Intensive Care Evaluation: risk adjustment

## Benchmarking after risk adjustment by PIM2 & PRISM3-24



Further customizing these models to our setting.

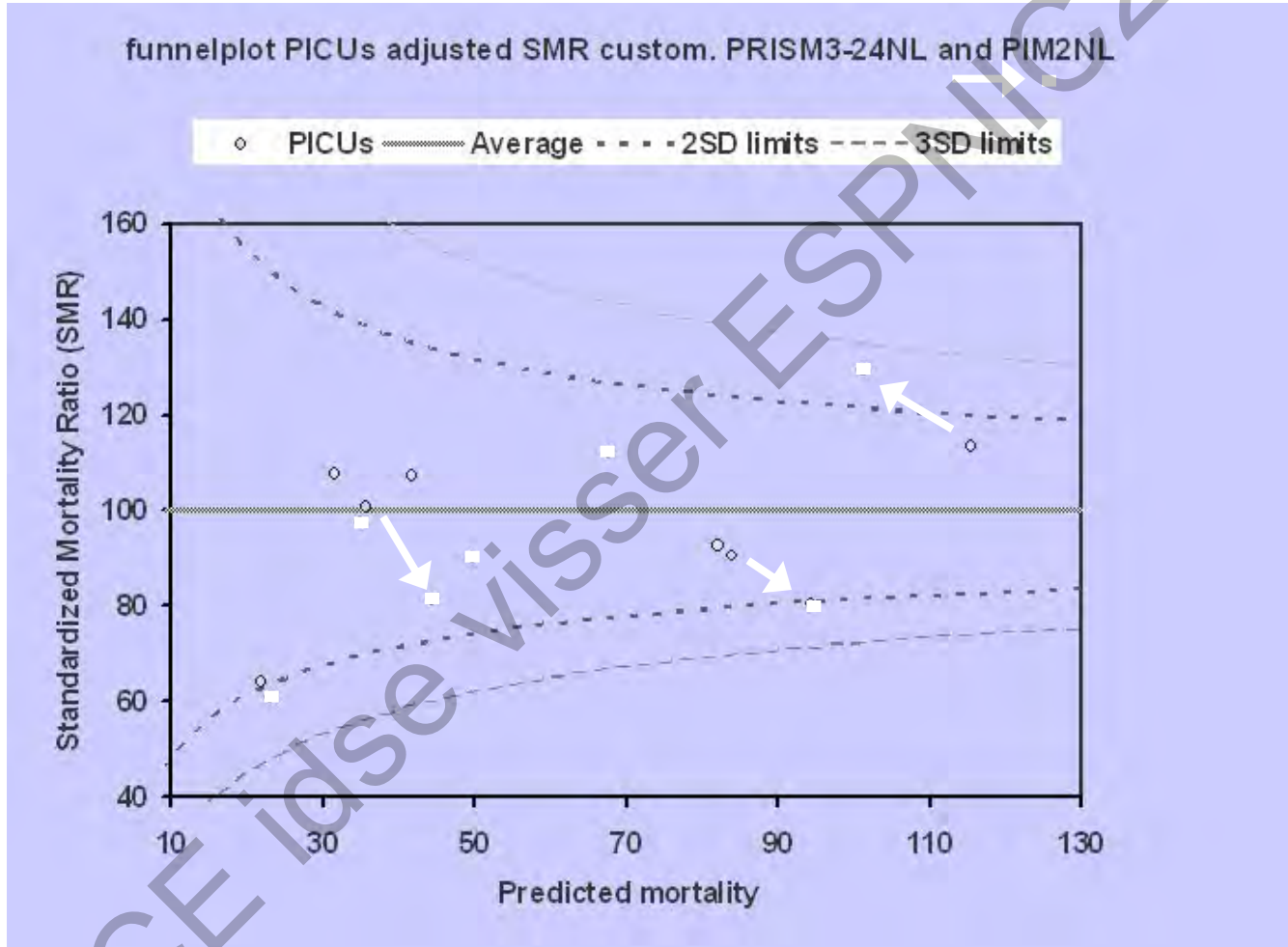
- Adjusting relative weights of risk factors
  - PIM2NL some improvement in discrimination
  - PRISM3-24NL no improvement, but still higher

Discrimination (c-statistic) customized models

Models\centers	PICU1	PICU2	PICU3	PICU4	PICU5	PICU6	PICU7	TOTAL
PIM2	.92	.84	.90	.76	.87	.86	.82	.85
<b>PIM2NL</b>	<b>.93</b>	<b>.86</b>	<b>.91</b>	<b>.79</b>	<b>.88</b>	<b>.86</b>	<b>.82</b>	<b>.86</b>
PRISM3-24	.97	.91	.92	.85	.93	.90	.86	.90
<b>PRISM3-24NL</b>	<b>.94</b>	<b>.89</b>	<b>.93</b>	<b>.80</b>	<b>.93</b>	<b>.90</b>	<b>.85</b>	<b>.90</b>

# Dutch Pediatric Intensive Care Evaluation: risk adjustment

## Benchmarking after customized risk adjustment



## Discussion

- Develop tailor-made Dutch adjustment tool?  
no international benchmark
- Continuing specialization and unique case mix  
European cooperation, specific risk profiles?
- Only benchmark within units over time?
- Accept differences and report adjusted outcome after  
extensive data review (G.Parry Qual Saf Health Care 2006)
- Wait for update? (...PIM3)

## Conclusion

Detecting outliers in PICU mortality depends on the risk adjustment tools used and their customization to the population at study.

With some less variation for PRISM3-24.



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