Defining the Oxygen Saturation Target in Critically-Ill Patients

Analysis of the MIMIC-III Database

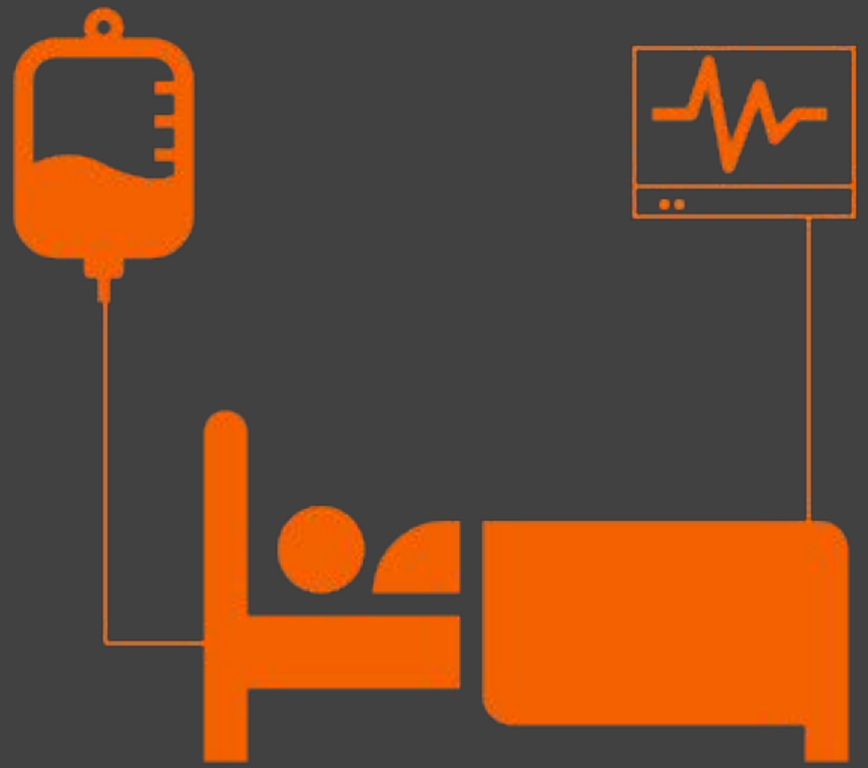
NUS-MIT Datathon 2018

8 July 2018

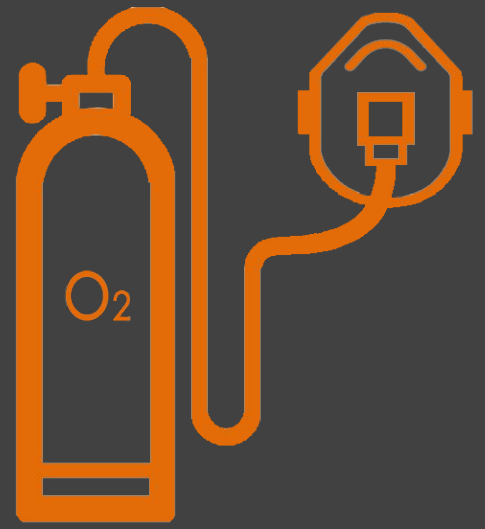
Team Oxygenator

Image obtained from Alibaba

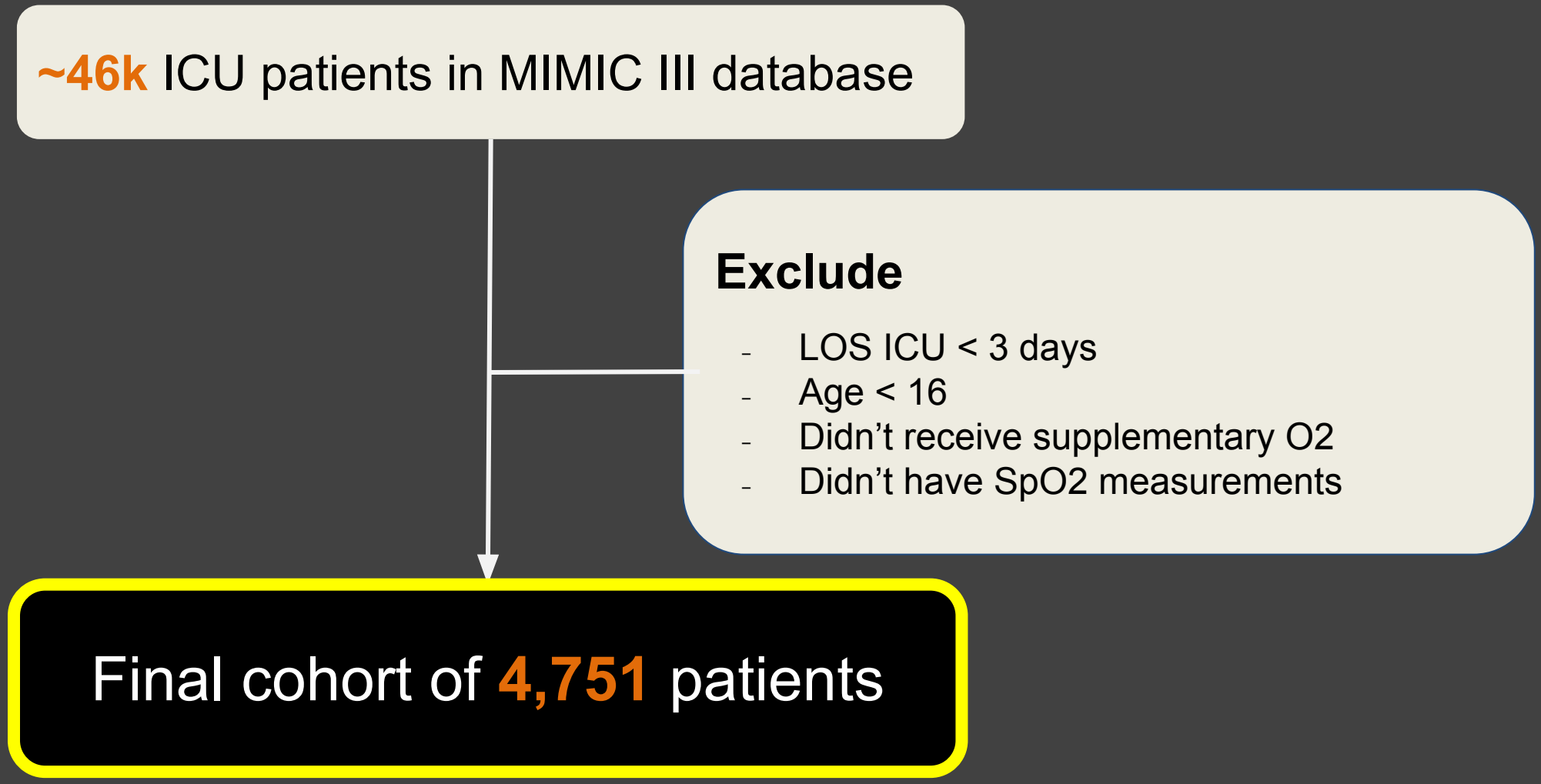
ICU-Mortality



Low oxygen is bad.
What about
high oxygen?

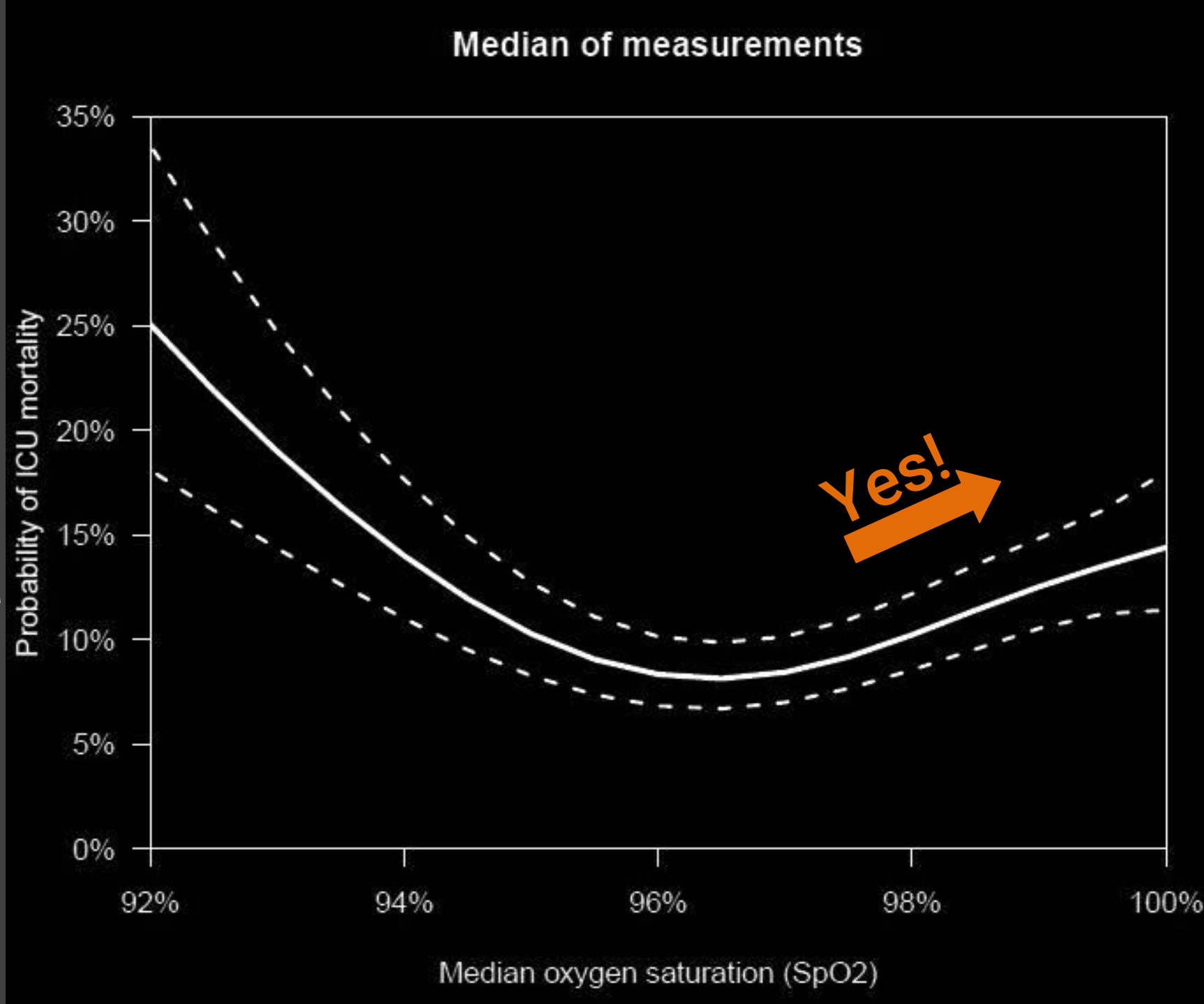


Cohort Identification

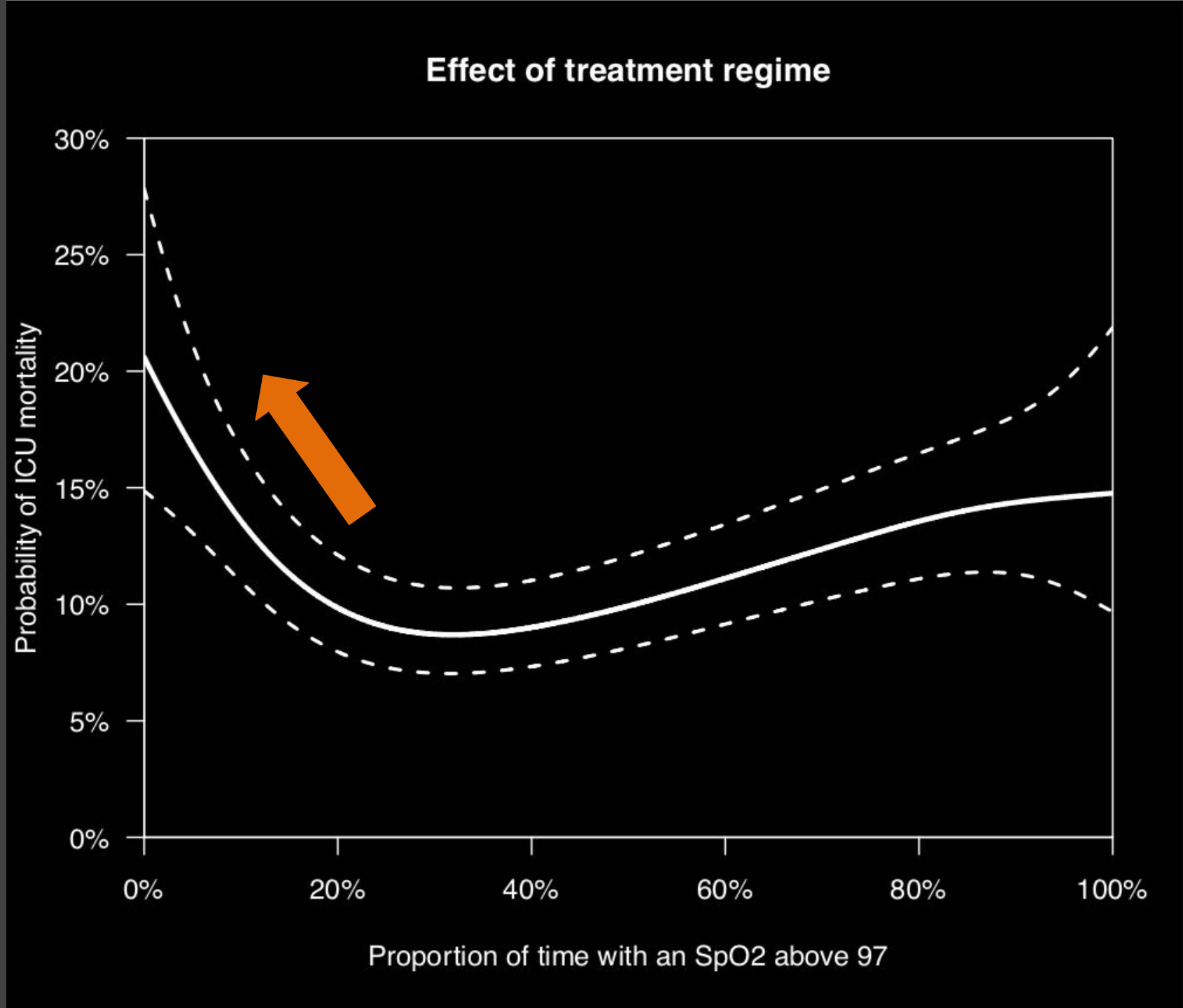


Is **high oxygen** bad?

Suggest range of 94% to 97%



What about above this **oxygen saturation range**?



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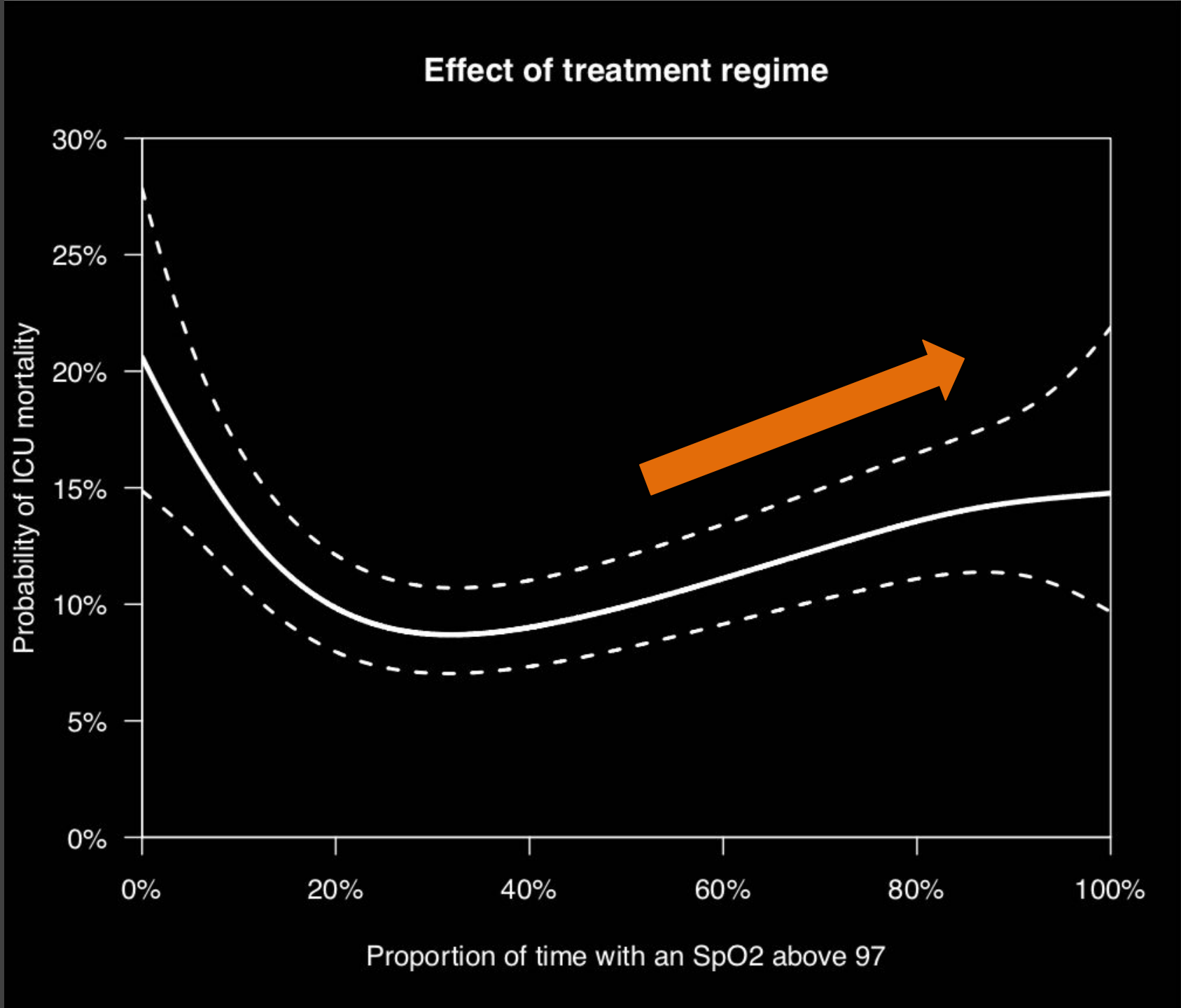
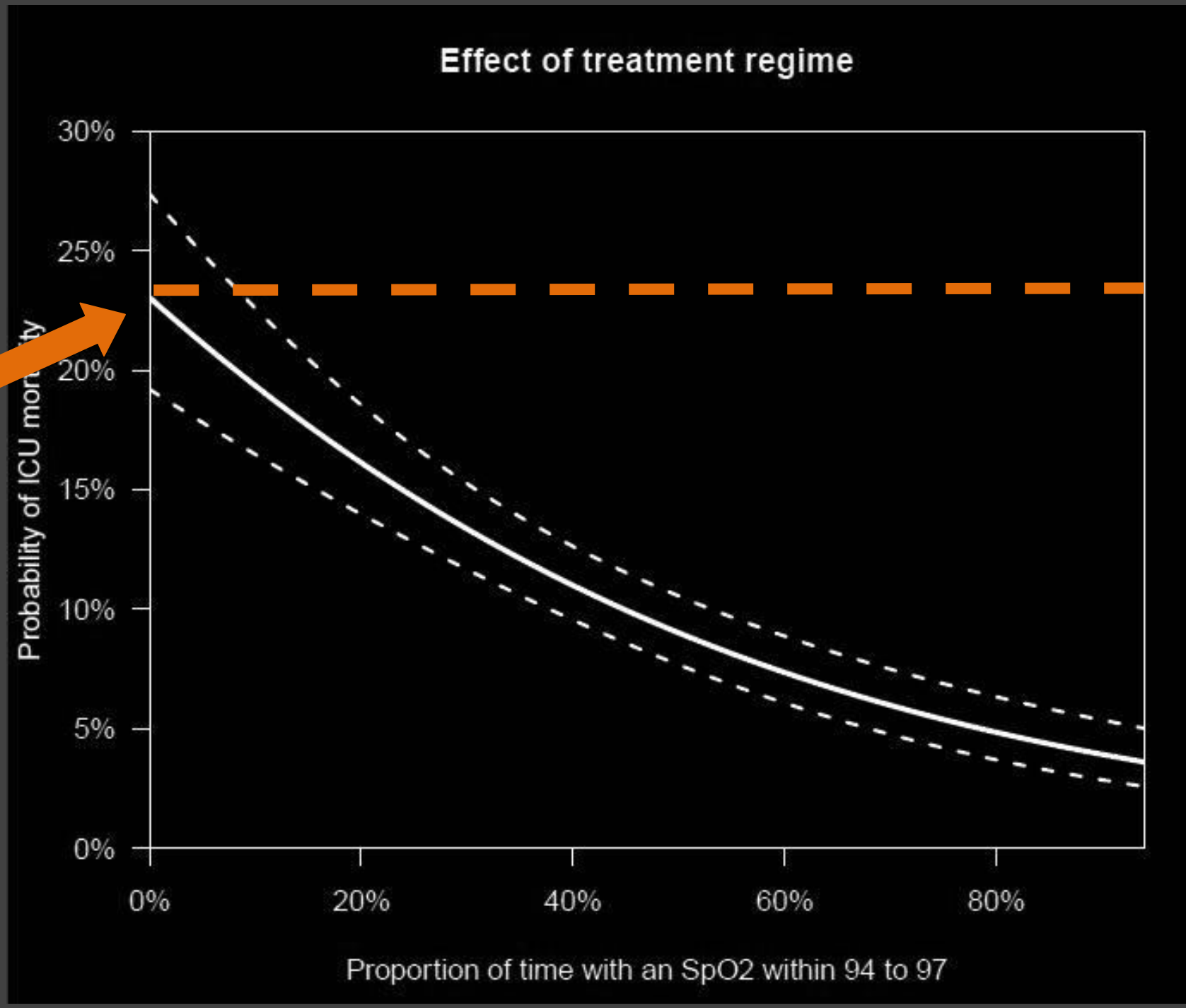


How important is this **oxygen saturation range**?



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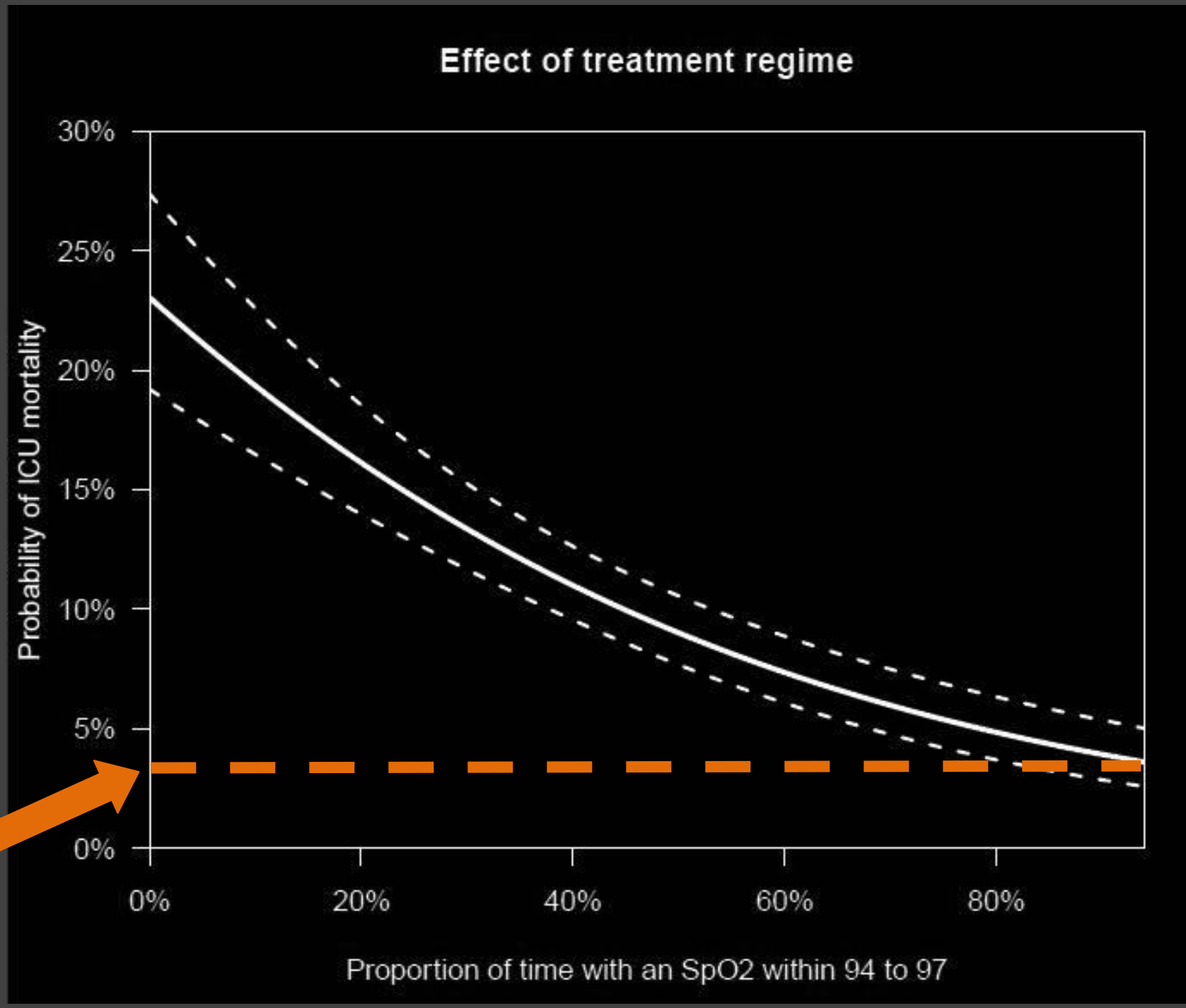
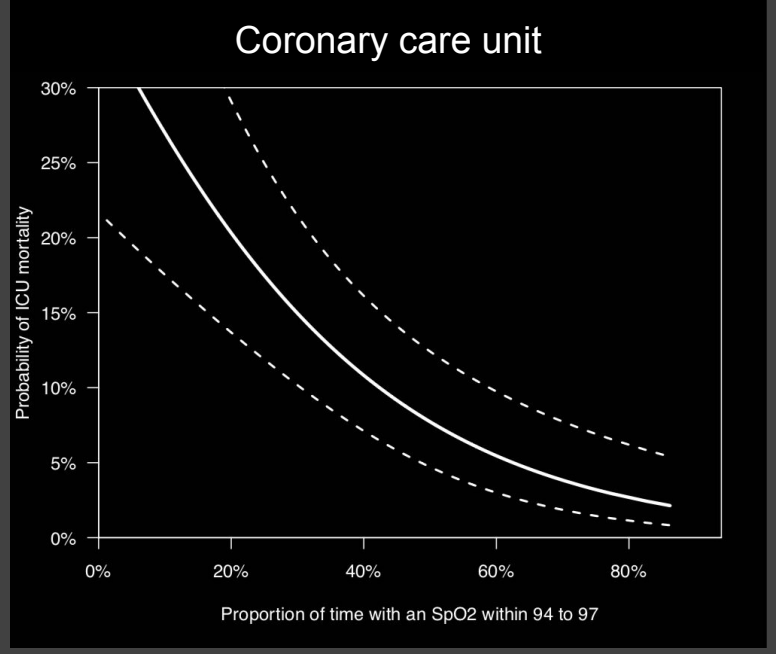


Does this hold across **ICU types**?



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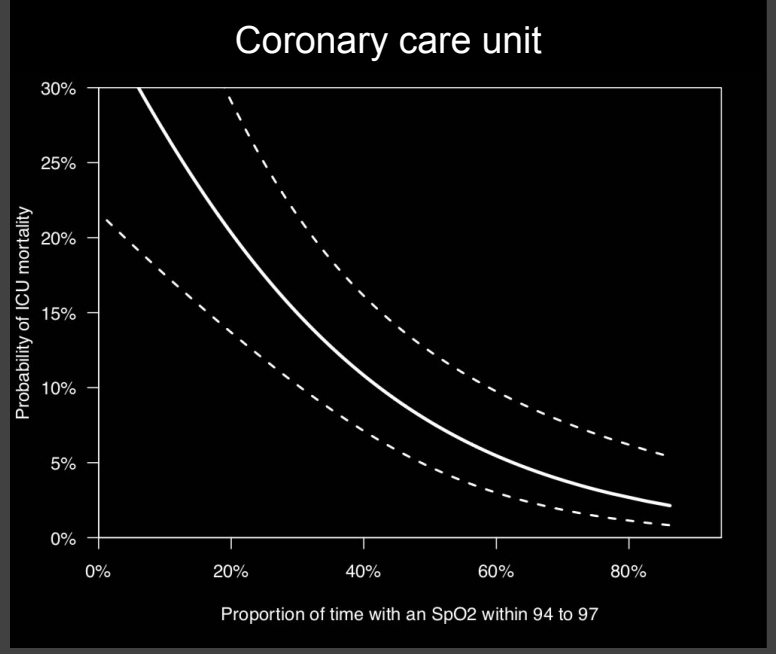

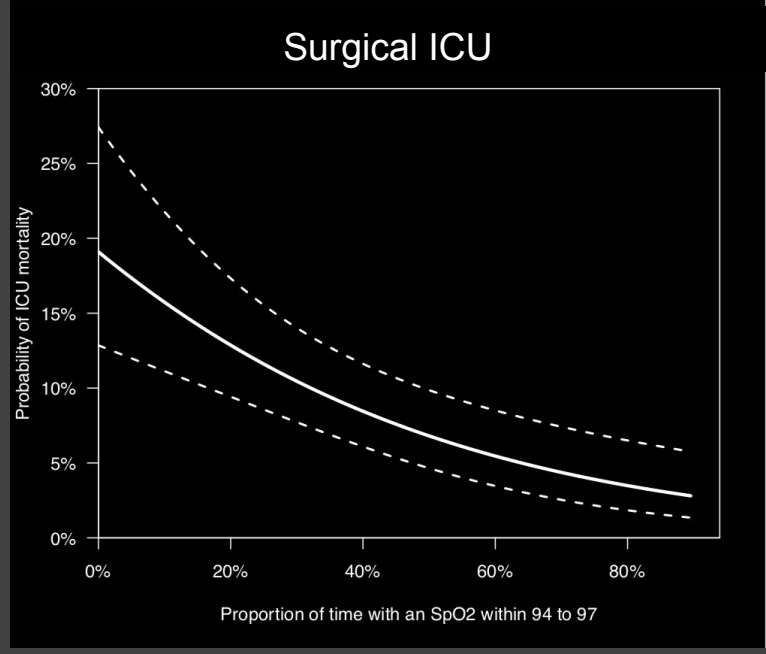

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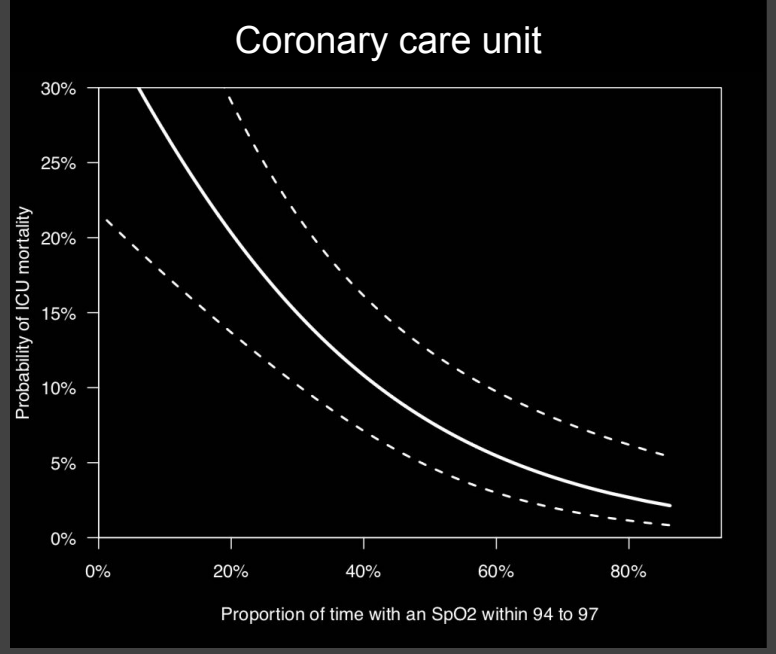

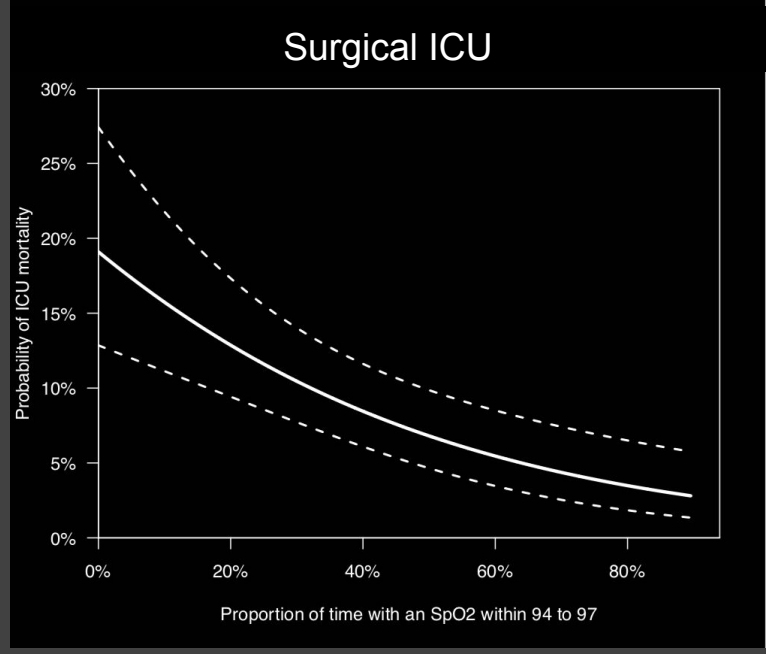

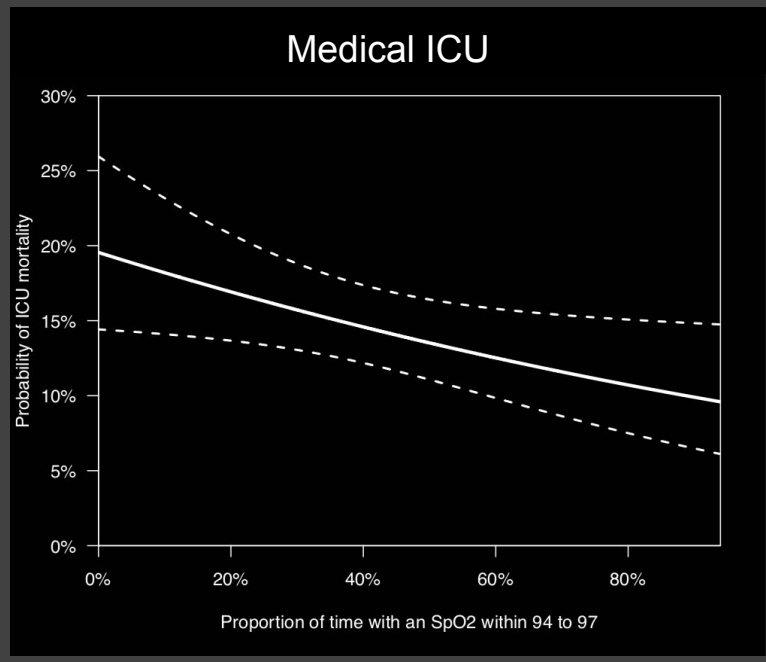

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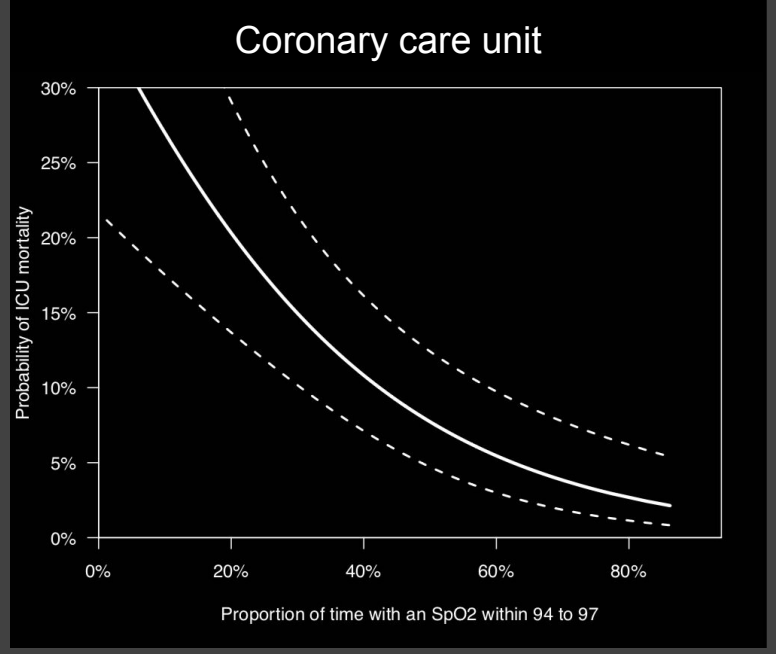

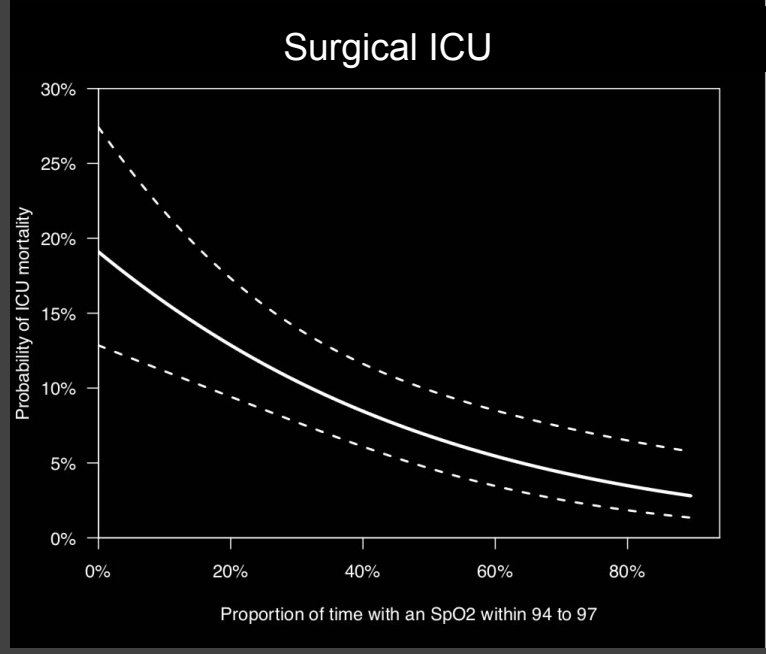

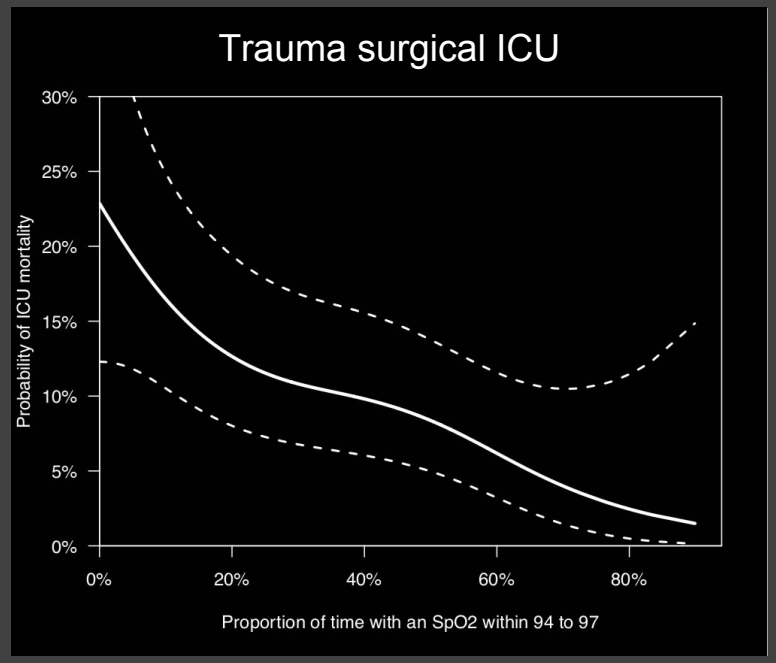

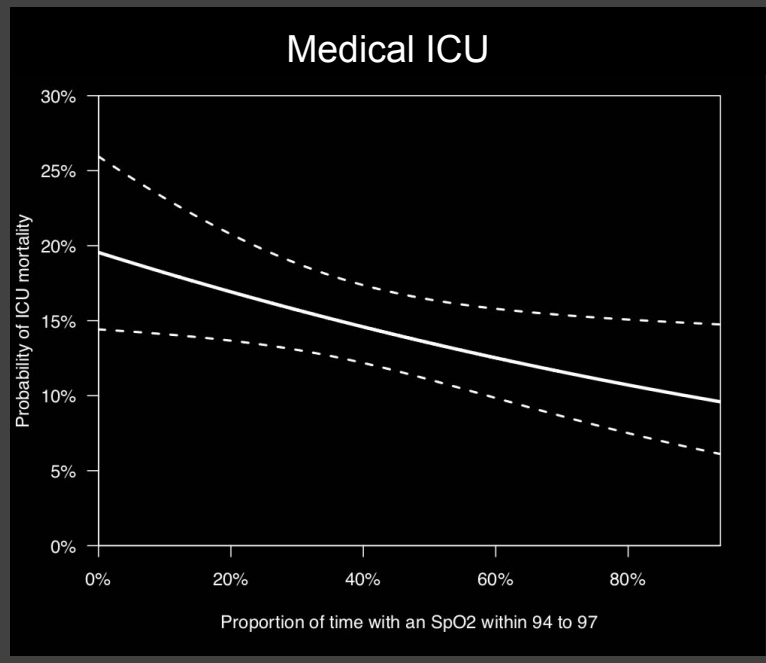

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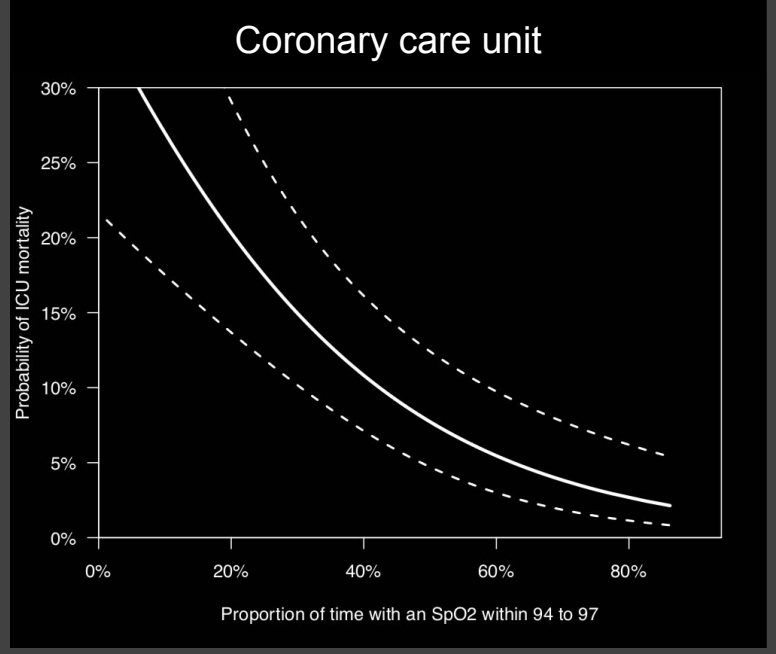

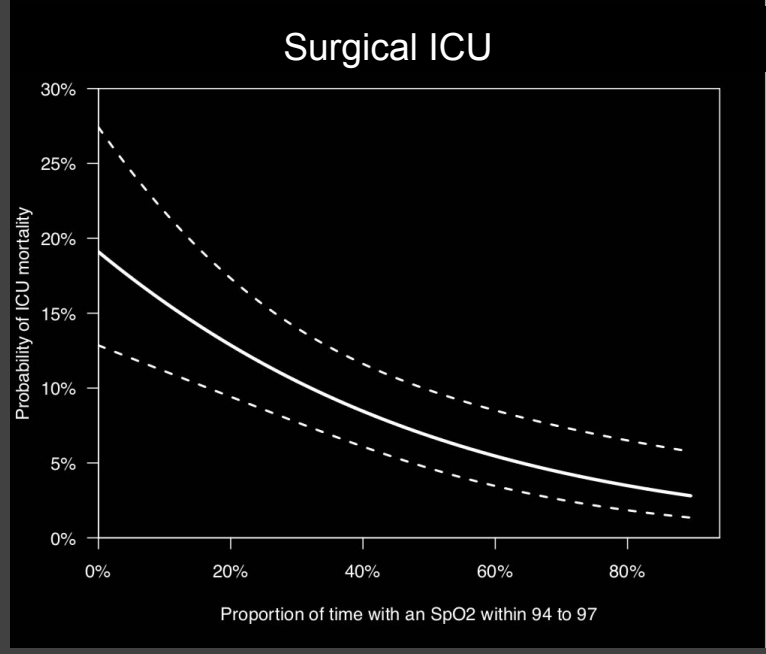

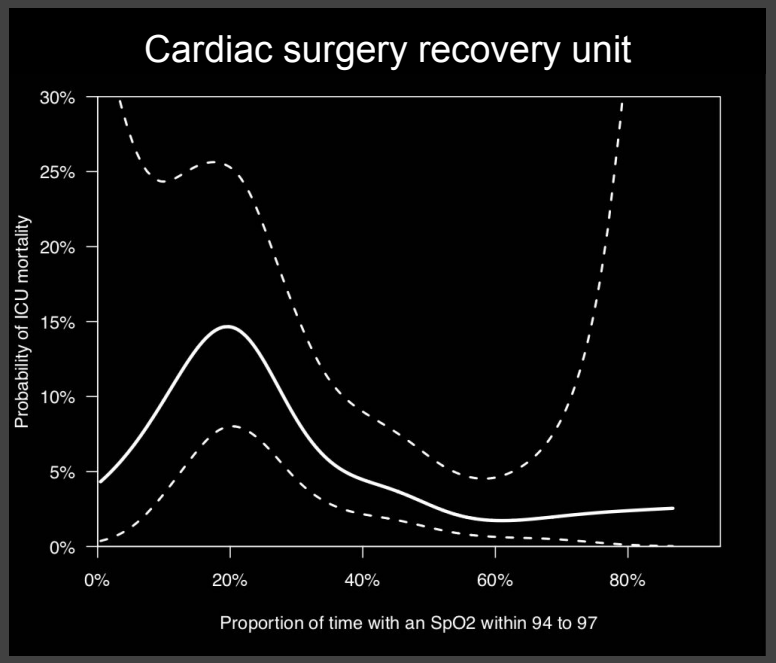

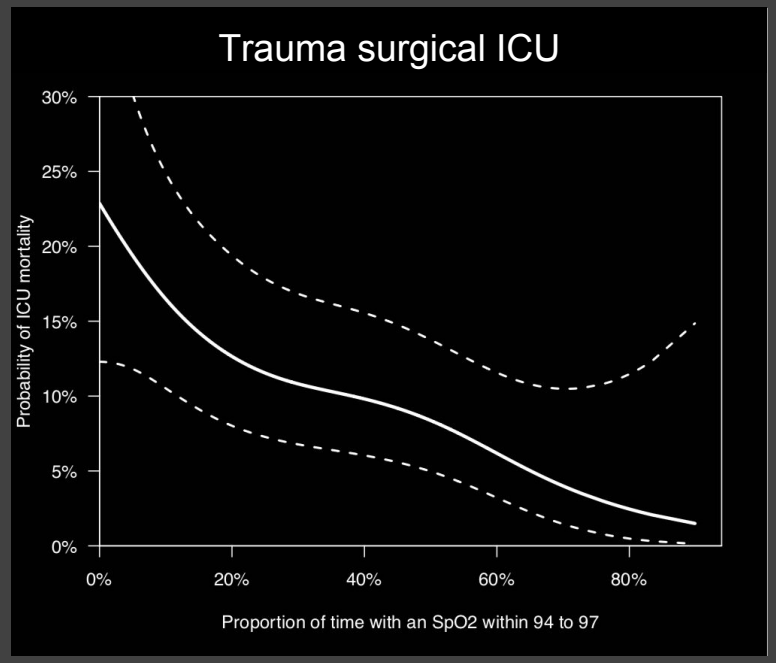

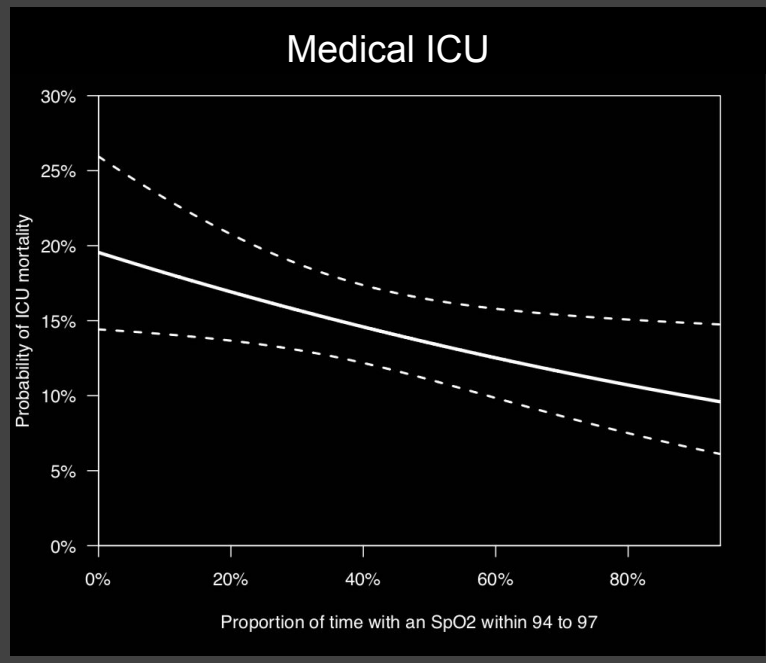

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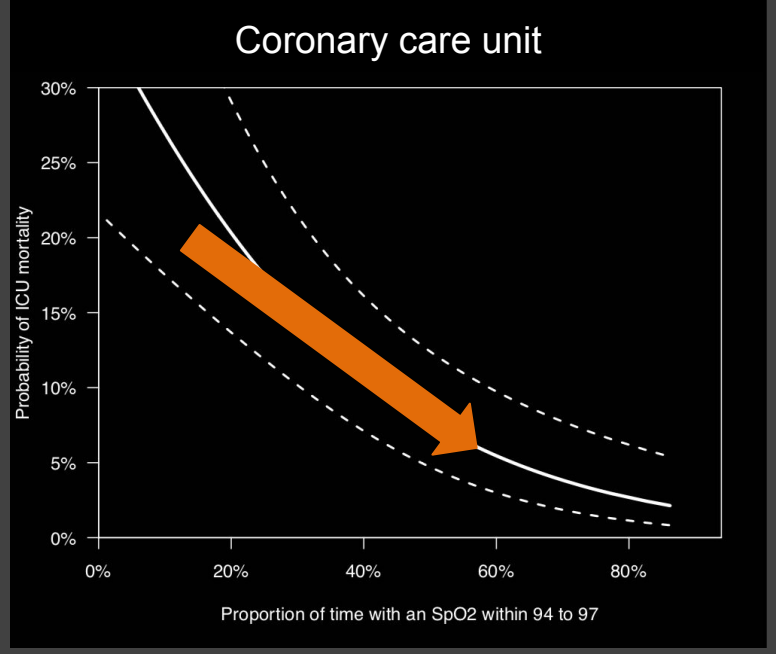
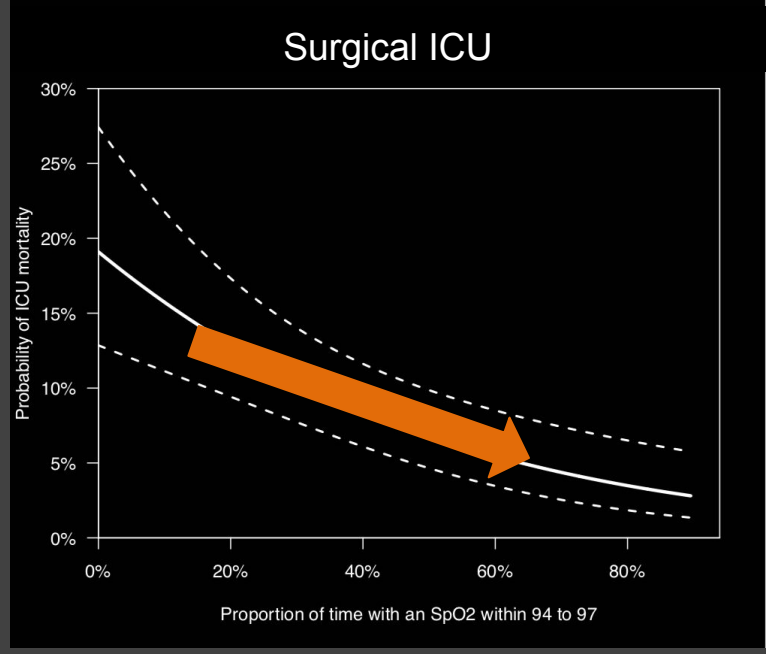
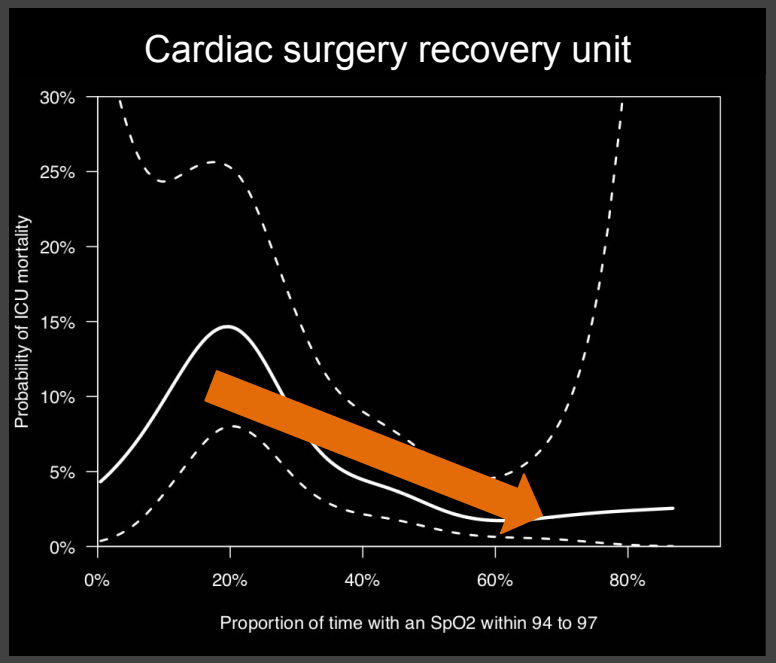
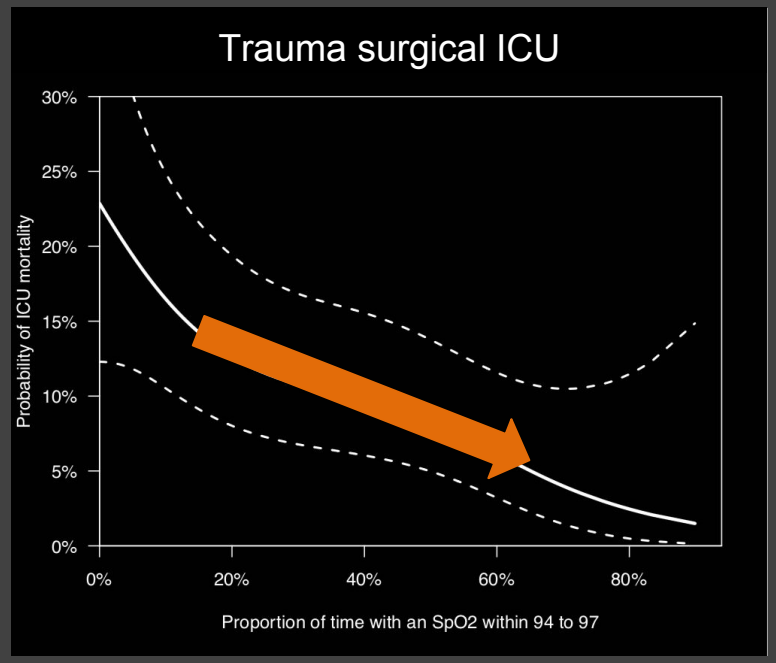
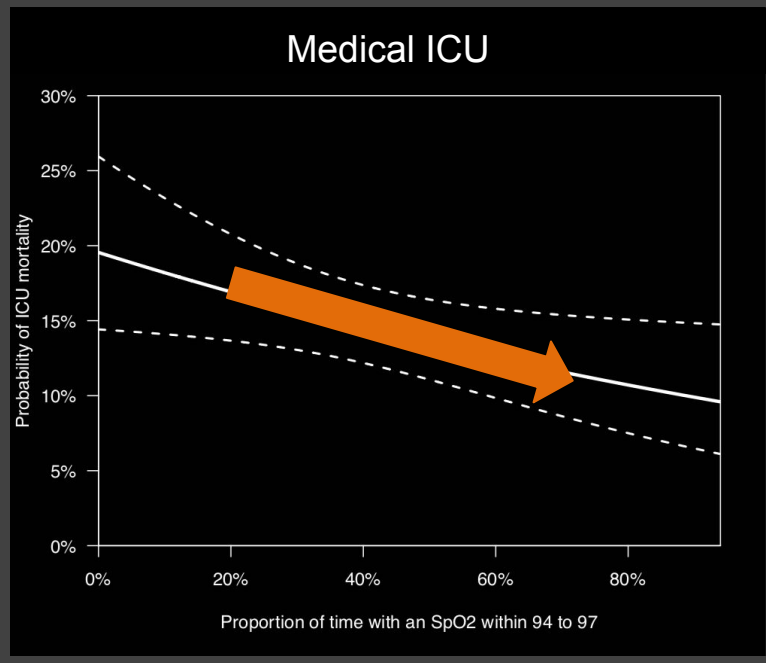










Takeaway

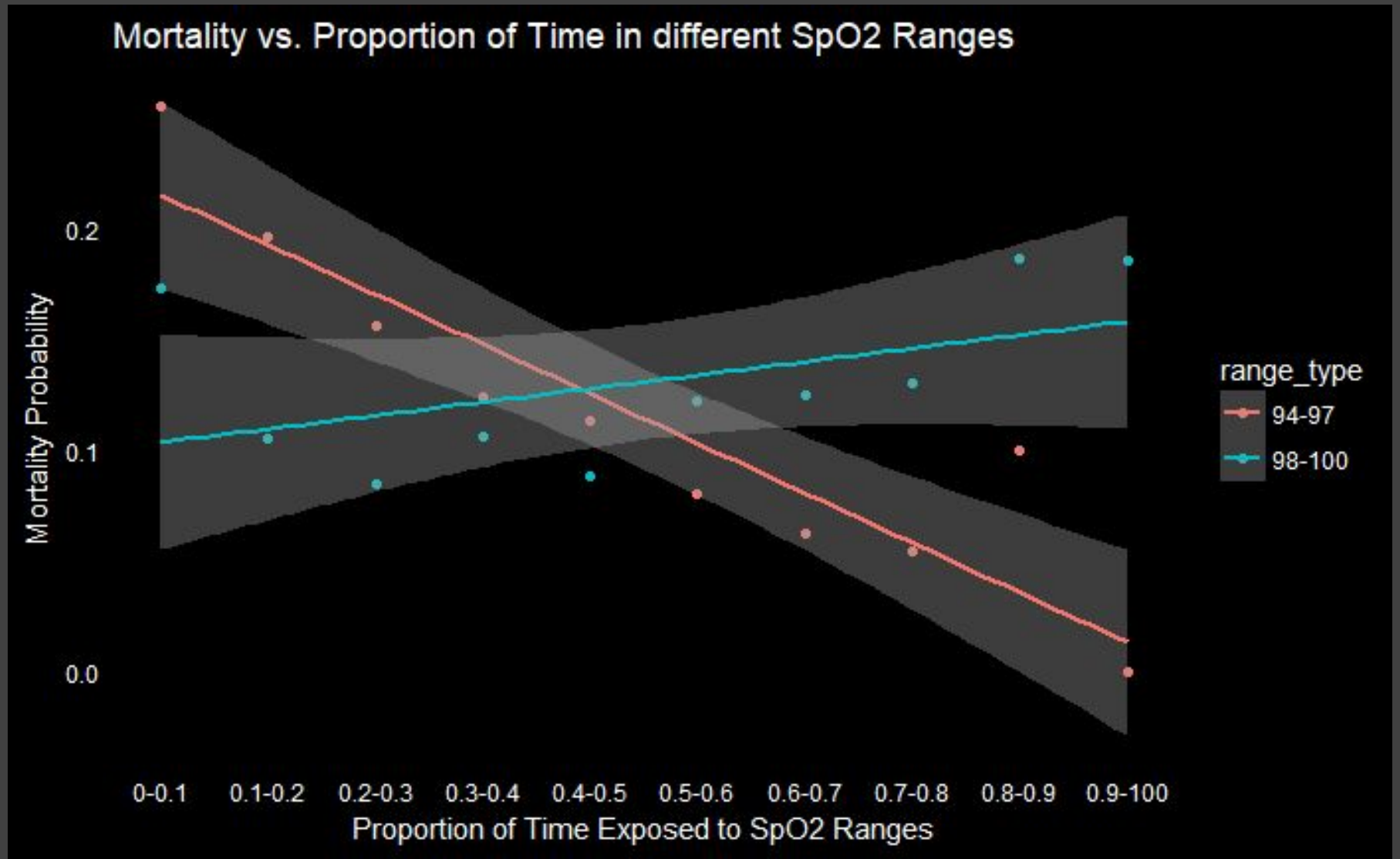
Our analysis suggests that 94% to 97% SpO2 is the optimal range within which longer exposure leads to better ICU outcome.

Questions?

Appendix

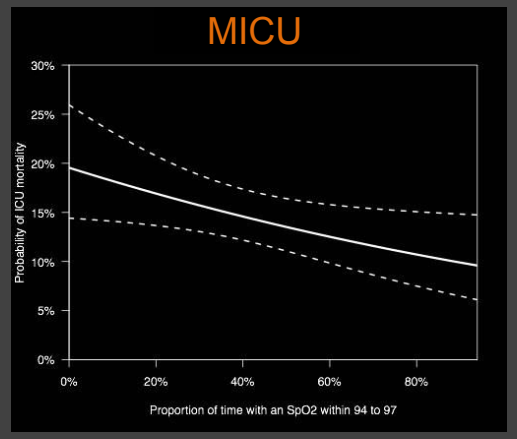
Other Findings and details

Hyperoxia is Harmful

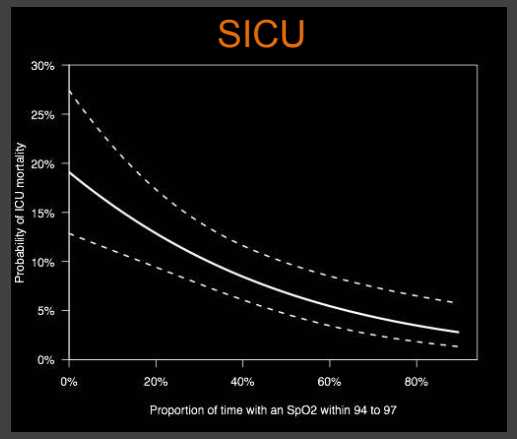


No effect modification across ICU types

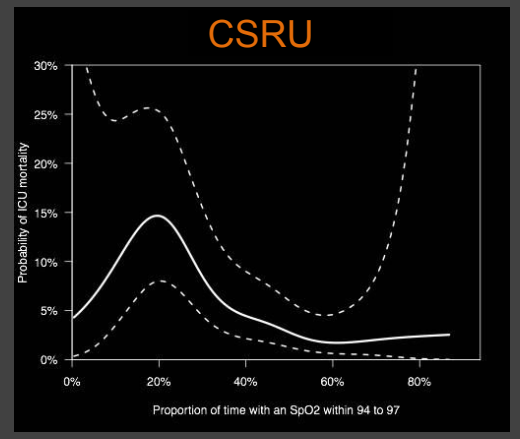
MICU



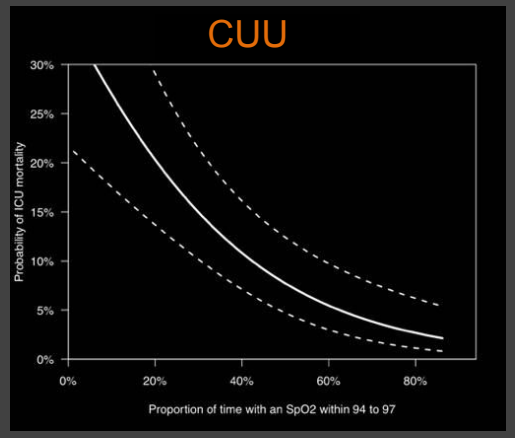
SICU



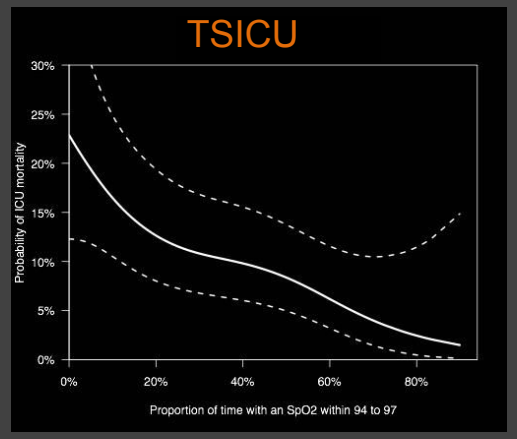
CSRU



CUU



TSICU



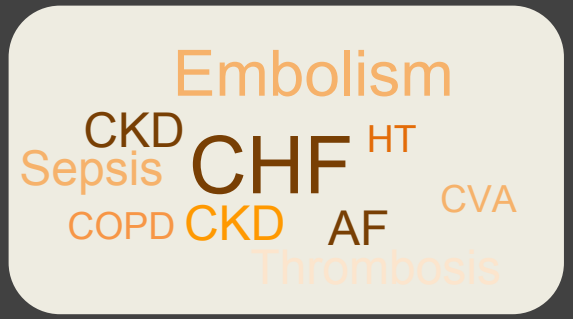
Confounders

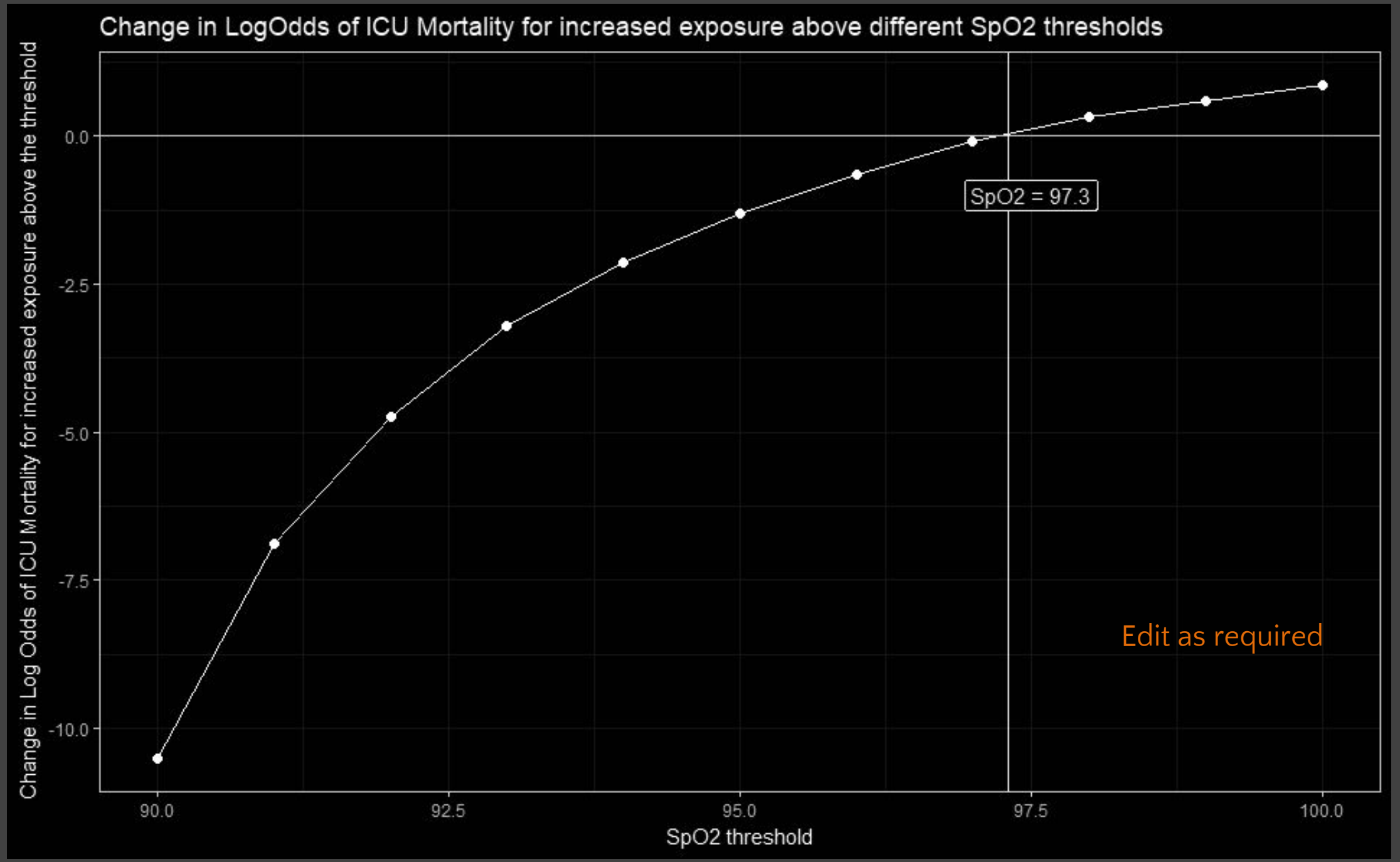
Gender

Disease Severity

Age

Co-morbidity




Change in LogOdds of ICU Mortality for increased exposure above different SpO2 thresholds
Change in Log Odds of ICU Mortality for increased exposure above the threshold
0.0
-2.5
-5.0
-7.5
-10.0
SpO2 = 97.3
Edit as required
90.0
92.5
95.0
97.5
100.0
SpO2 threshold

References

Data

MIMIC-III, a freely accessible critical care database. Johnson AEW, Pollard TJ, Shen L, Lehman L, Feng M, Ghassemi M, Moody B, Szolovits P, Celi LA, and Mark RG. Scientific Data (2016). DOI: 10.1038/sdata.2016.35. Available at: http://www.nature.com/articles/sdata201635

References

Literature

Chu, D. K., Kim, L. H., Young, P. J., Zamiri, N., Almenawer, S. A., Jaeschke, R., ... & Alhazzani, W. (2018). Mortality and morbidity in acutely ill adults treated with liberal versus conservative oxygen therapy (IOTA): a systematic review and meta-analysis. The Lancet, 391(10131), 1693-1705.

Girardis, M., Busani, S., Damiani, E., Donati, A., Rinaldi, L., Marudi, A., ... & Singer, M. (2016). Effect of conservative vs conventional oxygen therapy on mortality among patients in an intensive care unit: the oxygen-ICU randomized clinical trial. Jama, 316(15), 1583-1589.