IMPROVED CARE-PATHWAY CAN INCREASE THE OVERALL SURVIVAL AMONG ACUTE MYELOID LEUKAEMIA PATIENTS: A POPULATION-BASED STUDY USING DOUBLY ROBUST CAUSAL INFERENCE METHODS.

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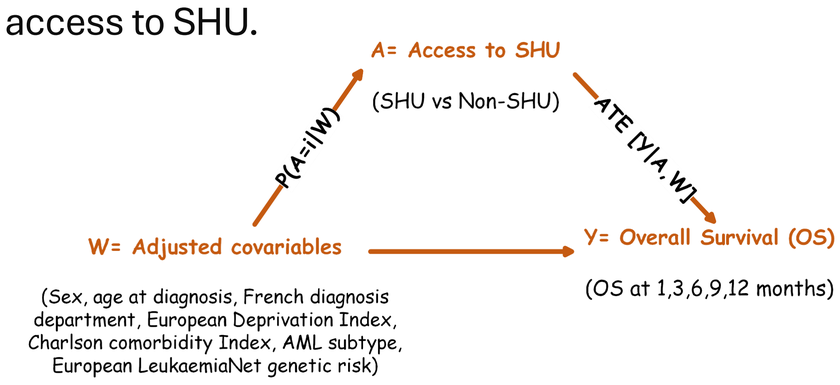
BACKGROUND

Approximately 10% of Acute Myeloid Leukaemia (AML) patients not admitted to a Specialized Haematology Unit (SHU) experience a significant loss of therapeutic opportunity. We aim to determine the causal relationship between access to SHU and patient 1-year overall survival.

METHODS

Study population: 1039 AML-incidents cases diagnosed between 2012 and 2016 in Côte-d'Or, Gironde and Basse-Normandie department. ***Statistical analysis***: We employed ***TMLE*** (Target Maximum Likelihood Estimation) with "***Super-Learner***" algorithm to estimate the adjusted Average Treatment Effect (ATE) of access to SHU, on patient overall survival, and derived the number of avoidable deaths attributable to access to SHU.



Estimands

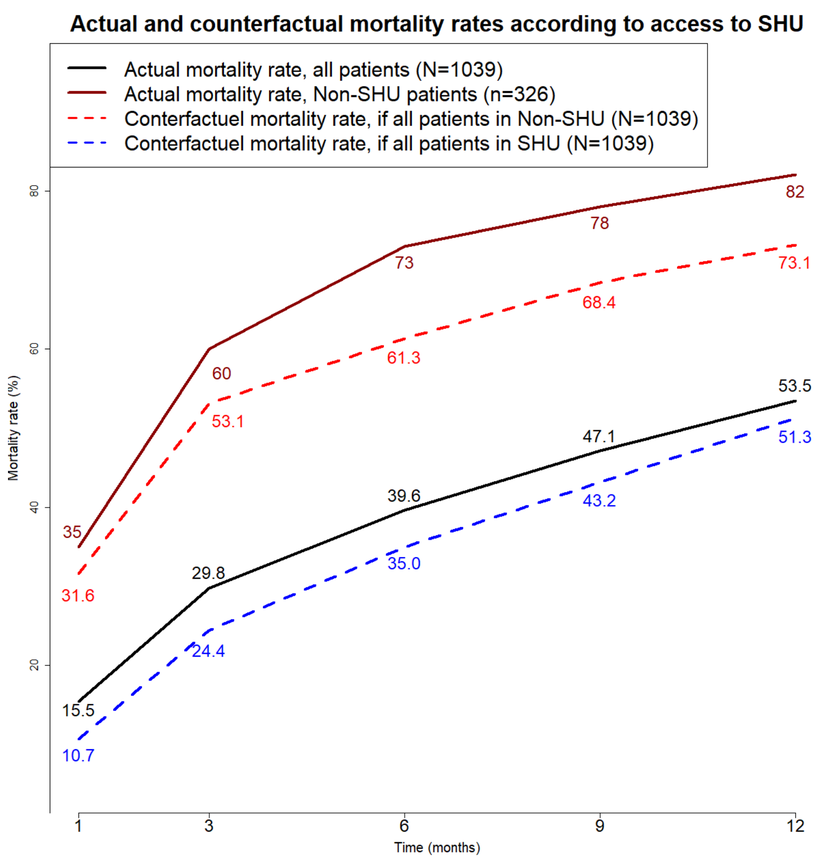
- **ATE** (for each time point), difference of mortality rate if :
  - i) All patients were admitted to SHU vs.
  - ii) No admission to the SHU.
- **Avoidable deaths among Non-SHU patients** (for each time point), difference between:
  - i) Actual situation: number of deaths vs.
  - ii) Counterfactual situation: all Non-SHU patients had been admitted to SHU.

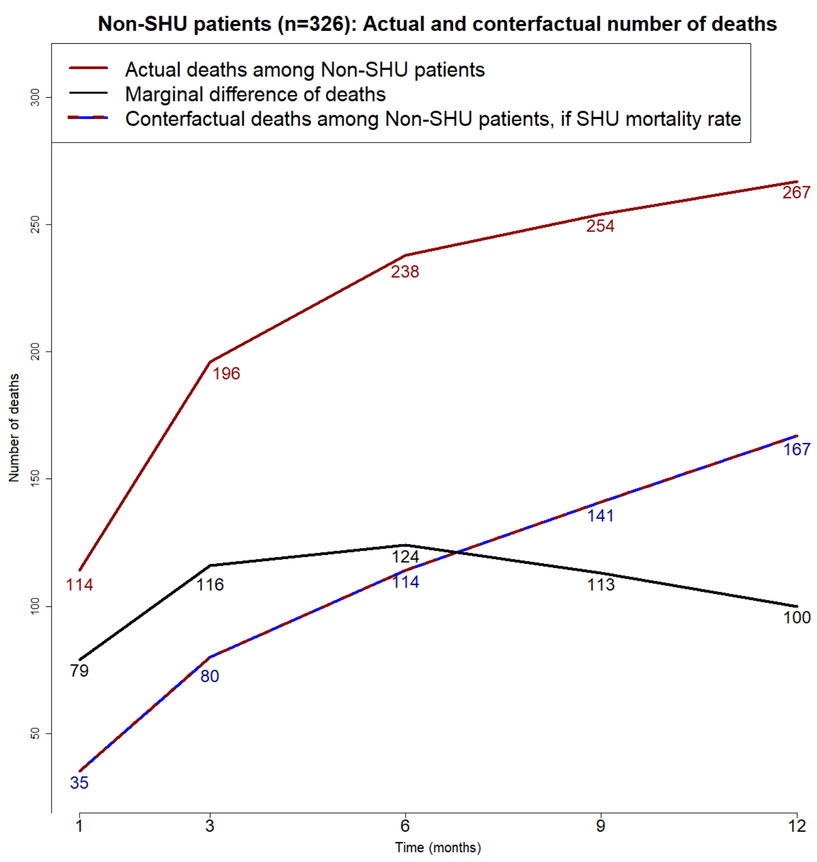
RESULTS

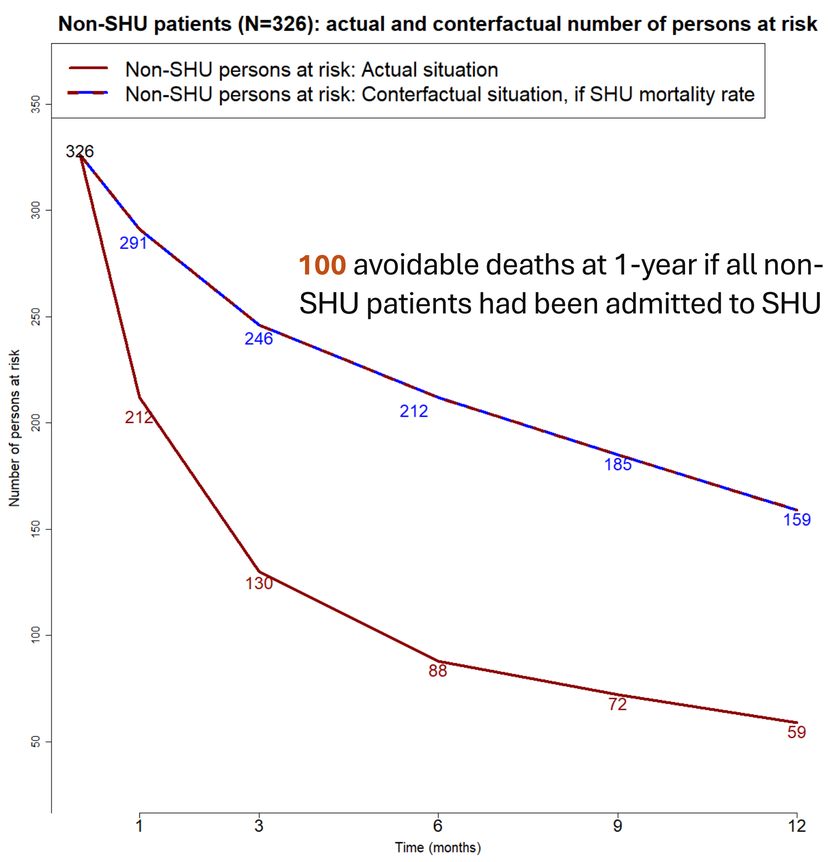
Table: The six steps of the ATE estimation using the doubly robust TMLE causal modeling approach

1-Overall survival modelling	2-Care-pathway modelling	3-Effect target	4-Optimisation of Model 1	5-Estimation of ATE	6-Inference
Model 1➔ **E [Y|A, W]**	Model 2➔ **P(A=i|W)**	Model 3➔ **(Ê[Y|A, W)**	Model 4➔ **Ê*[Y|A=i,W]**	***ATE***	***Variance***
G-computation	Propensity score	Fluctuation parameter (ε)	Model 1 optimisation	Effect estimation :**ATE**➔	$CI_{95\%}$
$P_{(Death)[SHU=No\| W=all]}$➔ **66,8 %**	i1=0,79.... i2 = 0,03	H1W=36,8 %	$P^*_{(Death)[SHU=No\|W=all]}$➔ **73,1 %**	$P^*_{(Death)[SHU=No\|W=all]}$-$P^*_{(Death)[SHU=Yes\|W=all]}$	**ATE ± 1,96*(V)²**
$P_{(Death)[SHU=Yes\| W=all]}$➔ **49,2 %**	...i1039 = 0,67	H0W=12,9 %	$P^*_{(Death)[SHU=Yes\|W=all]}$➔ **51,3%**	ATE= 73,1 - 51,3 = **21,8 %**	$CI_{95\%}$= **[14 – 28]**

Figure: Mortality rates, number of deaths (actual and counterfactual), and the corresponding avoidable deaths among non-SHU patients







100 avoidable deaths at 1-year if all non-SHU patients had been admitted to SHU

CONCLUSION

Admitting AML patients to a SHU during their care pathway could potentially mitigate the loss of therapeutic opportunities observed among non-SHU patients. This, in turn, might reduce the number of avoidable deaths causally attributable to the care pathway.