

Standardised crude probabilities of death to improve understanding of national and international cancer survival comparisons

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**University of
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Survival in the **hypothetical** situation where

- 1 it is not possible to die from causes other than the cancer.
 - 2 the age distribution was not as it is observed, but as that in a reference population.
- Many examples of the media, politicians, clinicians, patients and scientists interpreting incorrectly.

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For Fair Comparisons differences between population groups should not depend on,

- ① differences in the age distribution,
- ② differences in other cause mortality rates.

Probabilities of Death

(1) Net Probability of Death ($1 - \text{Net Survival}$)

Probability of death in hypothetical world where not possible to die from causes other than the cancer under study.

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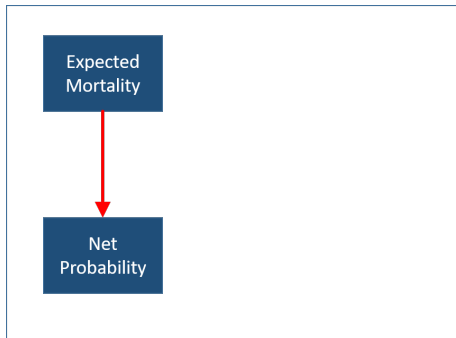
However, (2) and (3) depend on other cause mortality.

Making all-cause and crude survival comparable

- All-cause and crude probabilities are easier to interpret, **but are not comparable between populations.**
- Can we make them comparable?

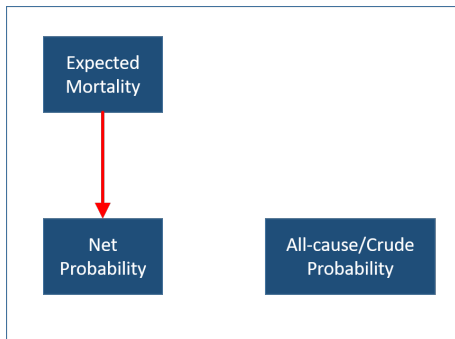
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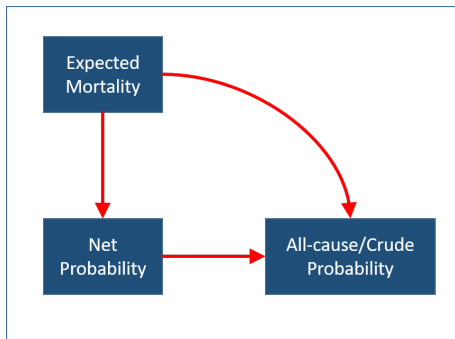
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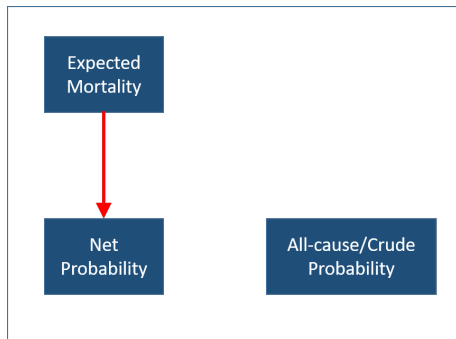
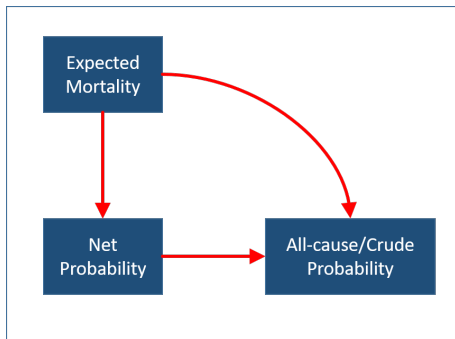
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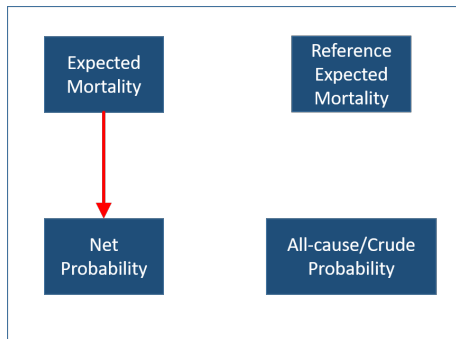
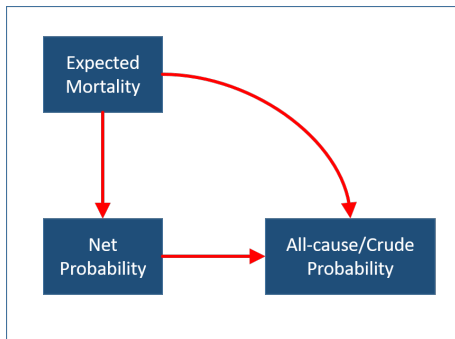
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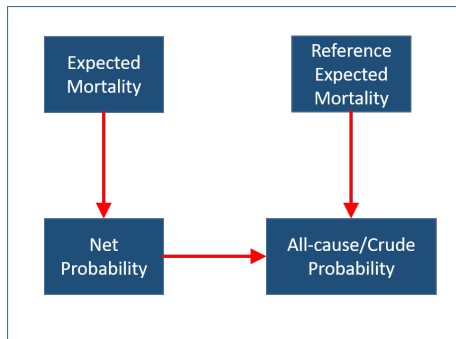
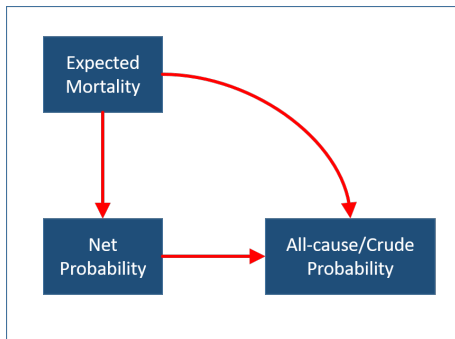
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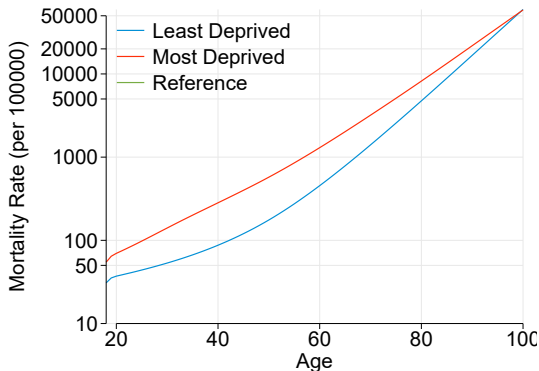
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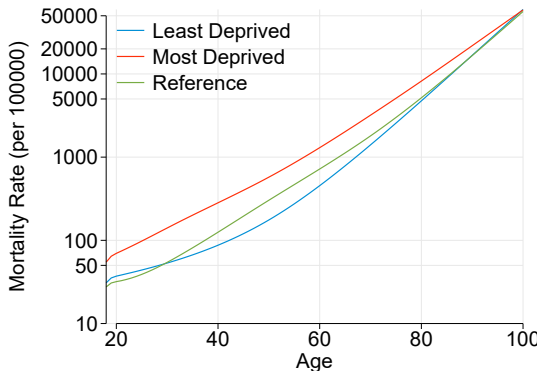
Example

- Men diagnosed in England with Melanoma.
- Compare those who live in most deprived areas with least deprived areas.

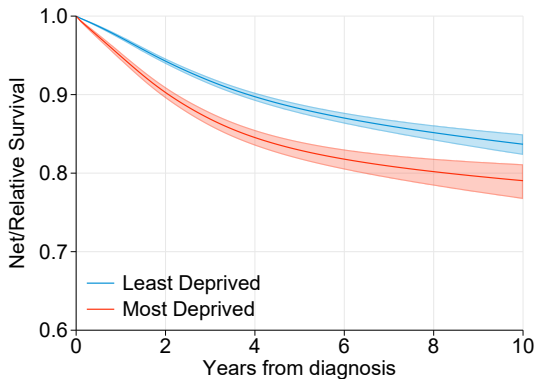


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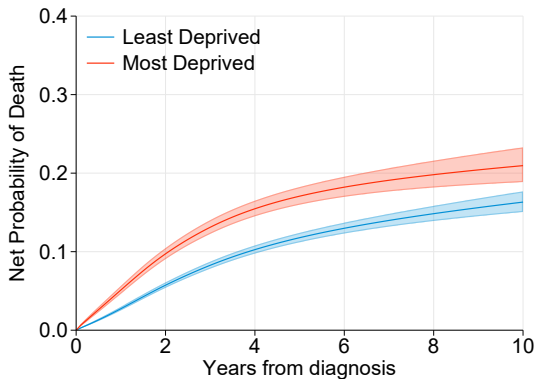
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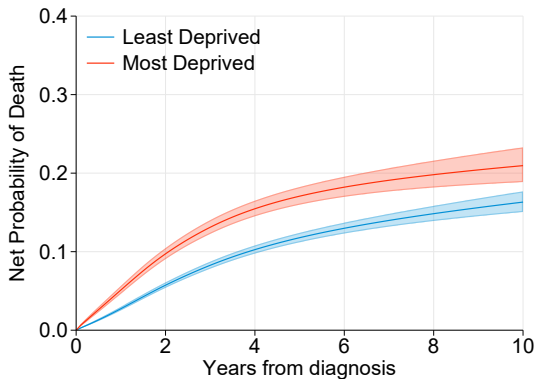
Net Probability of Survival



Net Probability of Death



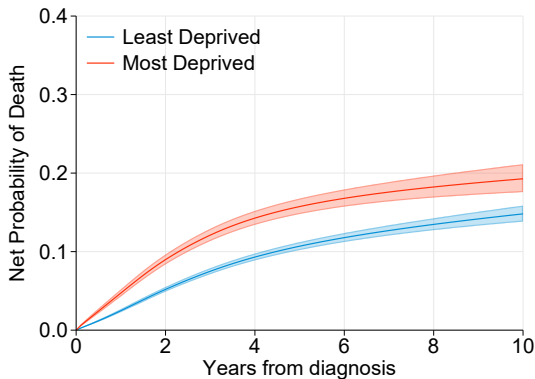
Net Probability of Death



Age Standardization: Internal

Fair Comparison: ~~X~~

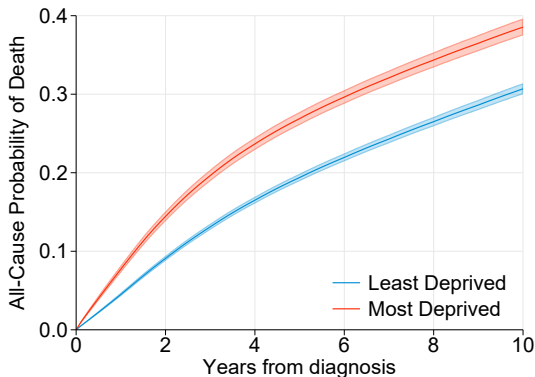
Net Probability of Death



Age Standardization: ICSS

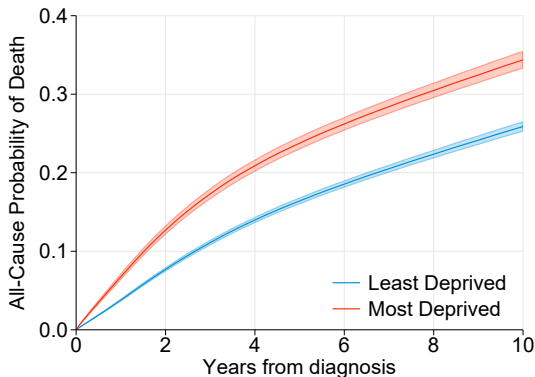
Fair Comparison: ✓

All-cause Probability of Death



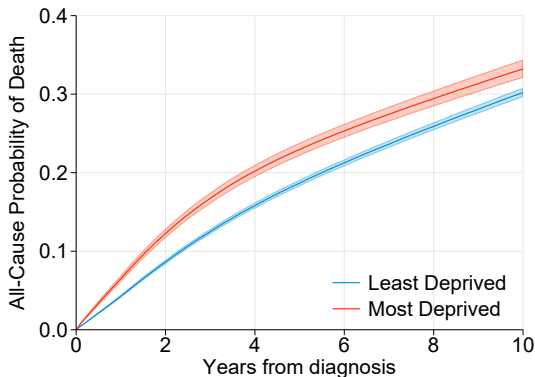
Age Standardization: Internal
Expected Rates: Separate
Fair Comparison: **X**

All-cause Probability of Death



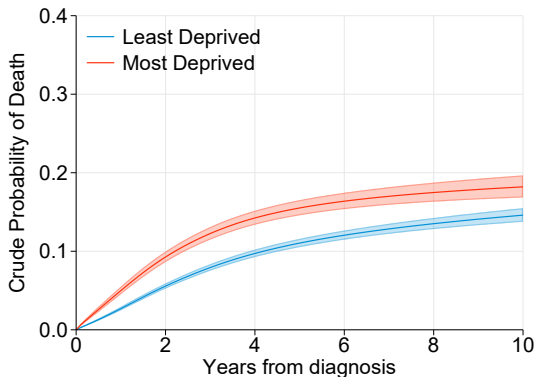
Age Standardization: ICSS
Expected Rates: Separate
Fair Comparison: ~~X~~

All-cause Probability of Death



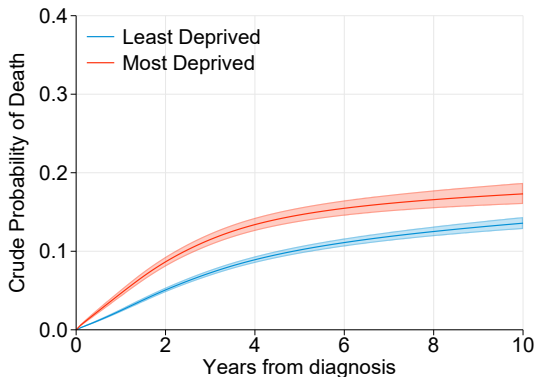
Age Standardization: ICSS
Expected Rates: Reference
Fair Comparison: ✓

Crude Probability of Death



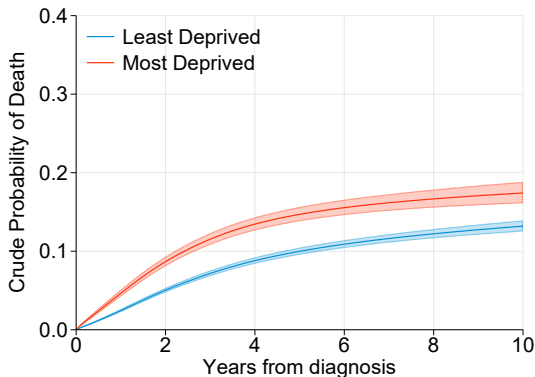
Age Standardization: Internal
Expected Rates: Separate
Fair Comparison: ~~X~~

Crude Probability of Death



Age Standardization: ICSS
Expected Rates: Separate
Fair Comparison: ~~X~~

Crude Probability of Death



Age Standardization: ICSS
Expected Rates: Reference
Fair Comparison: ✓

Choice of Hypotheticals

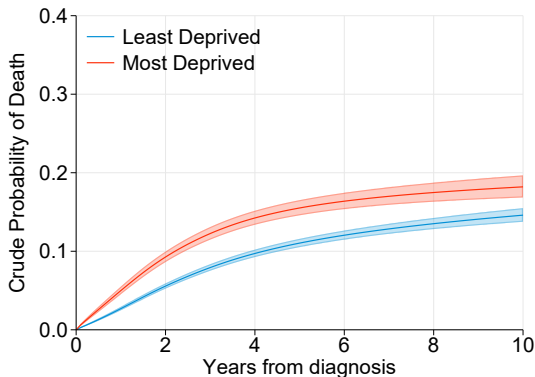
Net Probability of Death

- 1 Age distribution is that of reference.
- 2 Only possible to die from cancer under study.

All-cause/Crude Probability of Death

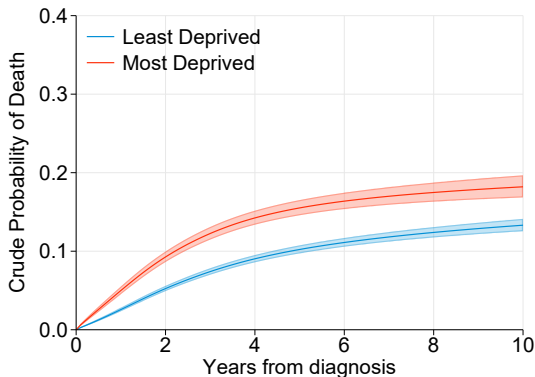
- 1 Age distribution is that of reference.
 - 2 Mortality rate due to other causes is that of reference.
- In some situations it is useful to make one group non-hypothetical.
 - ▶ Standardize to age distribution of particular group.
 - ▶ Use expected mortality rates of particular group.

Crude Probability of Death



Age Standardization: Internal
Expected Rates: Separate
Fair Comparison: ~~X~~

Crude Probability of Death



Age Standardization: Most Deprived

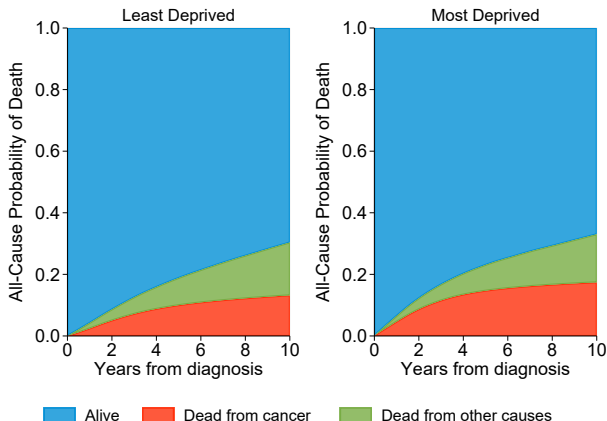
Expected Rates: Most Deprived

Fair Comparison: ✓

Summary

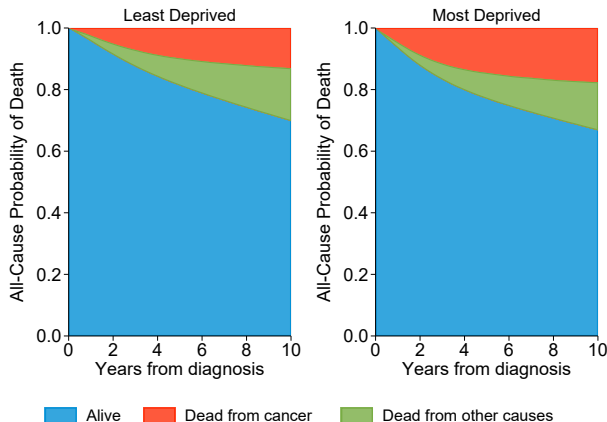
- Possible to make fair comparisons using all-cause or crude probabilities.
 - ▶ Need to age standardize
 - ▶ Need to use reference expected mortality rates.
- Useful alternative/compliment to net survival/mortality.
- Possible using modelling or life tables.
- Need to think about which age distribution to standardize over.
- Need to think which reference expected rates to use.

Stacked Plots



- Reference Adjusted All-Cause Survival
- Reference Adjusted Crude Probability of Death

Stacked Plots



- Reference Adjusted All-Cause Survival
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