The life history of a blood lead lab order in Broome County, NY

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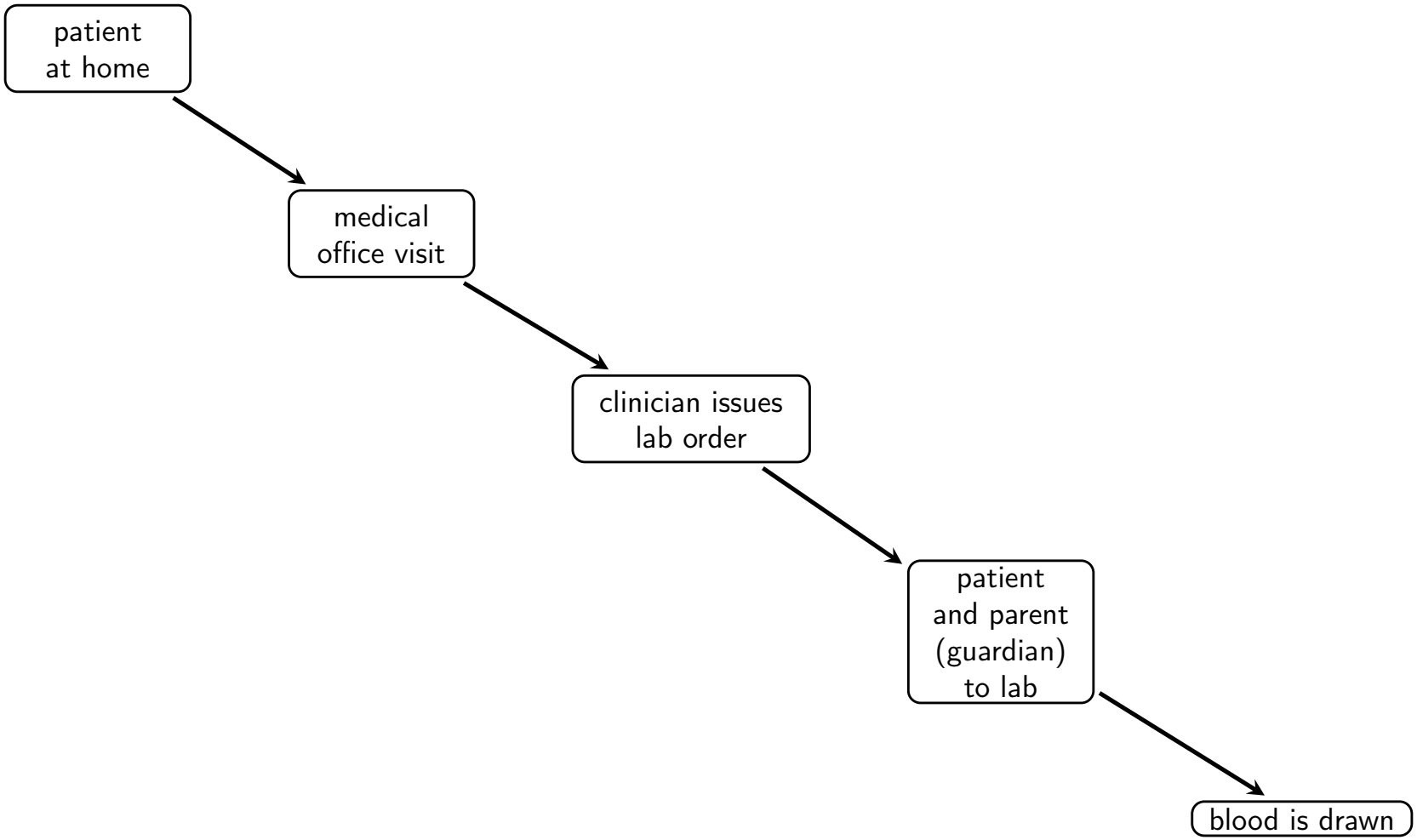
Blood lead testing in New York State

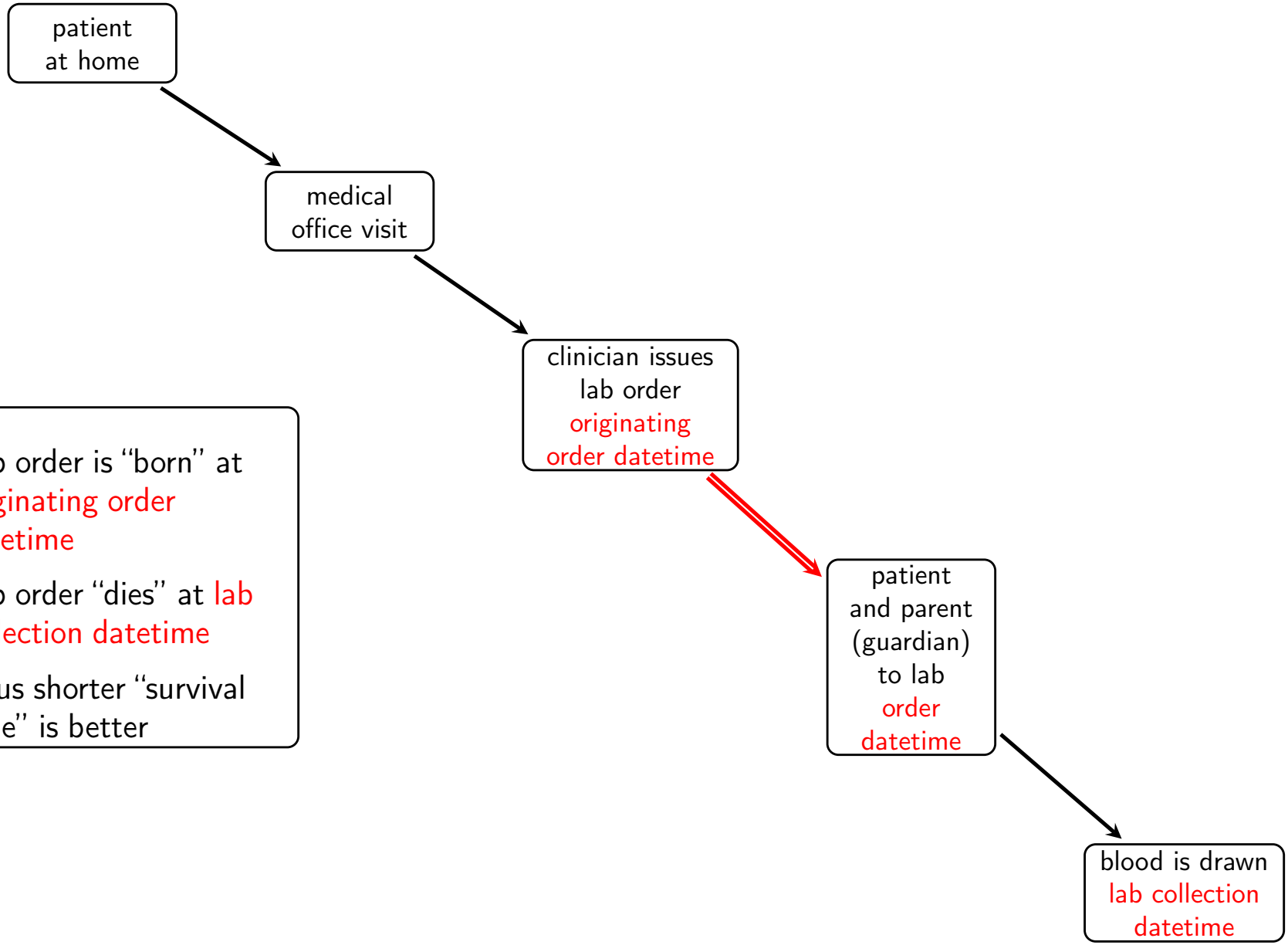
- All children must be offered a blood lead test at least twice, at ages 1 and 2 years
- Achieving that standard varies by county, from about 27% to about 76% (2018 data)[1]
  - Broome County was at 31% in those 2018 data from NYSDOH
  - we believe now around 35–36% based on local data

[1] New York State Community Health Indicator Reports Data Export Links

Getting blood lead measured at a lab is complicated



Getting blood lead measured at a lab is complicated



- Lab order is "born" at originating order datetime
- Lab order "dies" at lab collection datetime
- Thus shorter "survival time" is better

Approach and methods

- Concept
  - "survival analysis" or time-to-event analysis
  - unit of analysis is the lab order, not the patient
  - lab order is "born" at originating order datetime
  - lab order "dies" at lab collection datetime
  - thus shorter "survival time" is better
- Execution
  - UHS provided the necessary data from their Epic electronic medical record on 2024-05-17 14:54:00
  - all blood lead lab orders on children under age 3 years and resident in Broome
  - County Planning Department geocoded the home addresses to point locations
  - UHS IRB determined that this constituted public health surveillance
- Analysis
  - observation of a lab order ended at earlier of:
    - the lab collection datetime
    - 365.25 days after the order was generated (censored)
    - 2024-05-17 14:54:00 (censored)
  - plotted Kaplan-Meier survival curves
  - fit Cox proportional hazards model with Medicaid, age, and distance to geographic centroid of 3 hospitals as predictors
  - mapped smoothed ("locally averaged") survival time across the county

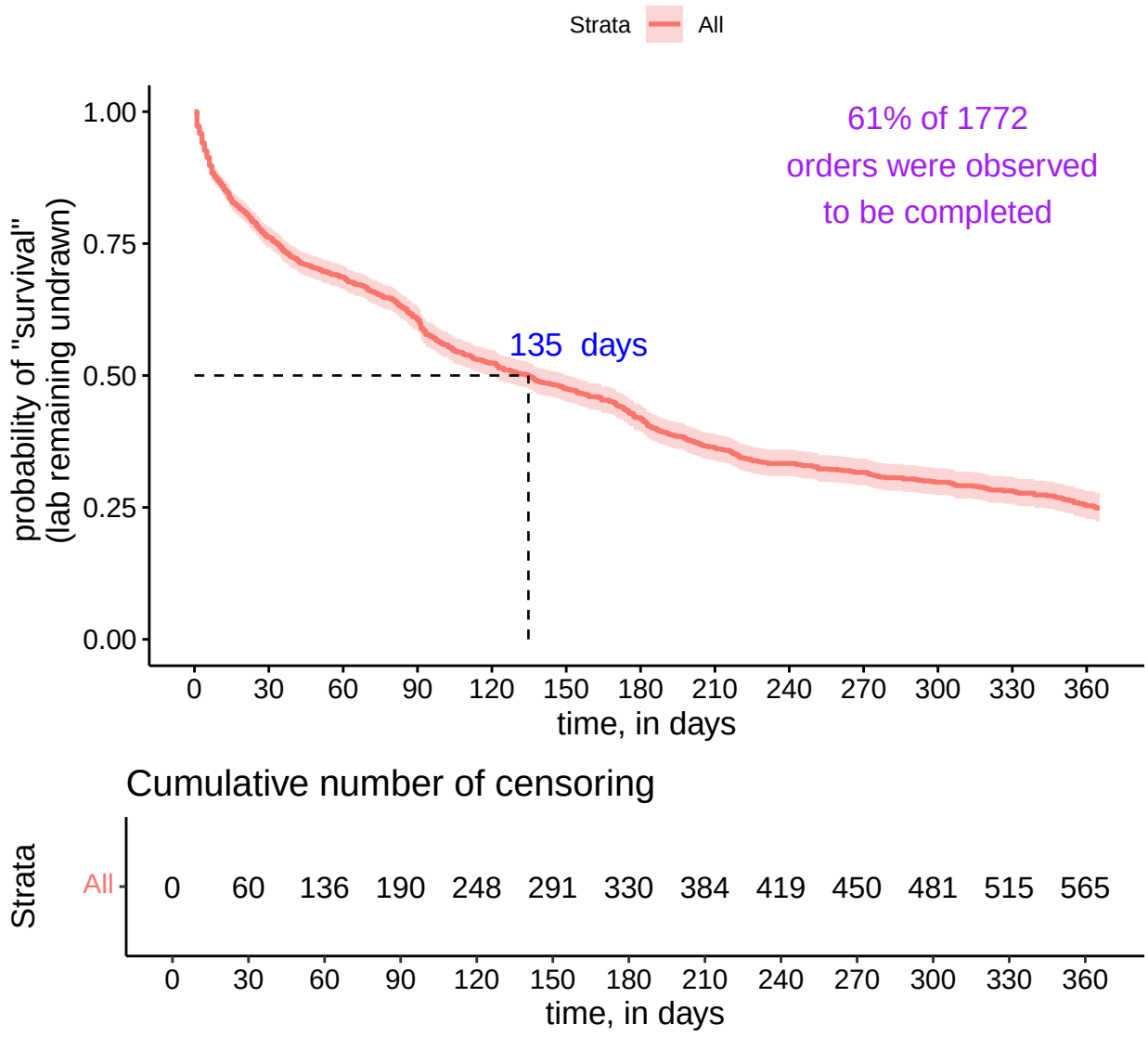
Description of data

- the analytical dataset comprised 3176 records with non-negative survival times
- earliest order date was 2021-01-22
- median observation time was 274 days
- about half were insured by some form of Medicaid
- 1772 were *not* completed/drawn on the same day the order was created
  - these are the focus of the survival analyses

Unconditional K-M survival curve, non-same-day draws

▸ conditional KM curves

"Survival curve" of those blood lead lab orders
NOT drawn on the same day as the order. UHS data only

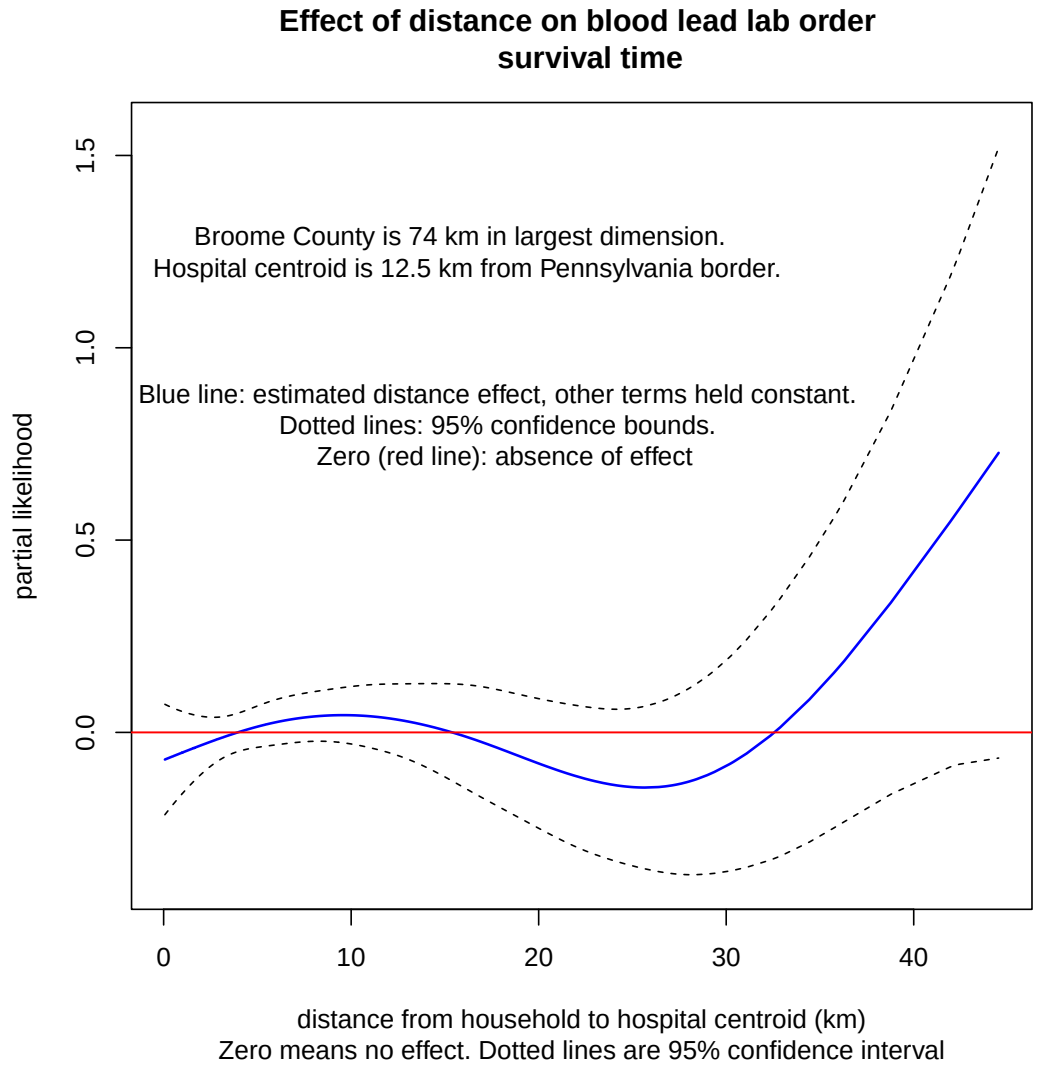


Cox proportional hazards model, non-same-day draws

- blood lead lab orders for children age 2 lingered longer than those for children age 1 (hazard ratio = 0.82, p <0.05).
- no evidence that Medicaid status was related to time to completion (hazard ratio for completion = 1, p = 0.98).

Cox proportional hazards model, non-same-day draws

Non-directional distance from hospital centroid to the household bore little relationship to lab order survival time



But direction matters

Conclusions, discussion, limitations

- Findings, broadly speaking
  - about 60% of all blood lead lab orders actually got drawn during the study period
  - blood lead lab orders linger: median time to completion ("survival time") was 4–5 months
  - lab order survival time may be shorter (better) in better-resourced neighborhoods and longer (worse) remote from a phlebotomy location
  - Medicaid insurance seems to have no effect on promptness of completing a blood lead lab order
- Actions
  - continued outreach to both clinicians *and* parents seems warranted
  - shared findings with UHS leadership
  - obtain and deploy more point-of-care capillary lead testing
- Limitations
  - data were from only one of our two healthcare systems
  - data excluded lab orders for children outside Broome County

▸ an alternative analysis

Acknowledgements

- Many thanks to:
  - the Business Intelligence and Epic teams at UHS for supporting the idea and providing the data
  - Doug English at the Broome County Department of Planning for geocoding the home addresses

Conditional K-M survival curves, non-same-day draws

Return

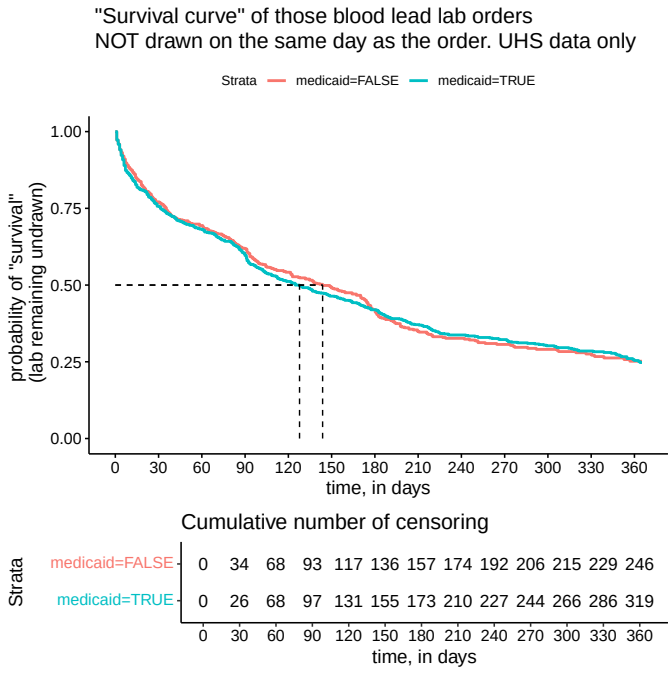


Figure: Medicaid insurance versus non-Medicaid. The curves are nearly identical.

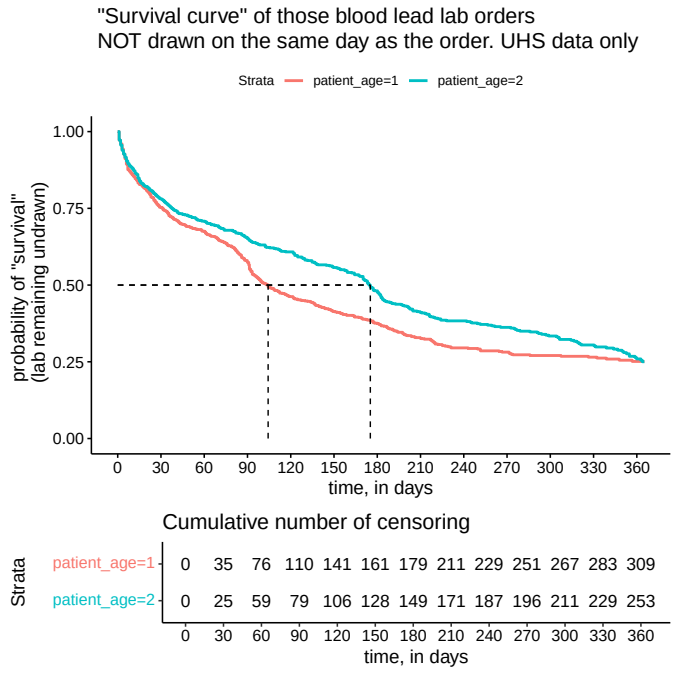


Figure: Age 1 versus age 2. Survival time appears longer among two-year olds.

An alternative K-M analysis

Return

"Survival curve" of those blood lead lab orders
NOT drawn on the same day as the order
AND with one full year observation