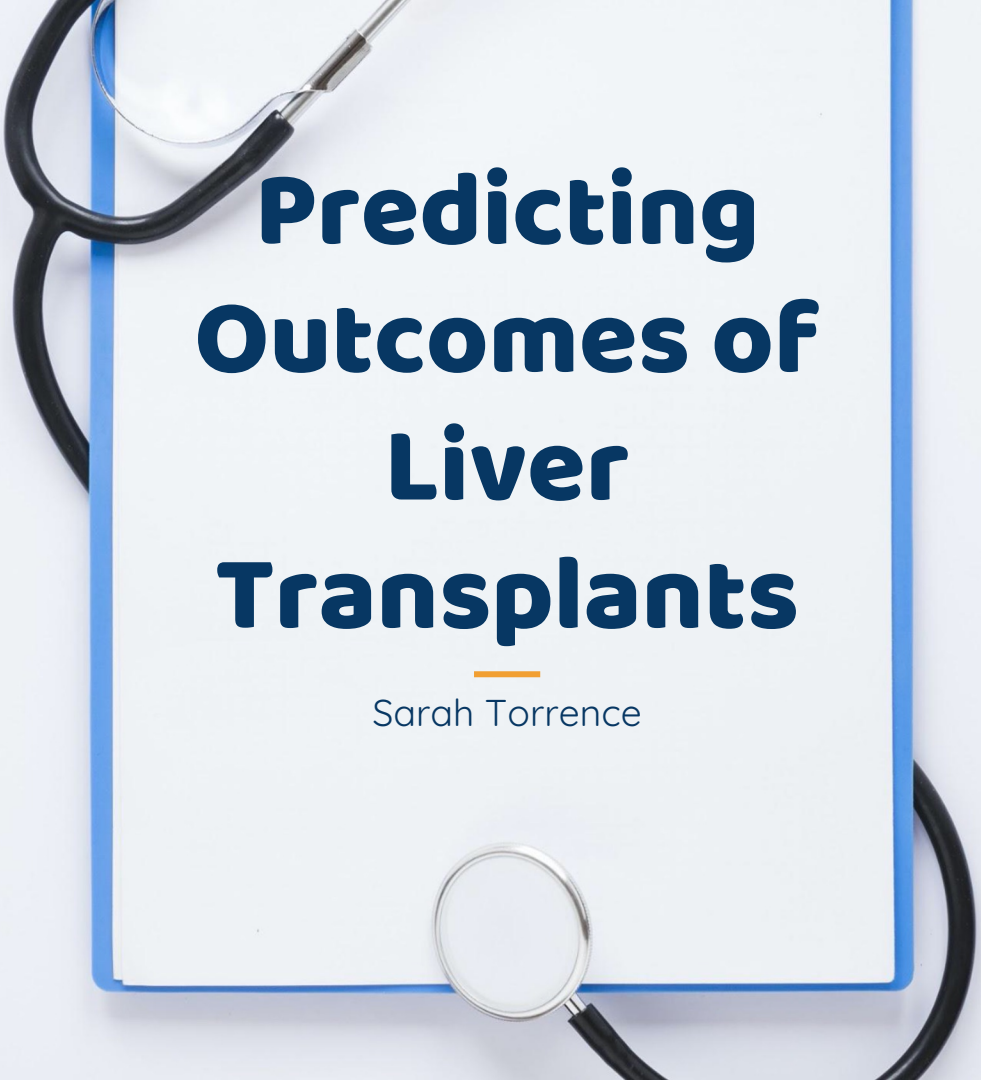


Predicting Outcomes of Liver Transplants

Sarah Torrence

2 Million

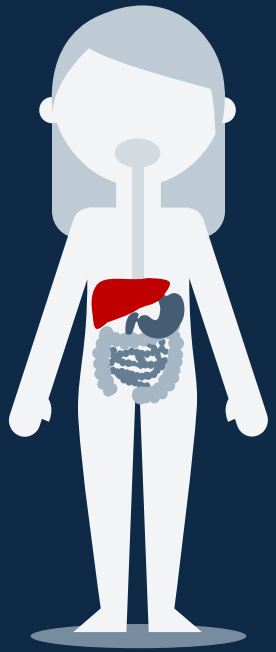
People die every year from liver disease.

2 Million

People die every year from liver disease.

11th

Cirrhosis 11th most common cause of death



Data

Transplant: 2009 - 2019

422 VUMC patients

90 day outcomes

Importance of Body Composition

Data Processing and Variable Selection

422
Patients

140
Variables

Data Processing and Variable Selection

422
Patients

140
Variables

- ✓ Cleaning
- ✓ Transforming
- ✓ Engineering Outcome

Data Processing and Variable Selection

422
Patients

140
Variables

- ✓ Cleaning
- ✓ Transforming
- ✓ Engineering Outcome

- ✓ Domain Knowledge
- ✓ Redundancy Analysis
- ✓ Variable Clustering
- ✓ Backward Selection

Data Processing and Variable Selection

422
Patients

140
Variables

- ✓ Cleaning
- ✓ Transforming
- ✓ Engineering Outcome

- ✓ Domain Knowledge
- ✓ Redundancy Analysis
- ✓ Variable Clustering
- ✓ Backward Selection

37,501
Observations

16
Predictors
+
1
Outcome

Outcome State

Home/Inpatient
Long-term Care

ICU/Ventilator

01

02

03

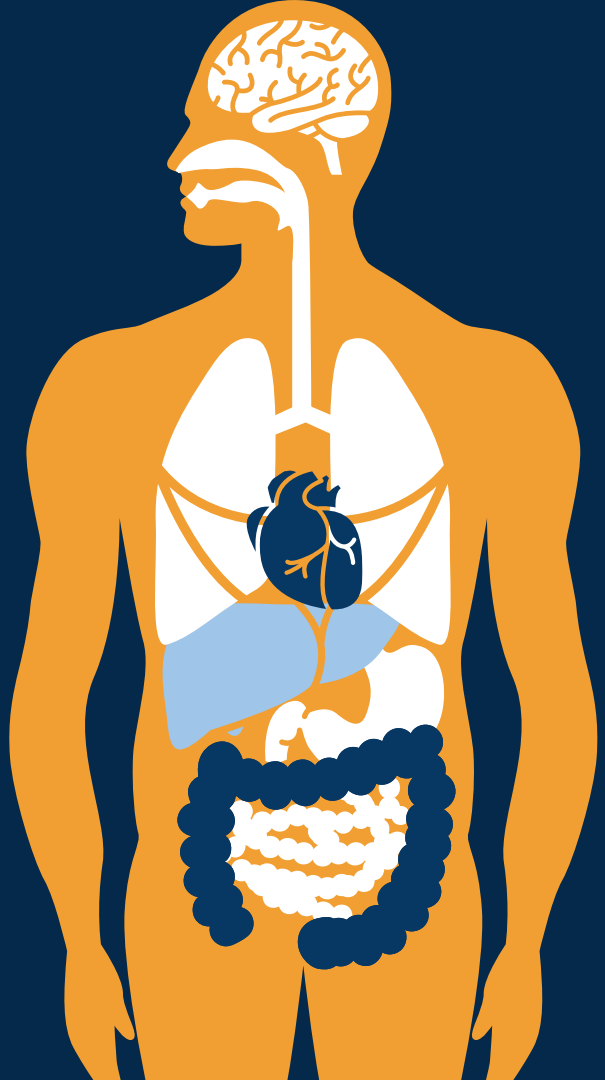
04

Hospital

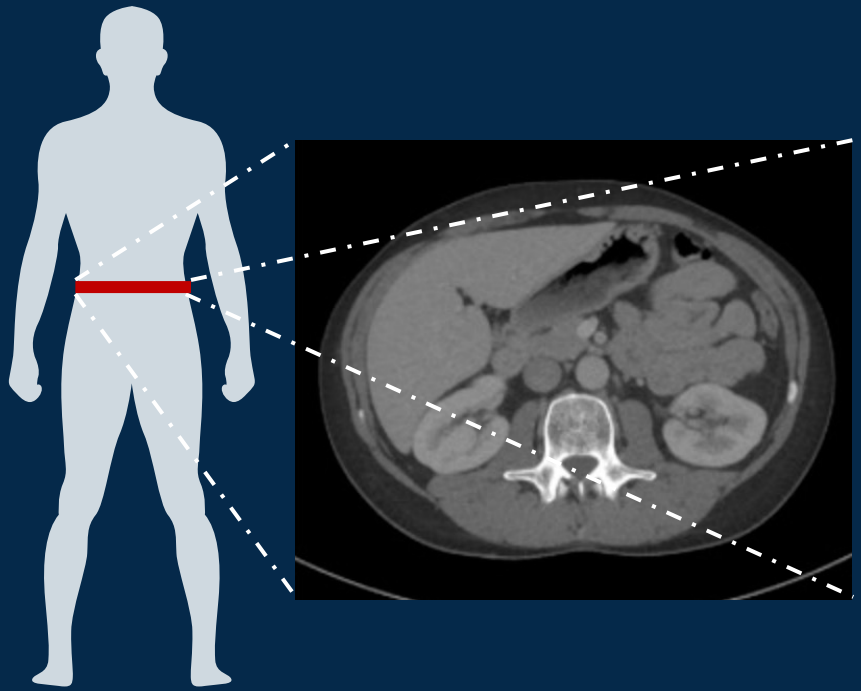
Dead

Predictors

- Age
- Sex
- Etiology of liver disease
- Surgery Duration
- Meld Score
- Day Post-transplant
- Hepatic Encephalopathy
- Comorbidities (diabetes and chronic kidney disease)
- Body Composition



Body Composition Measures



- Skeletal muscle area (cm2)
- Visceral adipose tissue (cm2)
- Subcutaneous adipose tissue (cm2)
- Skeletal muscle density (Hounsfield Units)
- Visceral adipose tissue density (Hounsfield Units)
- Subcutaneous adipose tissue density (Hounsfield Units)

Proportional Odds Model

with Robust Sandwich Covariance Estimator

Proportional Odds Model

with Robust Sandwich Covariance Estimator

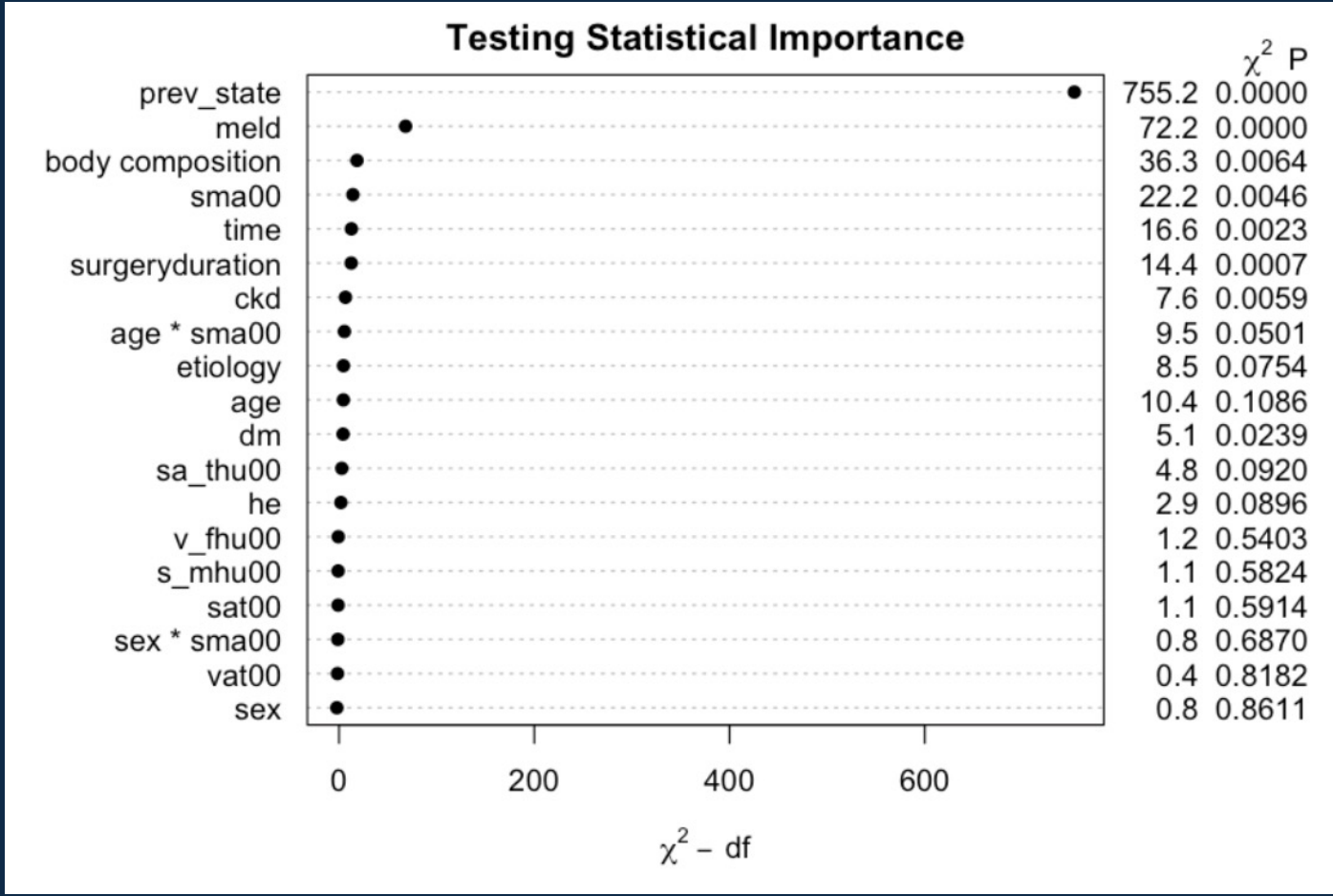
LR $\chi 2$	Adjusted R^2	Degrees of Freedom	Spearman's ρ
30851.04	0.913	40	0.587

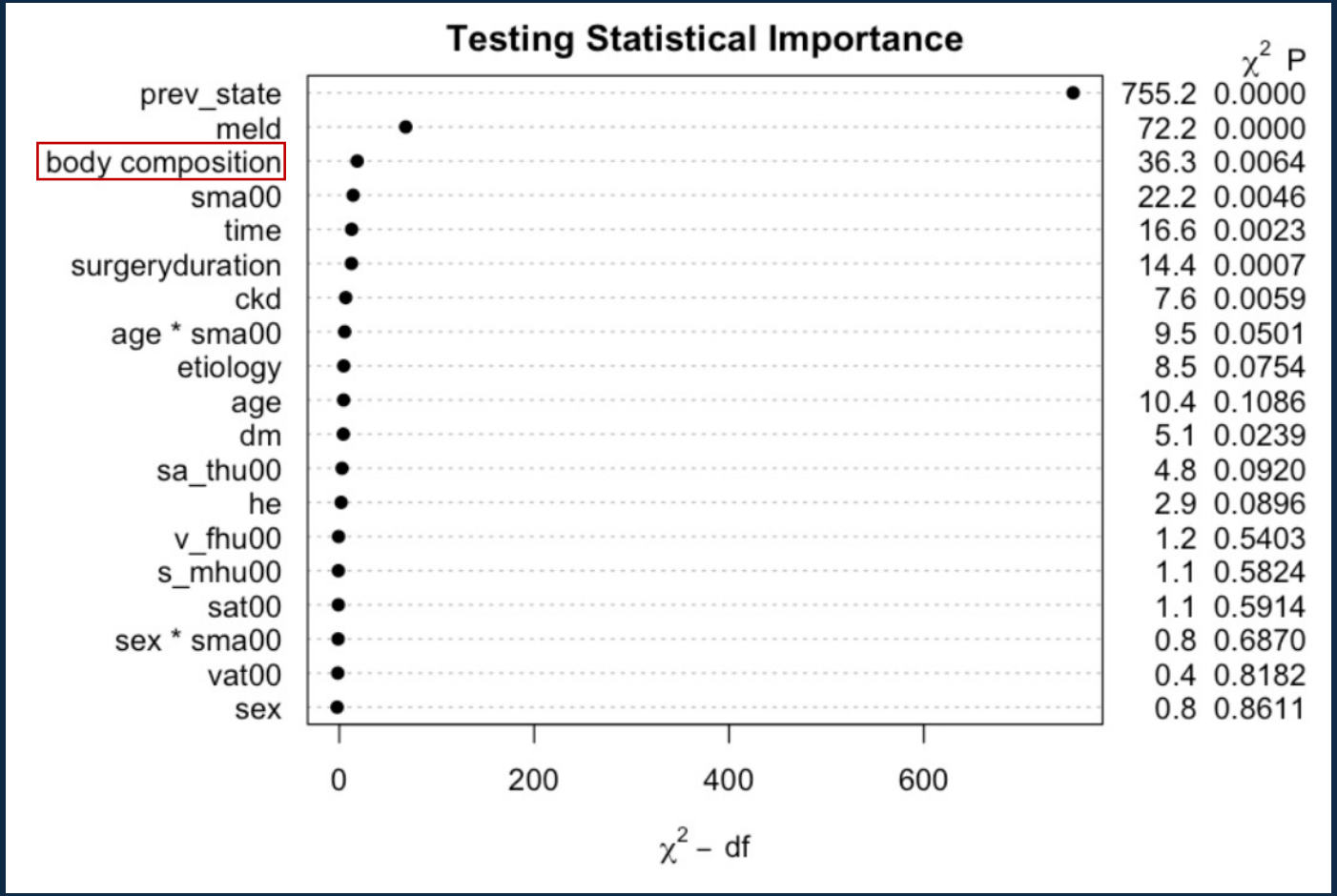
Proportional Odds Model

with Robust Sandwich Covariance Estimator

LR $\chi 2$	Adjusted R^2	Degrees of Freedom	Spearman's ρ
30851.04	0.913	40	0.587

Low risk of overfitting!!


Testing Statistical Importance
χ² P
prev_state 755.2 0.0000
meld 72.2 0.0000
body composition 36.3 0.0064
sma00 22.2 0.0046
time 16.6 0.0023
surgeryduration 14.4 0.0007
ckd 7.6 0.0059
age * sma00 9.5 0.0501
etiology 8.5 0.0754
age 10.4 0.1086
dm 5.1 0.0239
sa_thu00 4.8 0.0920
he 2.9 0.0896
v_fhu00 1.2 0.5403
s_mhu00 1.1 0.5824
sat00 1.1 0.5914
sex * sma00 0.8 0.6870
vat00 0.4 0.8182
sex 0.8 0.8611
0
200
400
600
χ² – df


Testing Statistical Importance
prev_state
meld
body composition
sma00
time
surgeryduration
ckd
age * sma00
etiology
age
dm
sa_thu00
he
v_fhu00
s_mhu00
sat00
sex * sma00
vat00
sex
χ2 P
755.2 0.0000
72.2 0.0000
36.3 0.0064
22.2 0.0046
16.6 0.0023
14.4 0.0007
7.6 0.0059
9.5 0.0501
8.5 0.0754
10.4 0.1086
5.1 0.0239
4.8 0.0920
2.9 0.0896
1.2 0.5403
1.1 0.5824
1.1 0.5914
0.8 0.6870
0.4 0.8182
0.8 0.8611
0
200
400
600
χ2 – df

Conclusions

- Provide “live” updates on patient’s status
- Flexible output –

4 states x 90 days x 422 patients

- Body composition’s role
- Negligible effect sizes besides previous state

THANK YOU!!

Do you have questions?

Sarak.k.torrence@Vanderbilt.edu
https://www.linkedin.com/in/sarah-torrence/
https://github.com/sktorre/liver_transplant_research

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- Harrell, F. E., Jr. (2016). Regression modeling strategies. Springer International Publishing.
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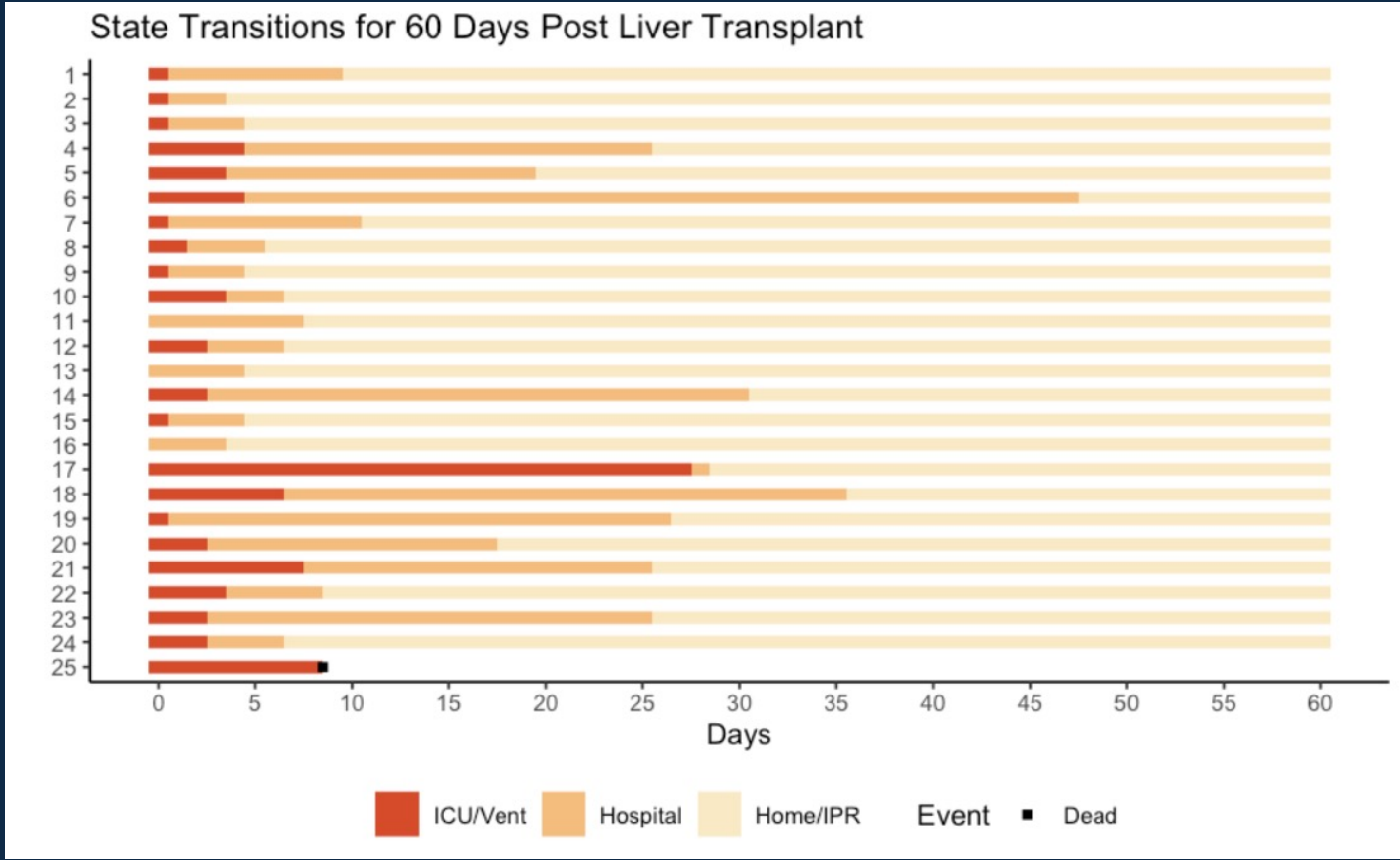
- https://www.sciencedirect.com/science/article/pii/S2214031X1830113X#fig6


State Transitions for 60 Days Post Liver Transplant
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
0
5
10
15
20
25
30
35
40
45
50
55
60
Days
ICU/Vent
Hospital
Home/IPR
Event
Dead