



Analysis of a Geriatric Ward

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*based upon the study
J. Meredith, "A Markovian
Analysis of a Geriatric Ward",
Management Science, June 1972*

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At the California Napa State Hospital, a resocialization program (GRP: Geriatric Resocialization Program) was instituted in 1964 in order to deinstitutionalize geriatric (elderly) patients so that they could be placed in boarding homes or their equivalent outside the hospital.

An analysis was performed to determine the costs and benefits of the program.

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Markov Chain Model

Current or former patients are classified in one of the following states:

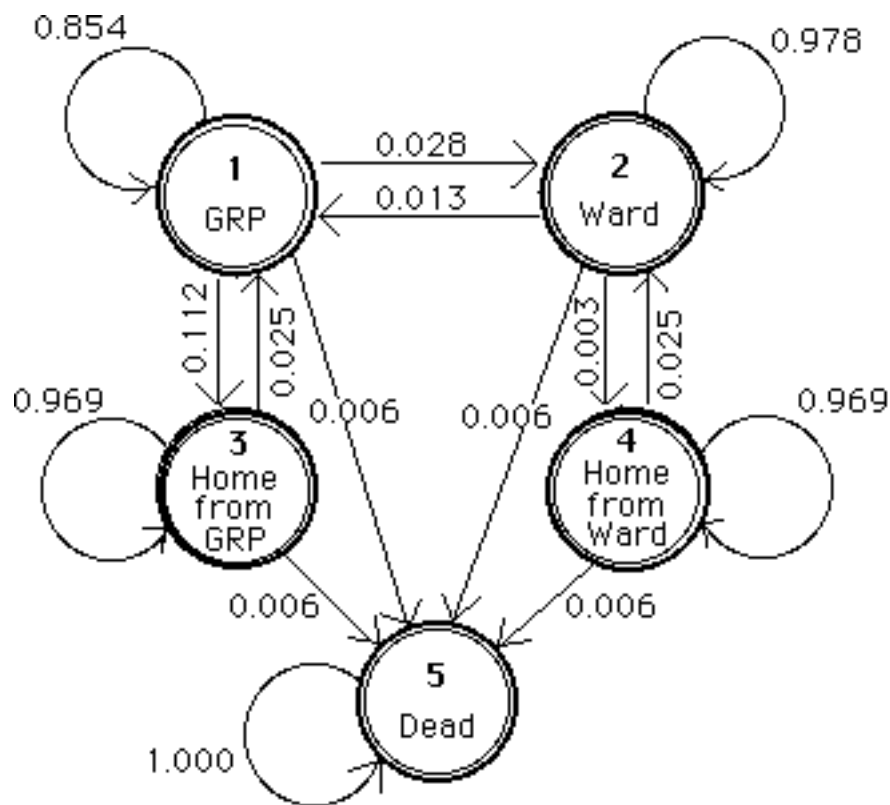
1. in the resocialization program (GRP)
2. in one of the hospital wards
3. in a boarding home, but placed from GRP
4. in a boarding home, but placed directly from a hospital ward
5. dead

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One-month Transition Probabilities & Costs

to from	GRP	Ward	Home (from GRP)	Home (from Ward)	Dead	Cost per Month(\$)
GRP	0.854	0.028	0.112	0.000	0.006	682
Ward	0.013	0.978	0.000	0.003	0.006	655
Home (from GRP)	0.025	0.000	0.969	0.000	0.006	226
Home (from Ward)	0.000	0.025	0.000	0.969	0.006	226
Dead	0.000	0.000	0.000	0.000	1.000	0

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Markov Chain Model

Note that state 5 "Dead" is absorbing

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Transition Probability Matrix

		to				
		1	2	3	4	5
from	1	0.854	0.028	0.112	0	0.006
	2	0.013	0.978	0	0.003	0.006
	3	0.025	0	0.969	0	0.006
	4	0	0.025	0	0.969	0.006
	5	0	0	0	0	1

states

i	name
1	GRP
2	Hospital Ward
3	Home (from GRP)
4	Home (from Ward)
5	Dead

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Analysis of Markov Chain with Absorbing States

A = Absorption Probabilities

	to	
f	1	5
o	1	1
m	2	1
	3	1
	4	1

states

i	name
1	GRP
2	Hospital Ward
3	Home (from GRP)
4	Home (from Ward)
5	Dead

*"Nothing is certain
but death & taxes!"*

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E = Expected No. Visits to Transient States

	to				
		1	2	3	4
f					
r	1	26.963165	38.556882	97.415308	3.7313112
o	2	17.90141	76.669561	64.676061	7.419635
m	3	21.744488	31.09426	110.8188	3.0091219
	4	14.436621	61.830291	52.158114	38.241641

COST ← 682 655 226 226

E + .× COST

66502.773 78720.951 60921.591 70774.961

states

*Life expectancy of a patient
in GRP is sum of first row,
namely 166.66 months!*

i	name
1	GRP
2	Hospital Ward
3	Home (from GRP)
4	Home (from Ward)
5	Dead

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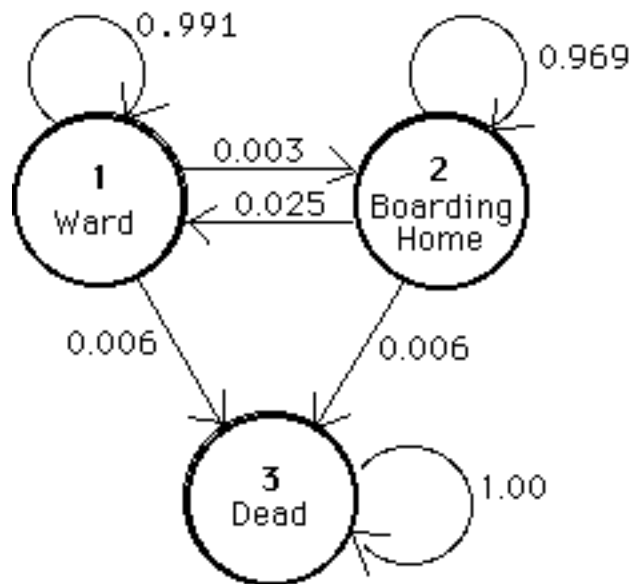
i	<i>current state of patient</i>	<i>cost./patient (lifetime)</i>
1	GRP	66502.77
2	Hospital Ward	78720.95
3	Home (from GRP)	60921.59
4	Home (from Ward)	70774.96

Total cost to the state of a GRP patient during his/her remaining lifetime will be \$66,502

For a patient currently in a hospital ward, this cost will be approximately \$12,000 more.

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Suppose that GRP were not in existence.
What would be the cost per person?



*There are now
only three states*

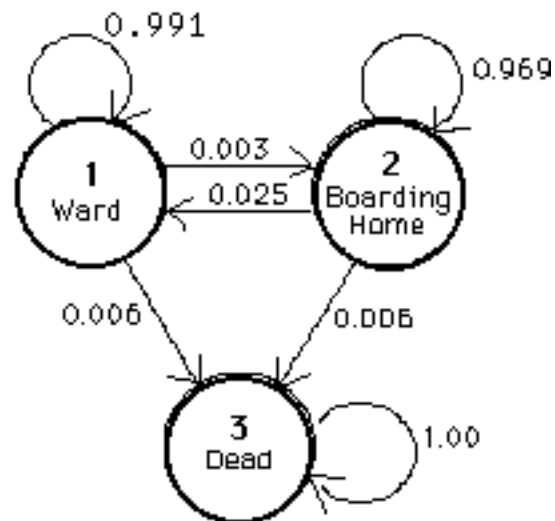
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Transition Probability Matrix

		to		
		1	2	3
f r o m	1	0.991	0.003	0.006
	2	0.025	0.969	0.006
	3	0	0	1

states

i	name
1	Hospital Ward
2	Boarding Home
3	Dead



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A = Absorption Probabilities

		to	
f			3
r			
o	1		1
m	2		1

states

i	name
1	Hospital Ward
2	Boarding Home
3	Dead

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E = Expected No. Visits to Transient States

		to	
f		1	2
r			
o	1	151.96078	14.705882
m	2	122.54902	44.117647

COST ← 655 226

E + .× COST

102857.84 90240.196

states

i	name
1	Hospital Ward
2	Boarding Home
3	Dead

<p><i>Note that the life expectancy of a patient in the ward is $151.96 + 14.71 = 166.67$ months</i></p>

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i	<i>current state of patient</i>	<i>cost./patient (lifetime)</i>
1	Hospital Ward	102857.84
2	Boarding Home	90240.19

If GRP were not instituted, the expected cost to the state for a patient in a hospital ward, for his/her remaining lifetime, would be \$102,857.

This is compared to the cost of a patient in the GRP program, namely \$66,502!