author

Analysis of a Geriatric Ward

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based upon the study
J. Meridith, "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) paitents 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

from \ to	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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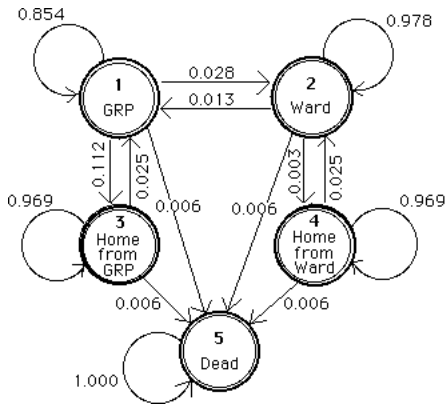

Markov Chain Model

Note that state 5 "Dead" is absorbing

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Transition Probability Matrix

from \ to	1	2	3	4	5
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

from \ to	5
1	1
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

from \ to	1	2	3	4
1	26.963165	38.556882	97.415308	3.7313112
2	17.90141	76.669561	64.676061	7.419635
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
```

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

states

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

i	current state of patient	cost/patient (lifetime)
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

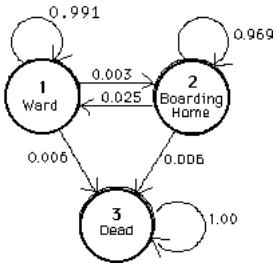
For a patient currently in a hospital ward, this cost will be approximately $12,000 more.

Transition Probability Matrix

from \ to	1	2	3
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



E = Expected No. Visits to Transient States

from \ to	1	2
1	151.96078	14.705882
2	122.54902	44.117647

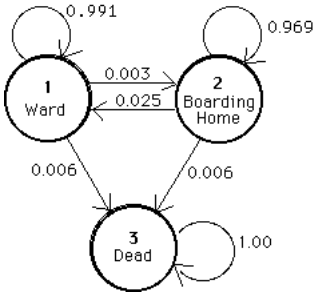
```
      COST ← 655 226
      E +.× COST
102857.84 90240.196
```

states

i	name
1	Hospital Ward
2	Boarding Home
3	Dead

Note that the life expectancy of a patient in the ward is 151.96 + 14.71 = 166.67 months

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



There are now only three states

A = Absorption Probabilities

from \ to	3
1	1
2	1

states

i	name
1	Hospital Ward
2	Boarding Home
3	Dead

i	current state of patient	cost/patient (lifetime)
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!