Introduction

FLoSC

Forecasting Length of Stay and Cost

FLoSC is a software toolkit to help local authorities analyse the patterns of length of stay for publicly funded residents and forecast the cost of a council's existing, known commitments.

Website: http://www.healthcareinformatics.org.uk/FLoSC

The Initial Research Project

- The project was
  - About modelling LOS and cost in institutional LTC for the elderly
  - In collaboration with the Housing and Social Service Department of the London Borough of Merton
  - Partially funded by the Engineering and Physical Sciences Research Council (EPSRC)

Haifeng Xie

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Care Services Efficiency Delivery Programme

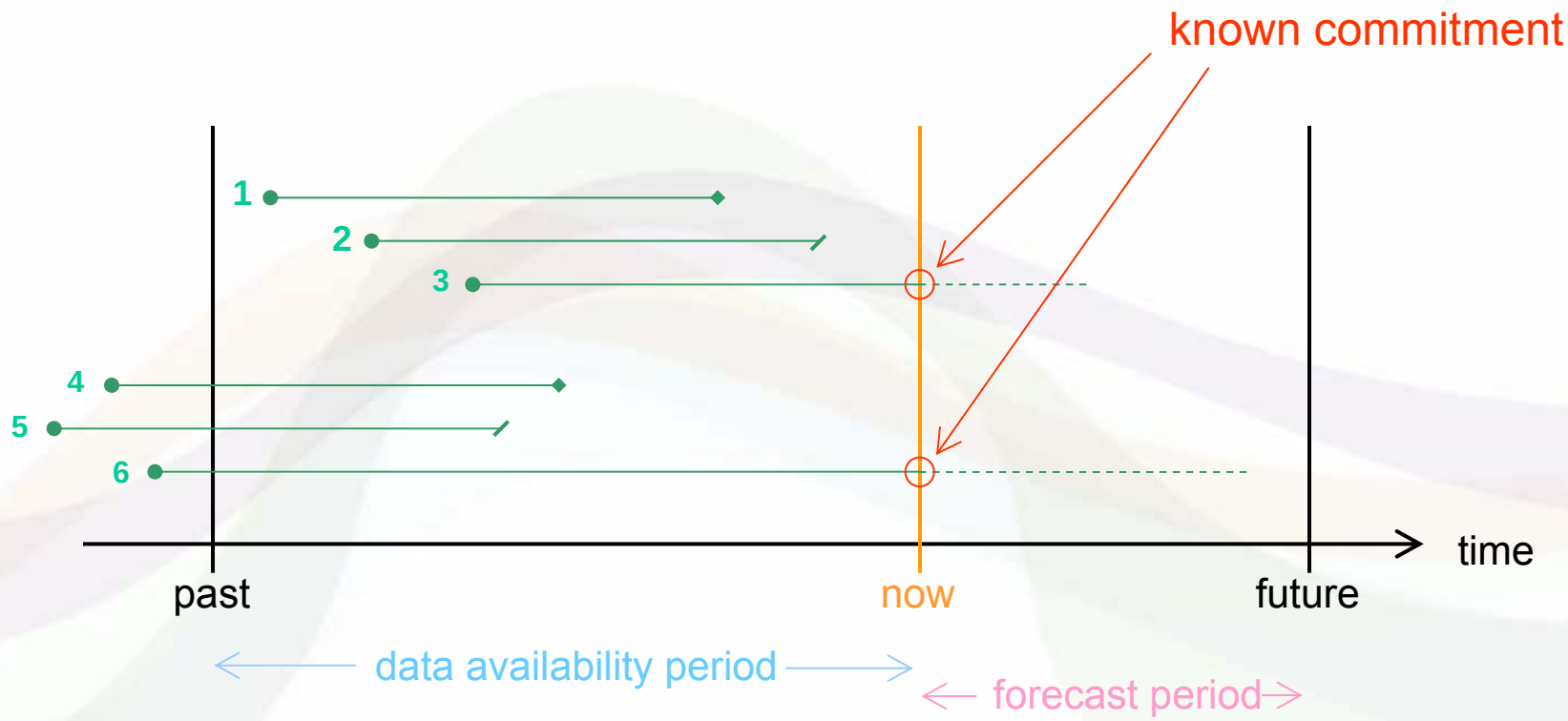
The Problem

- Local authorities have legal and institutional obligation to provide LTC
- Resources are limited; demand is rising rapidly
- Main concerns for local authority
  - who goes into LTC and where?
  - for how long?
  - and … how much?

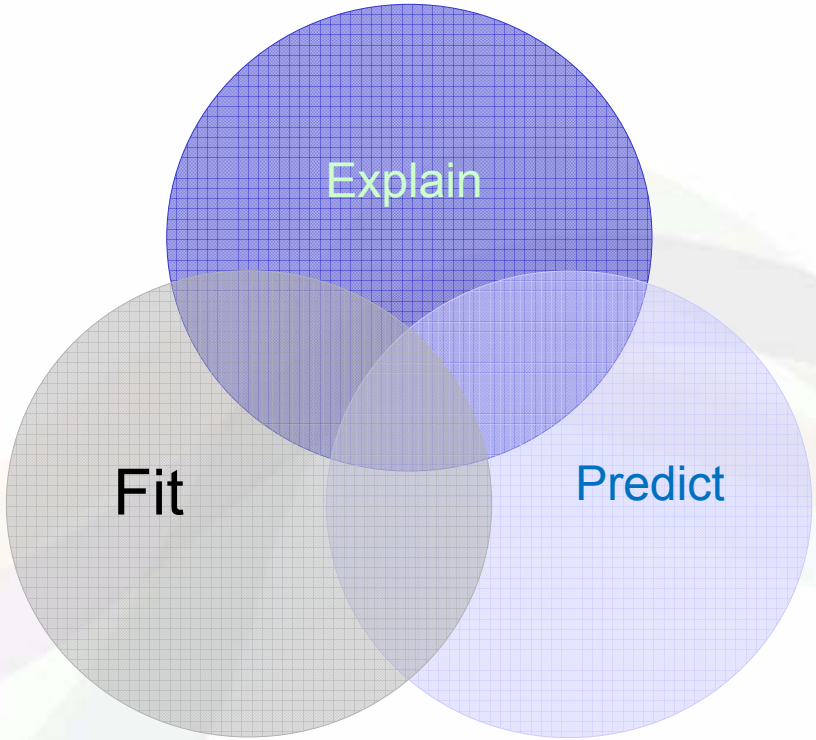
The Observation

- Residents in publicly funded LTC are not usually expected to go home
- Large diversity in LOS
  - Some stay weeks or months; some are there for years
- Average LOS is an incomplete measure
- Planning and budgeting for LTC is difficult
  - Two sources of uncertainty (at least)
    - Caused by those who are already inside the LTC system (known commitments)
    - Caused by unknown future demand

Known Commitment



So what do we want from our model?



Additionally the model should be generic

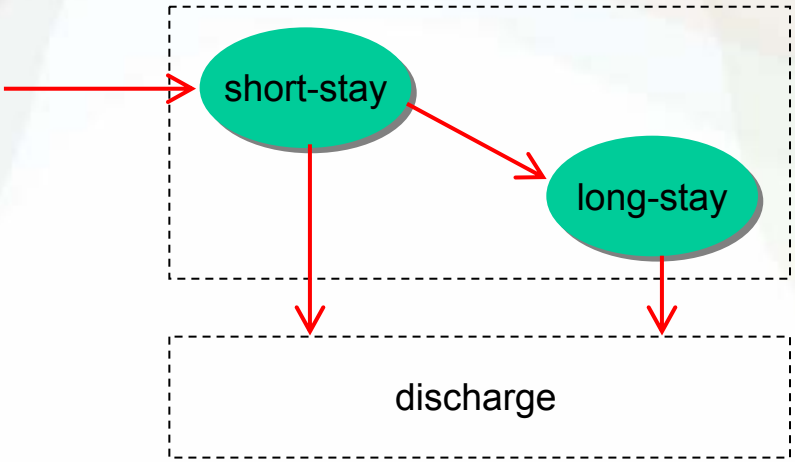
Key attribute of LoS models

The cost forecasting framework

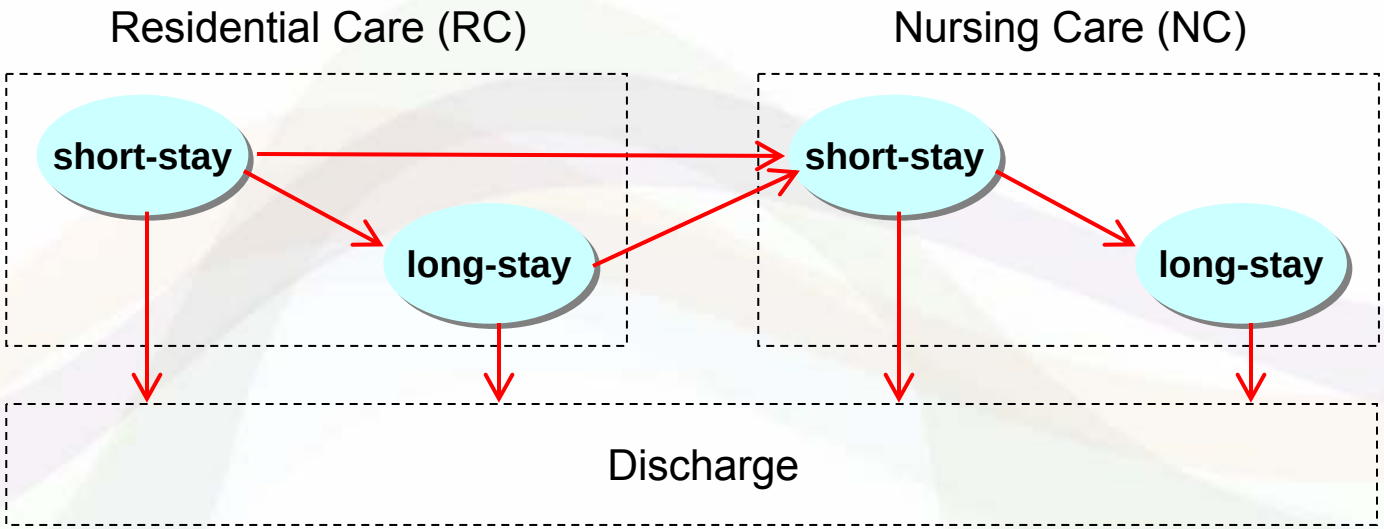
- Future cost depends on
  - How long a resident will stay from now?
  - How much cost of care will increase during their stay?
- Two major components
  - Model for survival and movements of publicly funded residents in the system
    - Called the survival model
  - Model for development of cost for RC and NC
    - Called the cost model

The Idea

- Building on the observation:
  - Some stay for short period of time
  - Some go on to stay for a long period of time
- Introduce “behaviour” states to capture the pattern
  - short-stay & long-stay states



The survival model



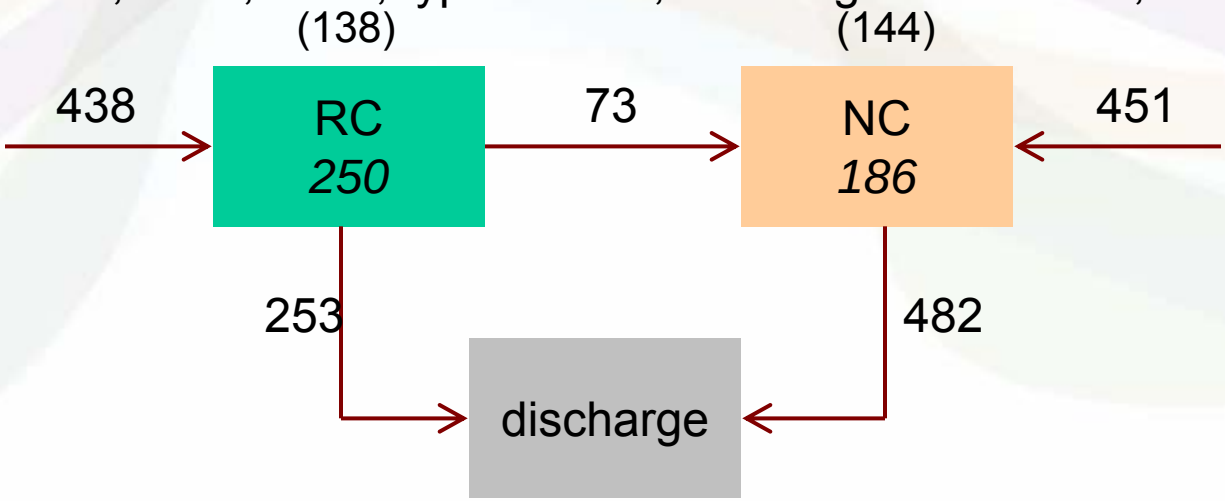
- Introduce conceptual (or virtual) states: short- and long-stay state
- Markov model (actually aggregated Markov model)

The cost model

- Cost of care (from local authority point of view) often only changes at beginning of a financial year, and remains constant throughout the year
- Cost modelled as a step function with increment at beginning of each financial year (1 April)

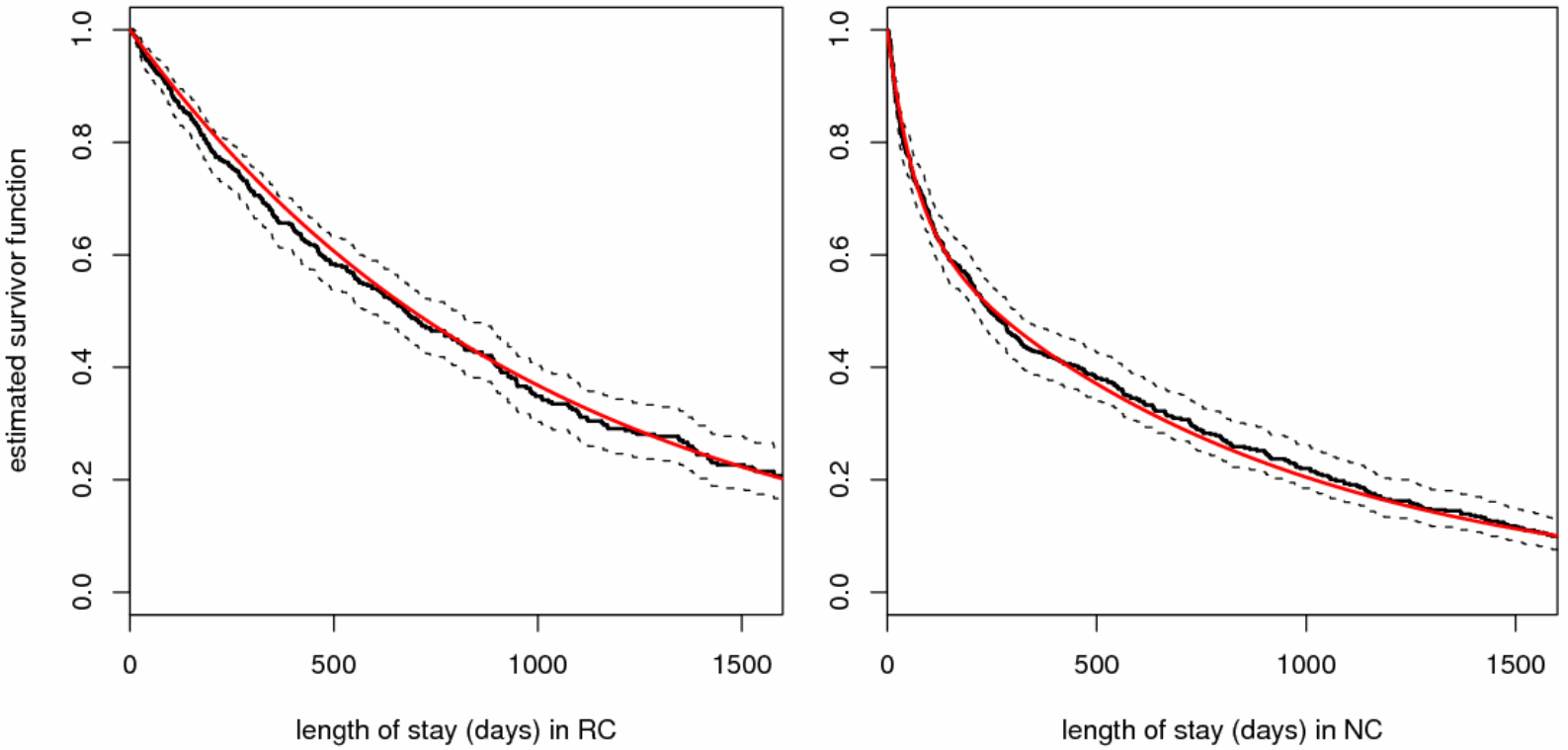
Data

- Merton provided four years data
  - Publicly funded residents present in RC and NC between 1 April 1997 and 1 April 2001 (1244 records of 1171 individuals including 138 already in RC, 144 already in NC, and 73 transfers)
  - Routine operational data
    - id, DOA, DOD, type of care, discharge destination, costs, etc.

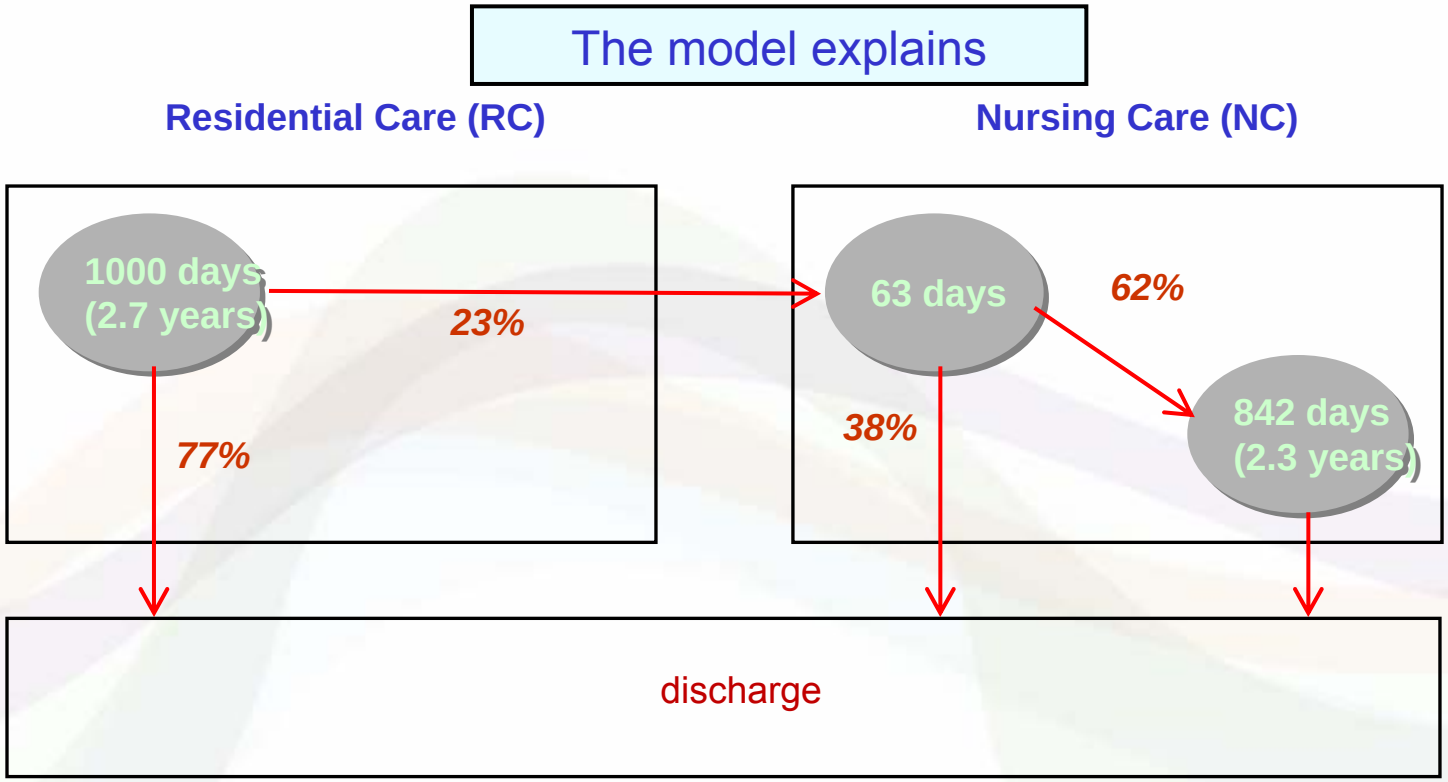


Survivor curves

The model fits



Movement of residents

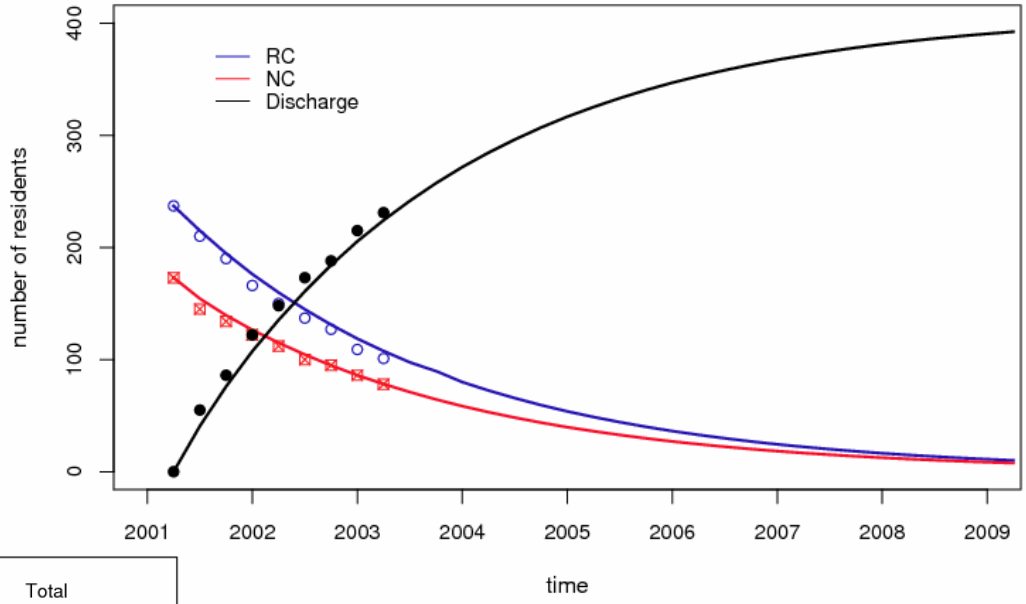


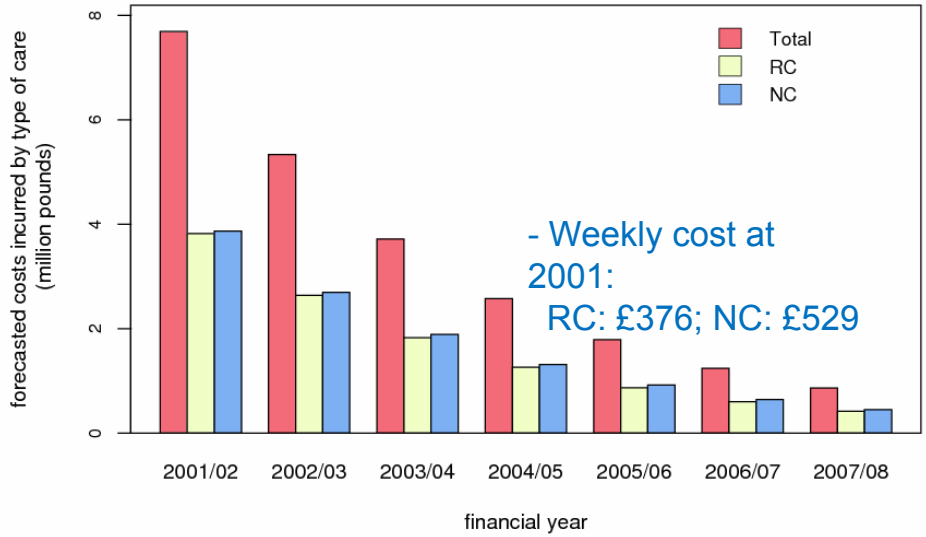
- Upon leaving RC, 23% of residents will transfer to NC
- High mortality rate in the first few months of admission to NC
- About 62% of those admitted to NC will become long-stay residents
- The survival pattern of long-stay residents in NC is similar to those in RC

Forecasting costs due to known commitments

Movement of residents already in the system:

The model predicts





- Weekly cost at 2001:
  RC: £376; NC: £529

Costs prediction vs. follow-up data given by Merton

	predicted	Observed
2001/02	£6,683,000	£6,471,000
2002/03	£4,624,000	£4,385,000

The Benefits

- Simple and intuitive model
- Simple data requirement
- Gives high level insights into the movement of residents in institutional LTC
- Predicts costs due to known commitment
  - Quantifies one source of uncertainty for budgeting
  - Up-to-date prediction; monitoring financial position during the year
- Model and forecasts can be easily updated

A “user friendly” software implementation of the LoS and cost forecasting framework for known commitment

FLoSC

Forecasting Length of Stay and Cost

- Development funded by the Care Services Efficiency Delivery (CSED) Program of the Department of Health
  - **CSED Mission** - Deliver evidence-based, pragmatic, practical efficiency improvement solutions through process and system changes across multiple councils
- Target users: social service departments (or alike) of local authorities

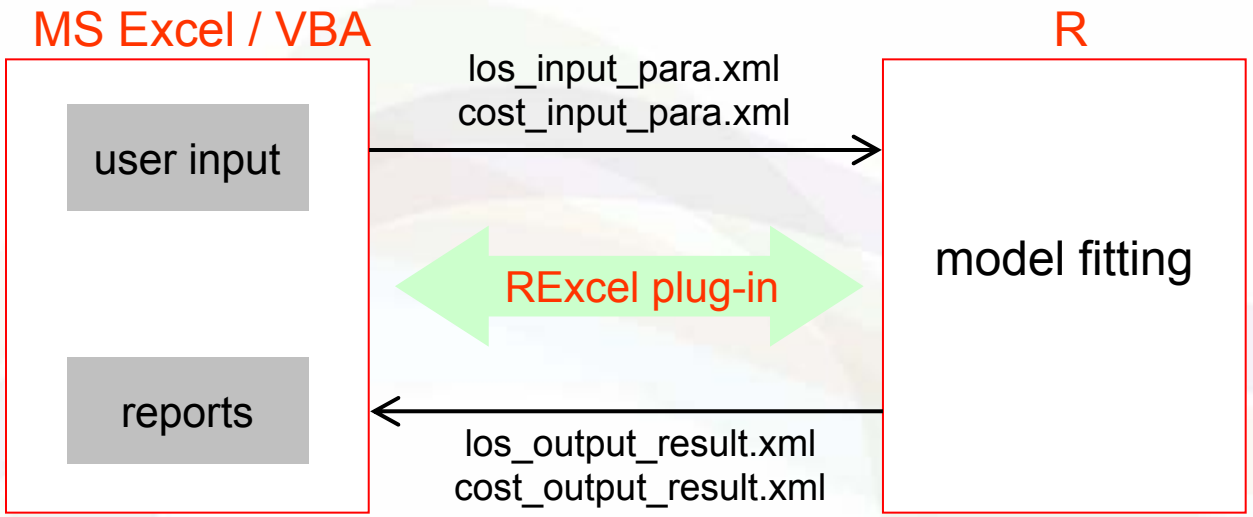
HSCMG Health & Social Care Modelling Group

University of Westminster

Department of Health

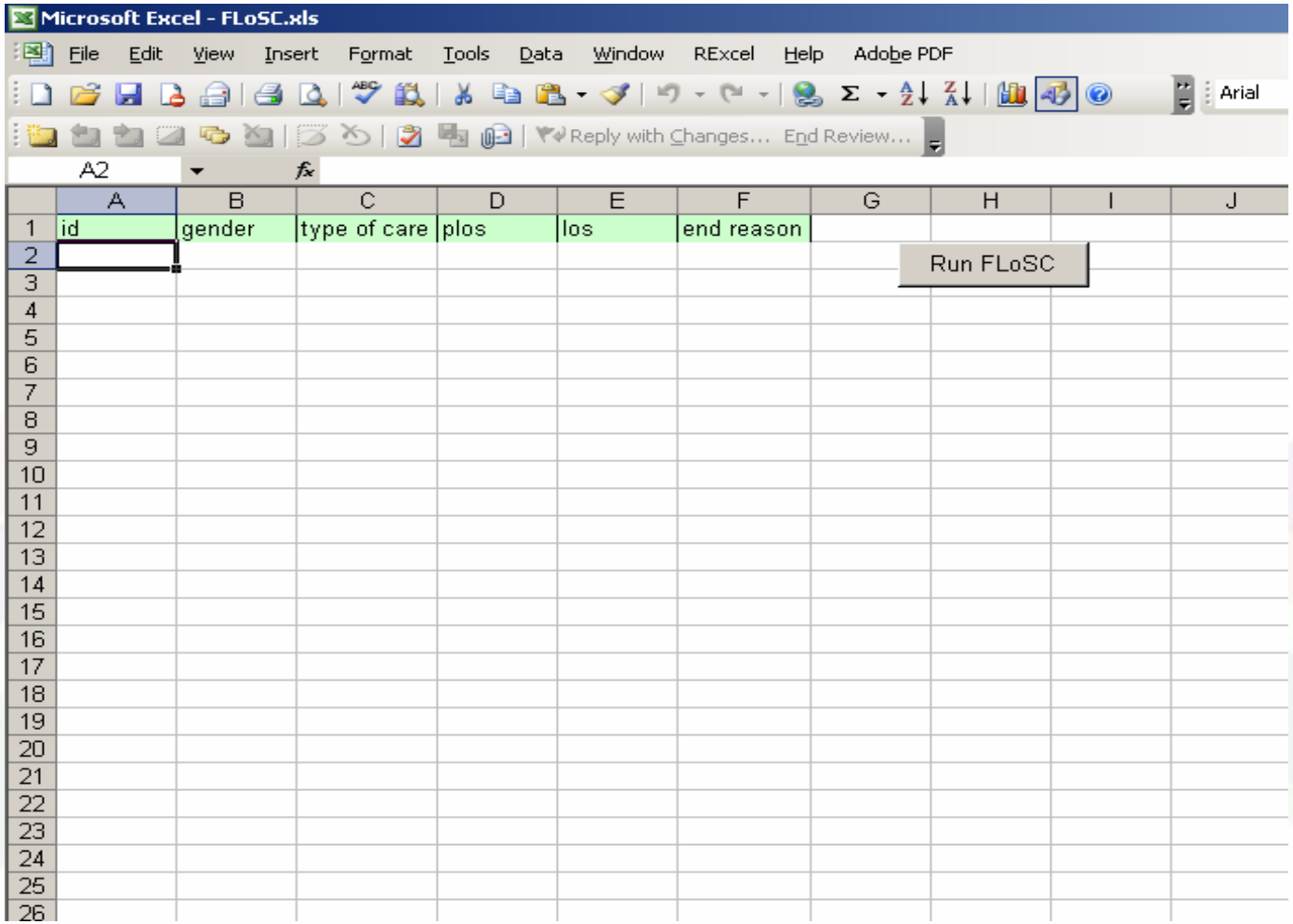
Care Services Efficiency Delivery

FLoSC: Software components



R is a free software environment for statistical computing and graphics

Once installed, the interface

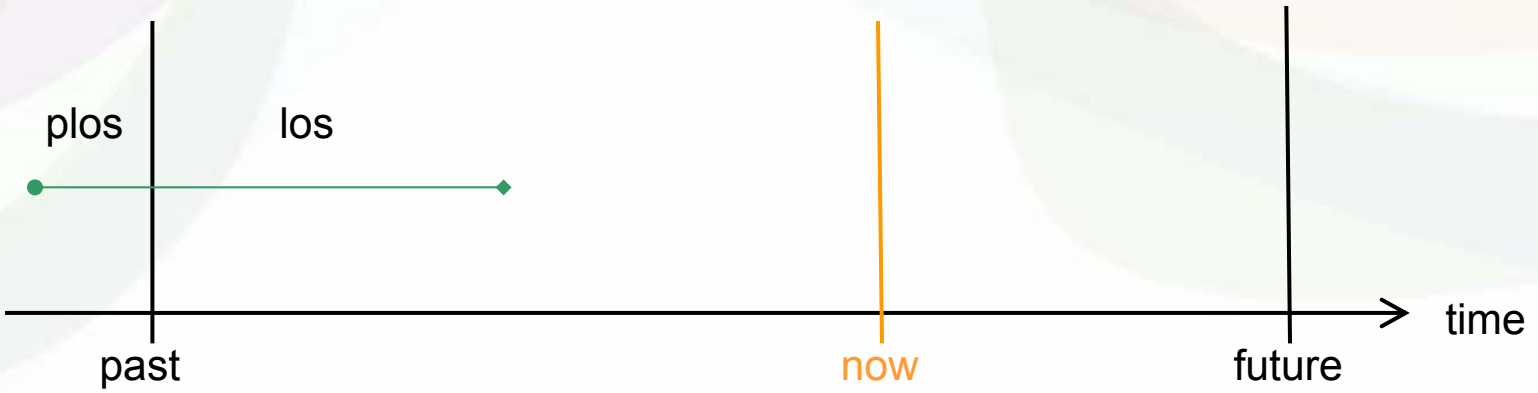


FLoSC Input Data

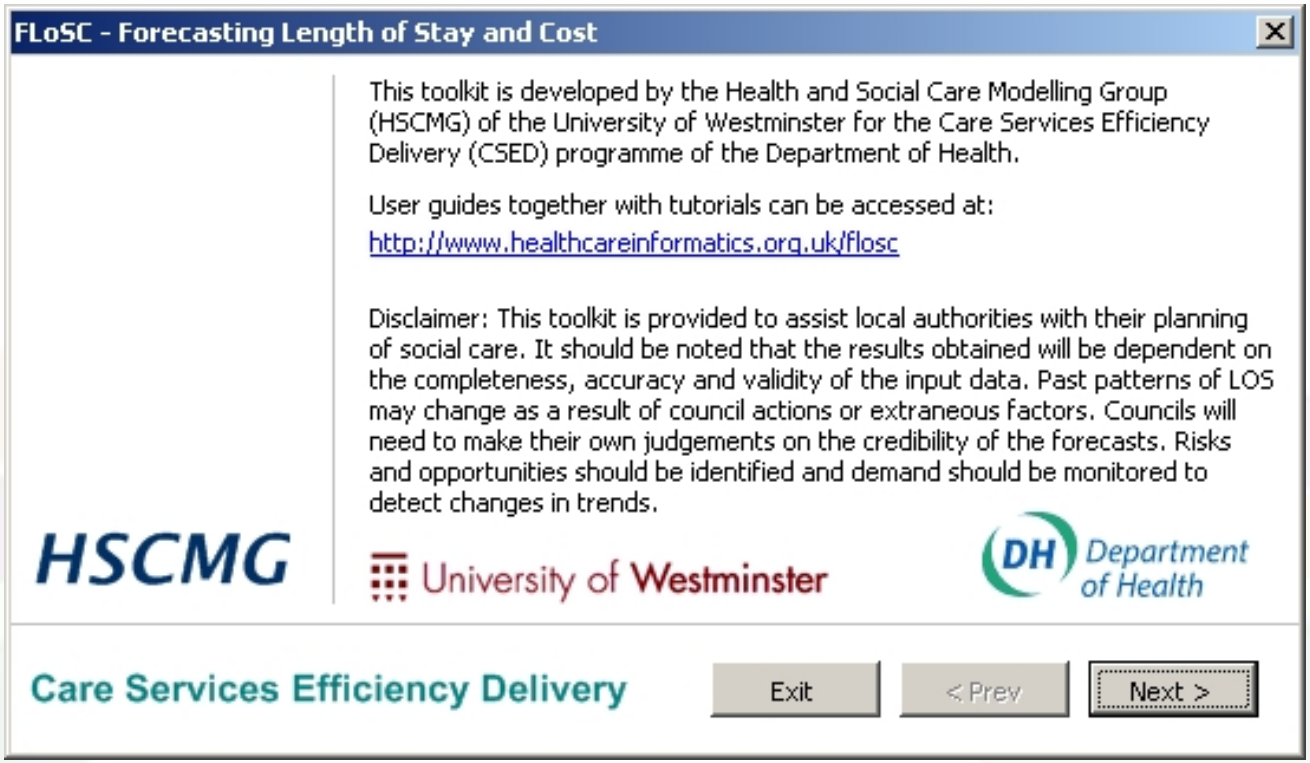
- Also because of difficulties in processing dates in Excel robustly, FLoSC requires LOS in days instead of dates

id	gender	type of care	plos	los	end reason
001	female	residential care	160	1231	to nursing care
001	female	nursing care	0	749	NA

One record per type of care, not per care home



Ready to go


FLoSC - Forecasting Length of Stay and Cost
This toolkit is developed by the Health and Social Care Modelling Group (HSCMG) of the University of Westminster for the Care Services Efficiency Delivery (CSED) programme of the Department of Health.
User guides together with tutorials can be accessed at:
http://www.healthcareinformatics.org.uk/flosc
Disclaimer: This toolkit is provided to assist local authorities with their planning of social care. It should be noted that the results obtained will be dependent on the completeness, accuracy and validity of the input data. Past patterns of LOS may change as a result of council actions or extraneous factors. Councils will need to make their own judgements on the credibility of the forecasts. Risks and opportunities should be identified and demand should be monitored to detect changes in trends.
HSCMG
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Care Services Efficiency Delivery
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< Prev
Next >

Another example

- 1318 records of residents present in RC and NC between 1 April 2003 and 24 September 2007
- First FLoSC summarises the data, after some basic cleansing
  - FLoSC deletes records of patients moving from NC to RC

General information

number of records	1340
period covered	between 2003-04-01 and 2007-09-24

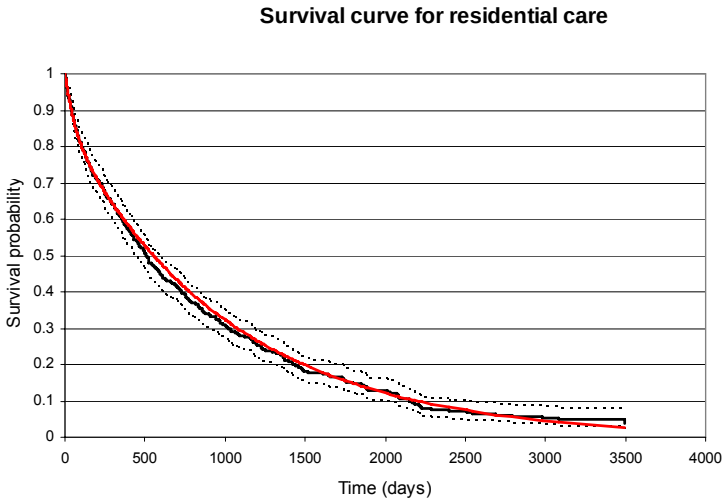
Data cleaning and data processing

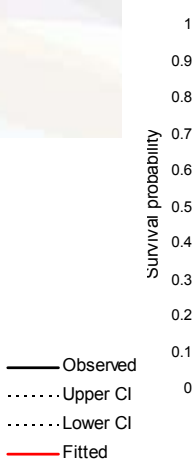
data subset criterion	gender = both ; type of care = both
number of record(s) deleted due to movement from NC to RC	22
number of record(s) in the working dataset	1318

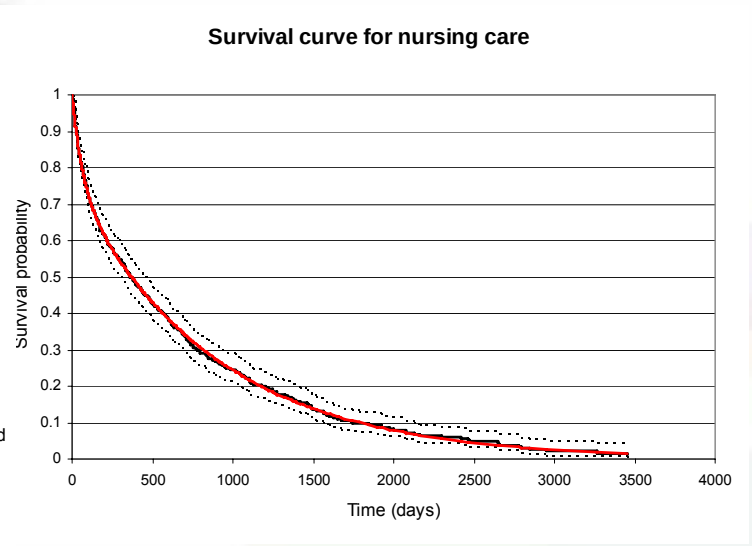
What FLoSC provides

- FLoSC provides summary statistics: counts, mean, standard deviation, median, quartiles, and skewness
- FLoSC shows survival cu

The model fits



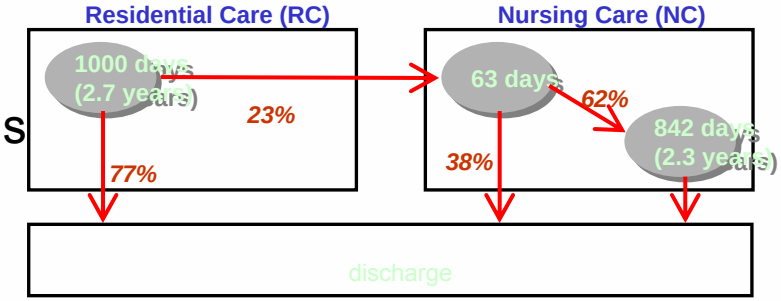


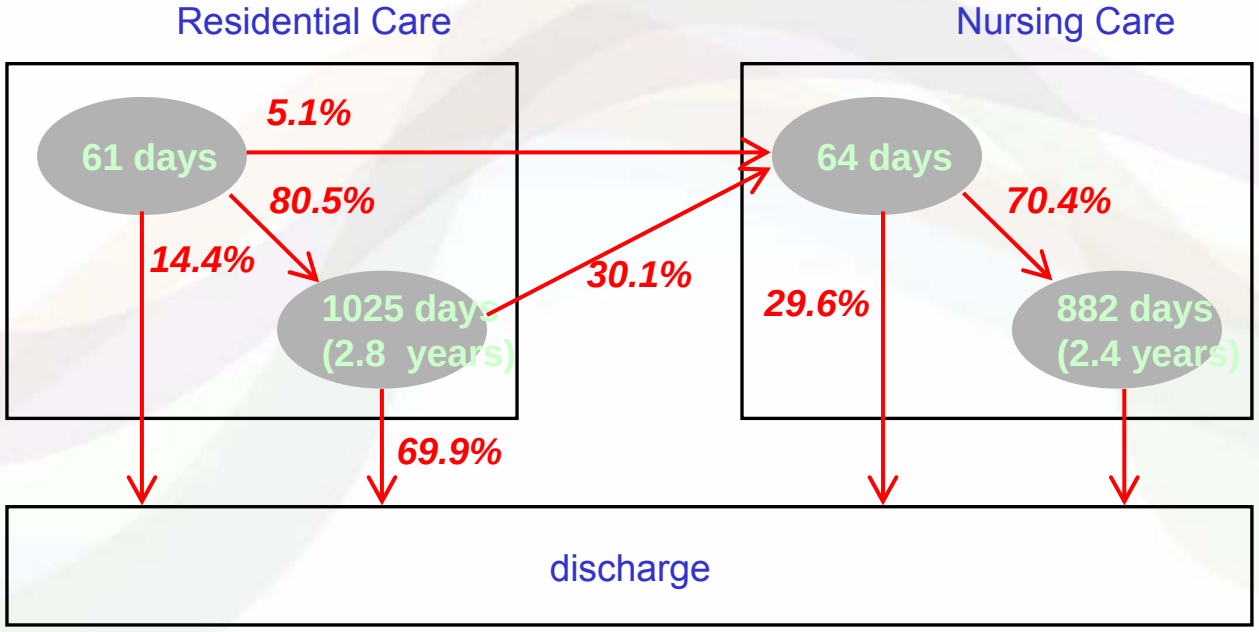


What FLoSC provides

The model explains

The previous model





This model

- Not always the same pattern is observed for a given type of care

What FLoSC provides

The model predicts

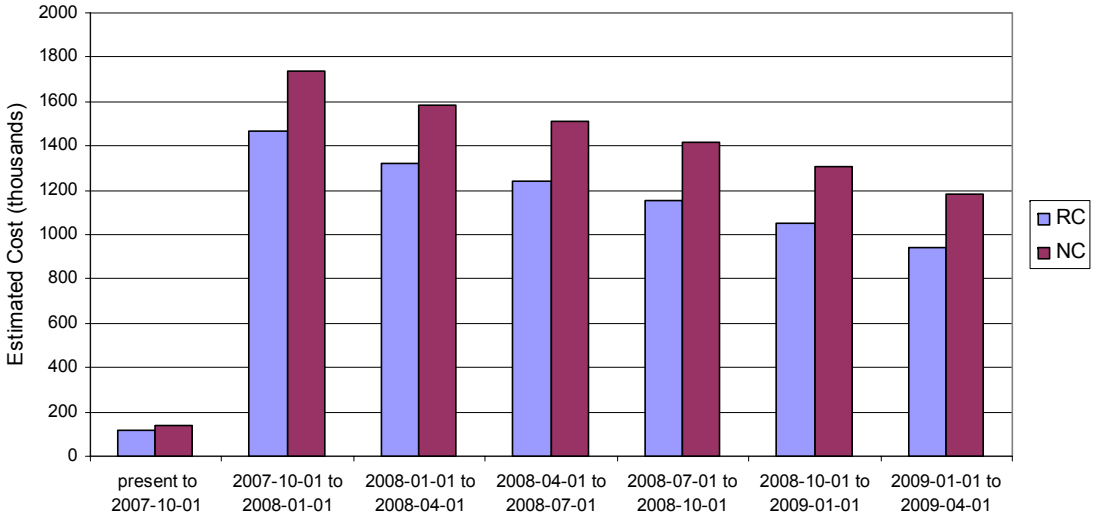
- Costs of known commitments broken down by type of care

Breakdown of the projected total cost by type of care

Financial period	RC	NC
present to 2007-10-01	£117,385	£138,612
2007-10-01 to 2008-01-01	£1,464,551	£1,738,593
2008-01-01 to 2008-04-01	£1,320,580	£1,585,248
2008-04-01 to 2008-07-01	£1,244,275	£1,510,845
2008-07-01 to 2008-10-01	£1,150,260	£1,412,967
2008-10-01 to 2009-01-01	£1,051,426	£1,306,425
2009-01-01 to 2009-04-01	£941,130	£1,182,393

	2006/07	2007/08	2008/09
Annual increase	-----	3.90%	3%
RC	£473.00	£491.45	£506.19
NC	£728.00	£756.39	£779.08

Estimated cost by type of care



- Nearly £3m (resp. £3.5m) until the end of the current financial year and nearly £4.5m (resp £5.5m) for the following financial year for RC (resp. NC)

What if things go wrong?

- Having data in the format expected by FLoSC is the biggest challenge
  - Most program crashes are caused by data issues
- "Hump" in LOS distribution
  - Fitting mixture of exponentials
  - Often caused by wrong data
    - LOS for residents permanently admitted in LTC is usually declining
- And much more after the break

THANK YOU!

Still before the break

- Data requirement
- Live demo