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Estimating informal care inputs associated with EQ-5D

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Contents

- Context
- Methods
- Results
- Conclusion
- Future research

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Context

- Work was commissioned by the UK Department of Health as part of its plans to implement value based pricing (VBP)
- Past approach to technology appraisal was to undertake cost-effectiveness analysis with QALYs and apply a threshold to determined reimbursement
- VBP was planned to undertake a cost-effectiveness analysis with wider societal benefits included and use this to set price
- Wider societal benefits were of two main kinds:
  - Equity considerations relating to the recipients of the health effects
  - Cost and health effects beyond those of the patients, or 'spillovers'

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Operationalising the VBP framework

- A completely new set of data requirements for every appraisal was not considered possible
- 15 years since EQ-5D was recommended and technologies are still arriving without EQ-5D data to support them!
- The aim was to develop a framework that could be applied to data produced as part of the existing technology appraisal (TA) process
- Estimate spillovers as a function of patient characteristics and utilities over time
- From the relevant age and gender distribution of the patient population, can we predict time spent on informal care, production losses, etc.

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Context in summary…

- Our work is not intended to produce the most accurate estimates of informal care inputs for a technology
- Directly observing these for the patient population of interest will produce much more accurate estimates
- Direct observation, was not thought possible within the next few years, so an estimation process, based on existing TA data requirements was required
- Best available evidence was required – if there were problems identified with the data, better data could be collected (if it were thought valuable)
- Method of valuation was out of scope

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Methods

- Health Outcomes Data Repositary (HoDaR)
- Large survey of patient discharged from a large teaching hospital (Currie et al, 2005)
- Clinical data, plus patient survey at 6 weeks post-discharge
  - EQ-5D and SF-36
  - Productivity losses and informal care
- 2002-2009 data cut with 59,512 responses (from 44,494 patients)
- Apply appropriate regression methods to estimate informal care input as a function of EQ-5D

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Data problems

- Underlying question
  - Number of days a friend or relative has needed to provide care or help with normal activities in the last six weeks
- Responses
  - Illogical responses….>42 days
- Mismatch in timings between informal care data and EQ-5D data
  - Informal care in the last six weeks, but EQ-5D today
  - In a population discharged from hospital, you would expect recovery…current EQ-5D is higher than the 'average' seen over the preceding six weeks and which generated the care needs

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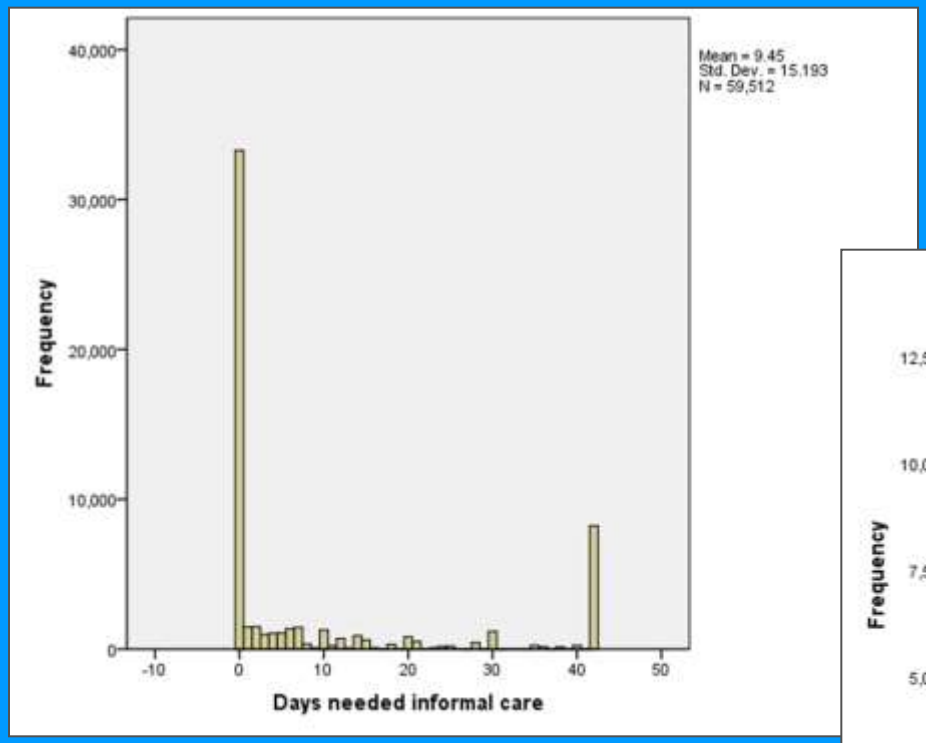
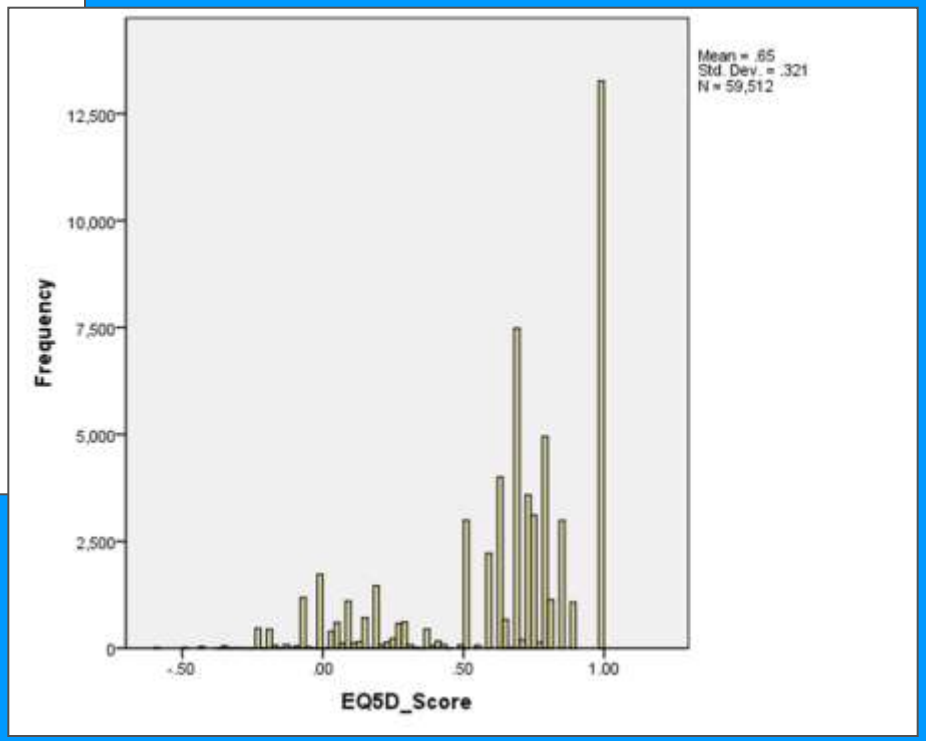
Data





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Regression methods

- Properties of the dependent variable…count data, skew, very large spike at zero days, a large spike at 42 days and repeated observations
- Poisson
- Two part model (using probit and truncated negative binomial)
- Zero-inflated negative binomial
  - Negative binomial regression supplemented with a binary model to increase the zero count
  - Inflation of constant term only
  - Inflation of covariates and constant term
- STATA version 11

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Covariates

- EQ-5D score (domain levels were not compatible with the scope of the work…Dixon et al, 2006)
- Age and age-squared (divided by 100)
- Gender
- Primary diagnosis
- Presence of a co-morbidity (multiple ICD codes on the inpatient record)
- Operation
- The last two covariates were omitted from simpler specifications as they may not always be available within the routine TA process (Rowen et al)

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Results (excluding ICD chapters and zero inflation coefficients)

	Poisson	Two-part model: Probit	Two-part model: Truncated negative binomial	Zero-inflated negative binomial, constant inflation	Zero-inflated negative binomial, variable inflation
	$\hat{\beta}$	$\hat{\beta}$	$\hat{\beta}$	$\hat{\beta}$	$\hat{\beta}$
EQ-5D score	-1.891***	2.205***	-0.870***	-1.028***	-0.858***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Comorbidity	0.279***	-0.169***	0.152***	0.186***	0.148***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Operation	-0.014	0.074***	0.013	0.004	0.009
	(0.351)	(0.000)	(0.304)	(0.782)	(0.504)
Age/100	0.049	2.460***	1.887***	1.697***	1.948***
	(0.846)	(0.000)	(0.000)	(0.000)	(0.000)
(Age/100)-squared	0.410*	-2.123***	-1.157***	-0.965***	-1.203***
	(0.060)	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.170***	-0.334***	-0.022*	0.011	-0.023*
	(0.000)	(0.000)	(0.070)	(0.374)	(0.061)
Constant	2.882***	-1.887***	2.671***	2.737***	2.654***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

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Results (zero inflation coefficients)

	Poisson	Two-part model: Probit	Two-part model: Truncated negative binomial	Zero-inflated negative binomial, constant inflation	Zero-inflated negative binomial, variable inflation
Inflated variables				$\hat{\gamma}$	$\hat{\gamma}$
Constant				0.125***	-3.343***
				(0.000)	(0.000)
EQ-5D score					4.123***
					(0.000)
Comorbidity					-0.393***
					(0.000)
Age					4.828***
					(0.000)
Age-squared					-4.012***
					(0.000)
Female					-0.563***
					(0.000)

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%
Figures in parentheses are p-values calculated with robust standard errors

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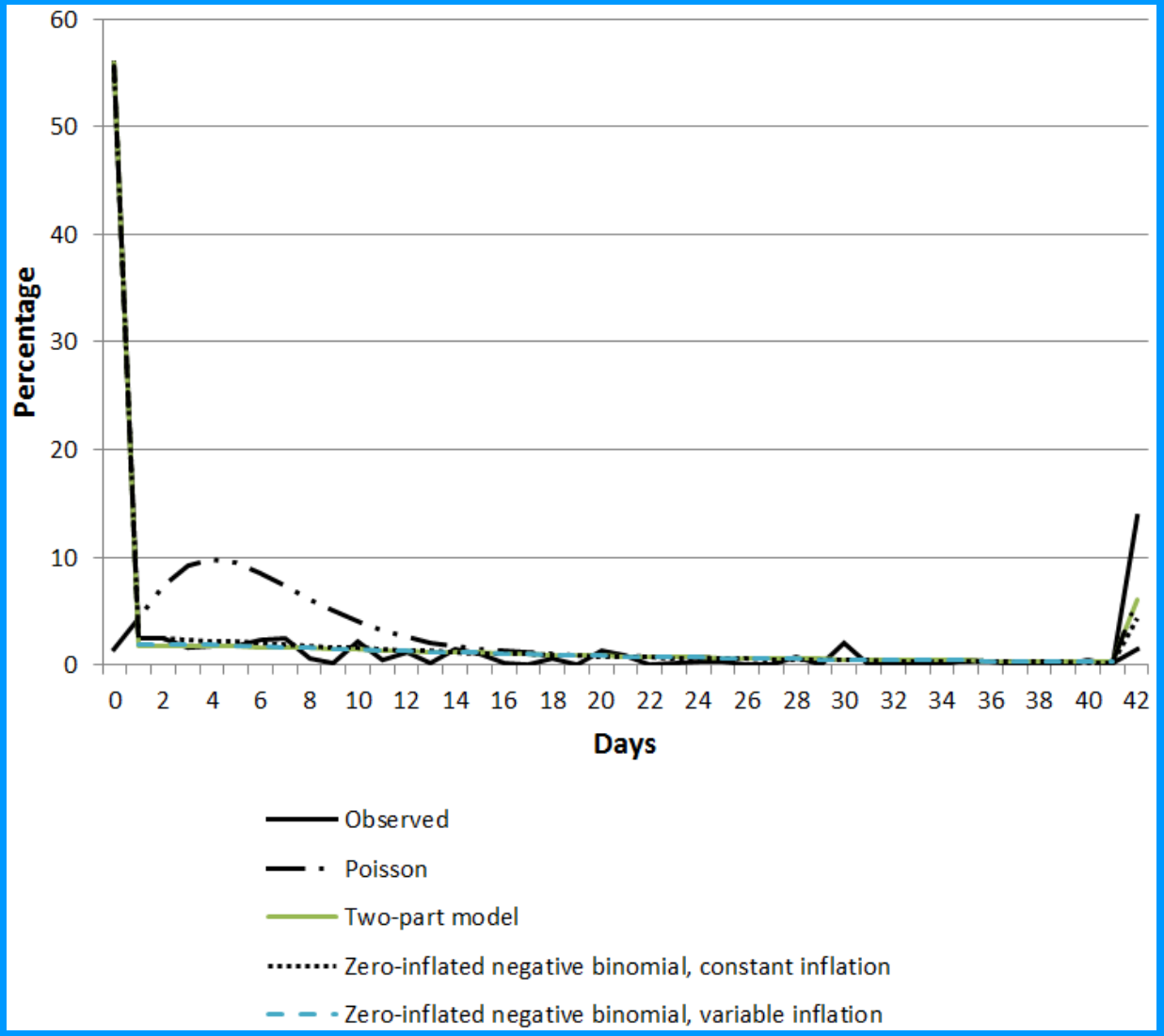
Predictions from the four models



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Predictions

Days	Observed Frequency	Observed Percent	Poisson	Two-part model	Zero-inflated negative binomial, constant inflation	Zero-inflated negative binomial, variable inflation
0	33272	55.91	1.50	55.99	55.55	55.78
1-7	8887	14.94	56.39	10.37	15.64	12.53
8-14	3615	6.07	24.50	9.46	10.14	9.49
15-21	2388	4.01	7.44	6.64	6.32	6.60
22-28	971	1.64	4.63	4.60	4.00	4.54
29-35	1542	2.60	2.77	3.19	2.60	3.14
36-41	592	1.01	1.29	1.96	1.51	1.93
42	8245	13.85	1.47	6.07	4.26	6.00

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Conclusions

- Reasonable estimates are possible and can be applied to existing TA data requirements – DH WSB model exists and works (Miners et al 2013, Griffin et al 2012)
- There are serious problems with the data used
- Another similar study, with similar methods was undertaken for production losses (time off work) and the same problems were encountered (Mukuria et al)
- Out of sample predictive validity has not been undertaken and would be problematic due to lack of a standardised question on informal care time
- How should these be used? As a feasibility exercise only? As the basis of estimates when nothing else is available?

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Future research

- This approach has the advantage of avoiding data collection for every single technology appraisal
- The need for standardised questions relating to informal care (and production losses)
- Need to match the requirements of economic evaluation…we had a vary narrow decision making focus
- How detailed?
  - Hours by each carer? Carer information to identify the appropriate opportunity cost?
- And what about joint production? Impact on carer wellbeing of caring for a loved one?

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- The usual disclaimers apply.

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References

- Miners A, Cairns J, Wailoo A. Department of Health proposal for including wider societal benefits into value based pricing: a description and critique. Sheffield: NICE Decision Support Unit, 2013.
- Griffiths S, Palmer S, Coares M, Spackman E, Tappenden P, Whyte S. Incorporating wider societal benefits into estimates of cost per QALY: case studies. Sheffield: NICE Decision Support Unit, 2012.
- Currie CJ, McEwan P, Peters JR, Patel TC, Dixon S. The routine collation of health outcomes data from hospital treated subjects in the Health Outcomes Data Repository (HODaR): Descriptive analysis from the first 20,000 subjects. *Value in Health* 2005; 8:581-590.
- Dixon S, Salek S, Walker M. Incorporating caregiver effects into economic evaluation. *Pharmacoeconomics* 2006; 24 (1): 43-53.
- Rowen D, Dixon S, Hernandez M, Mukuria C. (2013). Estimating informal care effects associated with EQ-5D tariff values for use in economic evaluation. Policy Research Unit in Economic Evaluation of Health and Care Interventions. Universities of Sheffield & York; EEPRU Research Report 012. Policy paper/document published 30/10/2013
- Mukuria C, Rowen D, Hernandez M, Dixon S. (2014). Examining productivity losses associated with health related quality of life using patient data. Policy Research Unit in Economic Evaluation of Health and Care Interventions. Universities of Sheffield & York; EEPRU Research Report 019. Policy paper/document published 01/06/2014.

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