Published in final edited form as:
Expert Rev Pharmacoecon Outcomes Res. 2015 April ; 15(2): 195–198. doi: 10.1586/14737167.2015.997216.

PROGRESS IN MEASURING FAMILY SPILLOVER EFFECTS FOR ECONOMIC EVALUATIONS

J. Mick Tilford, PhD[1,2] and **Nalin Payakachat, PhD**[2]

[1]Department of Health Policy and Management, University of Arkansas for Medical Sciences, Little Rock, AR

[2]Division of Pharmaceutical Evaluation and Policy, University of Arkansas for Medical Sciences, Little Rock, AR

Keywords

QALYs; cost; family spillover effects; economic evaluation; reference case analysis

The idea that certain health conditions and services affecting one person can have implications for the physical and mental health of other persons – especially family members – has been recognized for some time. However, few researchers attempted to include these ‘spillover’ effects in economic evaluations. For example, in their work on the cost of birth defects, Waitzman, Sheffler, and Romano noted that their estimates were conservative because they did not include the psychosocial and time costs of the birth defect on the family.[1] The US Panel on Cost-effectiveness Analysis in Health and Medicine recommended the inclusion of spillover effects on *caregiver time* in a Reference Case analysis as a cost in the numerator of the cost-effectiveness ratio. The Panel also recognized potential spillover effects on *family quality of life outcomes*, and recommended their inclusion in sensitivity analysis as quality-adjusted life years (QALYs) in the denominator of the cost-effectiveness ratio, but argued against their inclusion in a Reference Case analysis.[2]

The rationale for the latter recommendation is found in the Panel’s cost-effectiveness analysis of food fortification to prevent neural tube birth defects. The authors recognized the potential implications on the quality of life for the family from having a child born with a neural tube defect, but claimed that including spillover effects on the family “is not recommended in a Reference Case analysis because the methods for capturing these impacts are in early stages of development. Also, data on these quality-of-life impacts are not available.”[3] It should also be noted that measurement of the Global Burden of Disease does not account for family spillover effects either.[101]

In the past decade, however, research on incorporating family effects in economic evaluations has increased greatly to the point that one can argue they should be included in a

---

Corresponding Author: J. Mick Tilford, Ph.D., Professor and Chair, Department of Health Policy and Management, University of Arkansas for Medical Sciences, Little Rock, AR 72205, Ph: 501-526-6642, Fax: 501-526-6620, tilfordmickj@uams.edu.

Reference Case analysis, yet as we point out, more guidance on incorporating family spillover quality of life effects and time costs remains a priority. Guidelines for the Reference Case analysis within the National Institute for Health and Care Excellence (NICE) recommend measuring QALYs for all affected parties, including other family members, where warranted.[101] The NICE guidelines, however, do not include spillover time costs (loss of both work and leisure time) because the analysis is conducted from the perspective of the health system. In a societal analysis, both spillover time costs and quality of life effects should be considered.

Basu and Meltzer significantly advanced research on family spillover effects by developing a theoretical framework for their inclusion that showed how medical treatment can produce direct and indirect health effects on all family members including the patient.[4] They also recognized potential ethical issues from including family effects as illnesses affecting married persons or persons with children would have greater benefits from treatment and lower cost-effectiveness ratios relative to conditions that affect unmarried adults under this perspective. Basu et al. contributed to empirical methods for evaluating spillover effects on health by developing a modified time trade-off method to estimate spillover effects on the spouse (or partner) from a patient experiencing prostate cancer-related health states.[5] In this study, the patient's partner was asked to tradeoff his or her own life based on the expected burden to their self only from the patient incurring health states such as incontinence, impotence, or dying. This pilot study demonstrated the feasibility of direct elicitation approaches to measuring family spillover effects.

Prosser et al. evaluated spillover effects of chronic conditions using a novel standard gamble approach that included both family members who experienced the condition and a community sample without direct experience.[6] In their design, the chronic conditions (Alzheimer's or dementia, arthritis, cancer, or depression) could be studied across family relationships (child, spouse, and parent) and within experienced and community samples. Their research comparing conditions is especially important, as some have proposed that spillover effects may be particularly important for some mental health conditions (autism, ADHD, intellectual disability, schizophrenia) because social supports for families affected by these conditions may be limited. Prosser et al. found that spillover effects yielded from both samples were similar for all the specified chronic conditions and across family relationships. The large sample and innovative design provides important insight into the existence of spillover effects and points to the need for additional research to identify the magnitude of these effects for specific conditions. In particular, more work is needed comparing specific mental health conditions relative to physical conditions.

A number of studies sought to estimate spillover effects using generic instruments to preference-weight health outcomes. Using generic instruments to estimate family spillover effects requires specific attention to instrument choice and study design issues. Neumann et al. used the HUI2 to investigate whether caregiver utility scores declined (spillover disutility) with advancing stages of Alzheimer's disease.[7] The null finding may have been attributable to the choice of instrument, as a subsequent study using the same database found decreasing health-related quality of life among caregivers with more sensitive instruments.[8] Tilford et al. examined a similar question with caregivers of children with spina bifida using the Quality of Well-being (QWB) scale and found a decrease in caregiver scores as the severity of the child's lesion increased.[9] Surprisingly, few studies have examined the question of what generic preference-weighted instruments are best suited to studying family quality of life effects for economic evaluations,[10] despite numerous studies devoted to instrument comparisons across patient conditions.

As with any observational study, confounding can bias study findings and careful attention to this issue is warranted. For example, data were collected on children with hearing loss and their caregivers[11] and used to test the hypothesis that cochlear implantation would produce a gain in QALYs over and above the gain to the child from a spillover effect on the caregiver. The initial analysis revealed a large difference in HUI3 scores between the two groups of caregivers, but subsequent analysis indicated that the difference was due to selection bias and use of the HUI3 instrument in this context. Deaf caregivers were less likely to obtain cochlear implantation for their children, and given the HUI3 has a hearing domain, these caregivers had much worse health state preference scores creating the appearance of a spillover effect. In contrast, SF6D scores did not differ between groups irrespective of whether deaf caregivers were included or excluded from the analysis.

One area of potential importance for measuring spillover effects is sleep. We recently conducted an observational study of caregiver spillover effects associated with sleep treatment for clinically diagnosed children with autism using a registry.[12] The sample contained a large proportion of children with sleep problems that could benefit from treatment. Both the SF6D and the EQ5D were used to estimate potential caregiver spillover effects and produced similar marginal effects despite the large difference in average scores. The findings suggested that *caregiver health* would improve as much *from treatment of the child* as would the health of the child. Given the cost of behavioral treatments, the additional health gain to the caregiver greatly increases the probability that such treatments will be cost-effective.

Remarkably, we are unaware of any studies that have sought to capture family spillover effects in QALY terms using prospective randomized trial designs, although studies have evaluated caregiver interventions using generic instruments within randomized trials.[13] A recent trial by Romeo et al. comparing mirtazapine and sertraline to prevent depression in patients with dementia produced intriguing findings on cost-effectiveness.[14] The study measured QALYs for patients and unpaid caregiving time in the economic evaluation. The authors found a small gain in QALYs for the mirtazapine group, but a large decrease in unpaid caregiving time that greatly improved the cost-effectiveness profile for mirtazapine to treat depression. The authors explained the findings as mirtazapine potentially ameliorating sleep disturbances in patients with dementia, which improved the quality of life of the patient and relieved an important source of distress for the caregiver. Unfortunately, the authors did not design the study to capture caregiver spillover effects in QALY terms.

Had the Romeo et al. study measured caregiver QALYs in addition to unpaid caregiver time, it would have raised an important unanswered question in the literature addressed at the beginning of this essay. Should both unpaid caregiver time and caregiver QALYs be included in economic evaluations? Some may argue such inclusion amounts to double counting along the lines of the US Panel's decision not to include productivity effects in the numerator of the cost-effectiveness ratio by arguing they are captured in the QALY.[15] Because generic instruments are silent on this issue,[16] new guidance can be expected as the field moves forward, but our own perspective is that both spillover time and health effects belong in the evaluation.

Further questions in the spillover literature remain as well. Al-Janabi contrasted the evaluative scope (family versus patient) with the evaluative space (QALYs versus Well-Being),[15] the space issue again needs to be addresses under the expanded scope. Measures to describe spillover effects should extend beyond QALYs to capture more aspects of life than health alone. Research is progressing on measuring well-being of caregivers[17] and decomposing spillover effects into family and caregiver components.[18] Much more work can be expected in this area in the future.

A recent review of family spillover effects[18] demonstrates significant progress in methods and data for measuring disutility and that much more work remains. We believe this research agenda provides a shot in the arm to the economic evaluation literature that can increase both interest in the field and the use of economic evaluation by decision-makers. Much research is needed to identify the conditions and treatments that produce substantial spillover effects and those that can be safely ignored. Evidence from causal research designs, especially randomized trials, is lacking and necessary to improve understanding of findings from cohort studies. Finally, guidance is needed on a range of practical issues to permit widespread implementation of spillover findings in the field. The result of this research will be better estimates to guide decision-making. For example, a family perspective for cost-effectiveness of services for children with autism is likely to be more precise if the potential benefit to caregivers and siblings is included. A family perspective is better aligned with constituent understanding and interests in this condition, creating a more useful application and appreciation for cost-effectiveness analysis. We suspect the same could be true for other conditions as well.

Acknowledgement

Nalin Payakachat is funded by the National Institute of Mental Health (Grant R03MH102495). The content of this article is solely the responsibility of the authors and does not represent the official views of the National Institute of Mental Health or the National Institutes of Health.

References

(1). Waitzman, NJ.; Scheffler, RM.; Romano, PS. The Costs of Birth Defects: Estimates of the Value of Prevention. University Press of America Inc.; New York, London, Lanham: 1996.

(2). Gold, MR.; Siegel, JE.; Russell, LB.; Weinstein, MC. Cost-Effectiveness in Health and Medicine. Oxford University Press; New York, Oxford: 1996.

(3). Kelly, AE.; Haddix, AC.; Scanlon, KS.; Helmick, CG.; Mulinare, J. Cost-effectiveness of strategies to prevent neural tube defects. In: Siegel, JE.; Russell, LB.; Weinstein, MC.; Gold, MR., editors. Cost-Effectiveness in Health and Medicine. Oxford University Press; New York, Oxford: 1996. p. 312-349.

(4). Basu A, Meltzer D. Implications of spillover effects within the family for medical cost-effectiveness analysis. J Health Econ. 2005; 24:751–773. [PubMed: 15960995]

(5). Basu A, Dale W, Elstein A, Meltzer D. A time tradeoff method for eliciting partner's quality of life due to patient's health states in prostate cancer. Med Decis Making. 2010; 30:355–365. [PubMed: 20228288]

(6). Prosser LA, Lamarand K, Gebremariam A, Wittenberg E. Measuring Family HRQoL Spillover Effects Using Direct Health Utility Assessment. Med Decis Making. 2014

(7). Neumann PJ, Kuntz KM, Leon J, et al. Health utilities in Alzheimer's disease: a cross-sectional study of patients and caregivers. Med Care. 1999; 37:27–32. [PubMed: 10413389]

(8). Bell CM, Araki SS, Neumann PJ. The association between caregiver burden and caregiver health-related quality of life in Alzheimer disease. Alzheimer Dis Assoc Disord. 2001; 15:129–136. [PubMed: 11522930]

(9). Tilford JM, Grosse SD, Robbins JM, Pyne JM, Cleves MA, Hobbs CA. Health state preference scores of children with spina bifida and their caregivers. Qual Life Res. 2005; 14:1087–1098. [PubMed: 16041904]

(10). Payakachat N, Tilford JM, Brouwer WB, van Exel NJ, Grosse SD. Measuring health and well-being effects in family caregivers of children with craniofacial malformations. Qual Life Res. 2011; 20:1487–1495. [PubMed: 21347570]

(11). Smith-Olinde L, Grosse SD, Olinde F, Martin PF, Tilford JM. Health state preference scores for children with permanent childhood hearing loss: a comparative analysis of the QWB and HUI3. Qual Life Res. 2008; 17:943–953. [PubMed: 18484191]

(12). Tilford, JM.; Kuhlthau, KA.; Payakachat, N.; Pyne, JM.; Kovacs, E. Health utilities and caregiver spillover effects associated with sleep problems in children with autism spectrum disorders. Paper presented at the International Society for Quality of Life Research annual meeting; 2013.

(13). Knapp M, King D, Romeo R, et al. Cost effectiveness of a manual based coping strategy programme in promoting the mental health of family carers of people with dementia (the START (STrAtegies for RelaTives) study): a pragmatic randomised controlled trial. BMJ. 2013; 347:f6342. [PubMed: 24162943]

(14). Romeo R, Knapp M, Hellier J, et al. Cost-effectiveness analyses for mirtazapine and sertraline in dementia: randomised controlled trial. Br J Psychiatry. 2013; 202:121–128. [PubMed: 23258767]

(15). Brouwer WB, Koopmanschap MA, Rutten FF. Productivity costs measurement through quality of life? A response to the recommendation of the Washington Panel. Health Econ. 1997; 6:253–259. [PubMed: 9226143]

(16). Brouwer WB, Grootenboer S, Sendi P. The incorporation of income and leisure in health state valuations when the measure is silent: an empirical inquiry into the sound of silence. Med Decis Making. 2009; 29:503–512. [PubMed: 19509120]

(17). Al-Janabi H, Flynn TN, Coast J. QALYs and Carers. Pharmacoeconomics. 2011:29.

(18). Bobinac A, van Exel NJ, Rutten FF, Brouwer WB. Caring for and caring about: disentangling the caregiver effect and the family effect. J Health Econ. 2010; 29:549–556. [PubMed: 20579755]

(19). Bobinac A, van Exel NJ, Rutten FF, Brouwer WB. Health effects in significant others: separating family and care-giving effects. Med Decis Making. 2011; 31:292–298. [PubMed: 20671212]

(20). Wittenberg E, Prosser LA. Disutility of illness for caregivers and families: a systematic review of the literature. Pharmacoeconomics. 2013; 31:489–500. [PubMed: 23572441]

Website References

(101). World Health Organizaton. The Global Burden of Disease – 2004 Update. http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/

(102). National Institute for Health and Care Excellence. Guide to the methods of technology appraisal. 2013. http://publications.nice.org.uk/pmg9