OBJECTIVES: Patients with type 2 diabetes are known to make increased use of health-care resources, but the impact of specific macro and microvascular complications on costs is unclear. Here we use regression based methods to estimate the immediate and long-term impact of six diabetes-related complications on hospital costs, using data from the UKPD, a large (n = 5102) and long-term (median duration 10.3 years) clinical trial.

METHODS: Data on the occurrence and precise timing of pre-defined diabetes-related complications, and on all hospitalisations with associated specialties, lengths of stay, and procedures, were collected routinely for all patients during the trial. Panel data regression analysis was used to estimate the immediate impact (i.e. in the year event occurred) and long-term impact (i.e. in each subsequent year) of the following six diabetes-related complications on hospital costs: fatal and non fatal myocardial infarction (n = 828); fatal and non-fatal stroke (n = 271); heart failure (n = 166); angina (n = 319); blindness in one eye (n = 166); amputation (n = 67). Hospital costs were calculated using national average specialty-specific costs per inpatient day, expressed in 1999 £s UK.

RESULTS: All six diabetes-related complications had a statistically significant impact on hospital costs. In the year in which the complication occurred, diabetes-related complications were associated with increased hospital costs ranging from £995 for loss of sight in one eye to £5478 for an amputation. In subsequent years the annual magnitude of this effect ranged from 13% to 33% of the costs in the initial year.

CONCLUSIONS: Regression analysis on a large and well-validated, patient-specific data set yields plausible empirically based estimates of the hospital cost consequences of diabetes-related complications. These will be of use to other economists and health service researchers, particularly those interested in assessing the costs of diabetes and the cost-effectiveness of interventions within a modeling framework.

END OF ABSTRACT

DB2

BOTTOM UP VERSUS TOP DOWN COST ESTIMATES FOR TYPE 2 DIABETES
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OBJECTIVES: To compare top down and bottom up cost estimates of direct health-care costs for diabetes type 2 in the Netherlands.

METHODS: For the top down cost estimates we used comprehensive Dutch national age and sex-specific cost of illness estimates for diabetes and diseases related to diabetes complications. Costs for diabetes type 2 were separated by age (age 35 and older) and by prevalence rates for types 1 and 2. The costs of complications were estimated using costs and prevalence rates for cardiovascular diseases, neuropathy, nephropathy and retinopathy, combined with relative risks for these complications in patients with diabetes type 2. The bottom up costs were estimated using a sample of 1371 type 2 diabetes patients for whom their GP reported the total medical consumption related to diabetes and its complications during the previous six months.

RESULTS: Total medical costs for diabetes type 2 in 1998 were Euro 567 mln according to the bottom up estimate versus Euro 519 mln for the top down estimate, or less than 10 % difference in cost. The costs for in hospital care, ambulatory care and equipment were very comparable. The cost of medication was higher according to the bottom up study. The bottom up study identified a larger amount of cardiovascular and lipid lowering drugs. Both costing methods show that complications, especially cardiovascular, are responsible for a substantial portion of total health-care costs.

CONCLUSIONS: For diabetes type 2 it was demonstrated that using comprehensive top down disease costs combined with sound epidemiological data on complications, can yield valid cost estimates that are quite comparable with bottom up cost estimates.

END OF ABSTRACT

DB3

A DYNAMIC, THREE-PART MODEL FOR PREDICTING HOSPITAL COSTS IN TYPE 2 DIABETIC PATIENTS
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OBJECTIVE: To develop a model for predicting hospital costs in patients with diabetes mellitus.

METHODS: We have previously shown that, in comparison with standard cost models, better prediction can be achieved with a two-part model that independently predicts risk of hospitalization and cost of hospitalization. In this analysis we have developed a three-part model by adding mortality to the original two-part model, because patients who die do not necessarily incur hospital costs in the year of death. Furthermore we have extended the three-part model to an autoregression model. Age, gender, any hospitalization in the last year, log-hospital costs in the last year and log-mean costs over all previous years were included in the model. A Bayesian forecasting method was used to obtain a predictive distribution of costs in the next year.

RESULTS: We identified 5672 type 2 diabetic patients in the Tayside area and analyzed annual hospital costs between 1988 and 1995. The fitted three-part model showed that increasing age was associated with increasing mortality and with increasing costs per hospital episode. However, age was not associated with the risk of hospitalization. Cost of hospitalization in previous years was positively associated with risk of hospitalization (OR = 1.51/ln(mean costs), CI = 1.48, 1.53) and mortality (OR = 1.22/ln(mean costs), CI = 1.19,1.25). An example of Bayesian cost forecasting showed that for female patients aged 50 to 59, increasing hospital costs in the previous year increased the probability of having a high-cost hos-
pital admission in the next year but paradoxically it also increased the probability of having zero hospital costs due to increased risk of death without hospitalization.

CONCLUSIONS: Costs incurred in previous years can be used to predict costs and outcomes in the future. This dynamic three-part model clarifies the relationship between risk of hospitalization, cost of hospitalization and mortality.

INFECTION DISEASE

ESTIMATING THE POTENTIAL HEALTH GAIN AND COST CONSEQUENCES OF INTRODUCING A PRE-SCHOOL DTPA PERTUSSIS BOOSTER INTO THE UK CHILD VACCINATION SCHEDULE

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OBJECTIVE: To establish the likely health and cost impacts of a pre-school booster vaccination for Bordetella pertussis, when added to existing UK primary vaccination schedules assuming that a diphtheria, tetanus, and acellular pertussis, (DTPa) booster would replace the current diphtheria and tetanus (DT) booster.

METHODS: A transition state model of pertussis infection in a closed population representative of England and Wales, comprised of eight age bands with susceptible, infected and immune population sub-groups. Herd-immunity was explicitly modeled. Epidemiological service use and cost data were sourced from routine statistics, published literature and, where necessary, clinical estimates. The number of pertussis cases, hospitalizations and deaths were forecast for a five-year period. Quality of life gains were not explicitly calculated.

RESULTS: Introducing a pre-school pertussis booster and achieving 84% coverage is predicted to cost an additional £14.32m over a five-year period, assuming £5 marginal cost between DTPa and DTP or £8.60m assuming a £3 marginal cost. Offset against this are the cost of reduced hospitalizations and GP consultations, which are expected to total between £4.21m and £4.60m. The return on this investment would be a reduction in up to 1700 hospitalizations, between 5000 and 27,000 pertussis cases depending on the level of under-reporting and one infant death.

CONCLUSIONS: The introduction of a pre-school booster is predicted to significantly reduce the number of hospitalizations and pertussis cases contracted. The estimated marginal cost of this strategy is £10m over a five-year period, assuming a £5 difference between DTP and DTPa or £4m, were the difference only £3.

THE ECONOMIC BURDEN OF VIRAL RESPIRATORY INFECTION IN THE UNITED STATES

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Viral respiratory infection (VRI) is the most commonly occurring illness in man, imposing considerable burden on patients and on society. However, to date, no formal study of the economic impact of VRI has been performed.

OBJECTIVES: To rigorously quantify the economic impact of viral respiratory disease (VRI) in the US in terms of health-care resource utilization (direct costs) and productivity losses (indirect costs).

METHODS: Publicly available databases including the US Census, National Health Interview Survey (NHIS), the Medical Expenditure Panel Survey (MEPS) and the National Ambulatory Medical Care Survey (NAMCS) were used. From these databases, projections regarding population characteristics, physician and emergency-room encounters, prescription and over-the-counter drug utilization, and productivity losses related to VRI were made. Data obtained from primary epidemiological research and prospective randomized clinical trials were used to estimate the incidence of VRI in the general population and the rate of secondary clinical complications associated with VRI.

RESULTS: Nearly 500 million episodes of VRI occur annually in the US alone. Direct costs associated with VRI are estimated to be $16.8 billion annually and are broken down as follows: physician visits, $6 billion; complications, $3.8 billion; prescription and over-the-counter medications, $4.8 billion. Indirect costs for employed individuals approximate $7.6 billion per year. Physician encounters via a telephone and the internet, productivity losses incurred by caregivers (i.e. parent) of VRI-infected individuals, and costs associated with diminished productivity while at work or home were not included, suggesting that this projection of total VRI costs—$25 billion annually in the US alone—is very likely an under-estimate.

CONCLUSIONS: Viral respiratory infections impose a significant clinical and economic burden to society, approaching or surpassing the aggregate costs of many common chronic diseases. The resultant clinical and cost ramifications attributable to this common acute condition warrants increased attention from health-care providers and policy makers.

THE OBSERVED COSTS AND HEALTH-CARE USE OF CHILDREN IN A RANDOMIZED CONTROLLED TRIAL OF PNEUMOCOCCAL CONJUGATE VACCINE

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OBJECTIVE: Pneumococcal conjugate vaccine for infants has recently been found effective against meningitis,