# Performance of the mental health system in Europe - models of mental health care financing

**PAUNA Carmen Beatrice[1], BALAN Mariana[2]**
*[1,2] Institute for Economic Forecasting-NIER, Romanian Academy, Bucharest*

***Abstract.***

*The overarching aim of our paper is to look at the different models of health care financing, their mental health care services in nine European countries..*

*Based on a special methodology it can be concluded that no major differences were found in any of the countries in the way in which mental health is funded compared with the health system in general.*

*There are presented also some mathematic models used to study the durations of treatments, the improvement in the patient's condition, the use of medications, and the performance of the health services in general and of mental health in special.*

***Keywords:*** *mental health system, models of health care financing, health care services mapping, performance*

***JEL classification:*** *C21, C23, C32, I15, I18, E01*

## 1. Introduction

Based on a wide and long European experience there is a tide relationship between different models of health care financing and high quality, equity, efficiency and better long term health outcomes. To distinguish at least some of them it is necessary to do mapping services **for mental health care** in the studied countries, in our case in nine European countries: Austria, Marea Britanie, Estonia, Finalnda, Franta, Italia, Norvegia, Romania, Spania (as part of the EU funded REFINEMENT project).

[1] *CS I, Ph.D., Institute for Economic Forecasting-NIER, Romanian Academy, Bucharest, Romania, e-mail: carmenbpauna@gmail.com*

[2] *Professor, Ph.D., Institute for Economic Forecasting-NIER, Romanian Academy, Bucharest, Romania, e-mail: dr.mariana.balan@gmail.com*

There actually have been attempts to standardize the description of services (De Jong, 2000; De Jong et al., 1995) to aid these comparisons. For example, the European Psychiatric Care Assessment Team (EPCAT) developed **the European Service Mapping Schedule (ESMS)** to describe Mental Health services for the population of a catchment area provided by public sector health and social service agencies, voluntary sector and private sector providers (Johnson et al., 2000).

This instrument classifies provision in a "service mapping tree" on the basis of operationalised definitions of Mental Health services and it also documents the associated levels of services provision in order to compare services in catchment areas across different countries (Becker et al., 2002).

A further development of this approach has been the creation of a new instrument called '**Description and Evaluation of Services and Directories in Europe' (DESDE)** which also includes long term care and disability services and which is now used in sixteen European countries (Salvador-Carulla et al., 2006). What has been missing from these service mapping instruments to date – including the **WHO's Assessment Instrument for Mental Health Services (WHO-AIMS)** (WHO, 2005) - has been a common comparison of primary care, general health and social care services that may be used to support people with Mental Health needs. The majority of people with common Mental Health problems such as depression in a number of countries are treated almost exclusively by general practitioners whilst social care services can have an critical role to play in providing a route back to employment and/or providing support to allow independent living. For such a reason, the REFINEMENT project has developed its own tool **The Refinement Mapping Services Toolkit (REMAST)**, which is one of the three legacy products of the Refinement project intended to be used also by other countries and regions seeking to undertake analysis of their mental health systems, and also for future adaptation for the analysis of the relationship between financing systems and health care outcomes.

## 2. Some elements of REFINEMENT project

Finally, the REFINEMENT project refers directly to health geography as an important factor that influences overall population health since it devotes considerable attention to the spatial distribution of health facilities (Guagliardo, 2004). The question of spatial organization and distribution of health care facilities is one element of the spatial equity of public services where equity is

the absence of differences across socially, economically, demographically or geographically defined population groups (Macinko and Starfield, 2002).

No major differences were found in any of the countries in the way in which mental health is funded compared with the health system in general, although these systems vary considerably; central government revenues account for 80% plus of funding for health care in England, Italy, Norway and Spain; local government revenue covers 68% of fund in Spain; predominantly single fund social health insurance accounting for 70% plus of funding in Estonia, France and Romania, with more mixed funding systems seen in Austria and Finland. While there are few differences in the way that mental health and somatic health are treated in primary care in each country, more marked differences are seen for that receiving inpatient care.

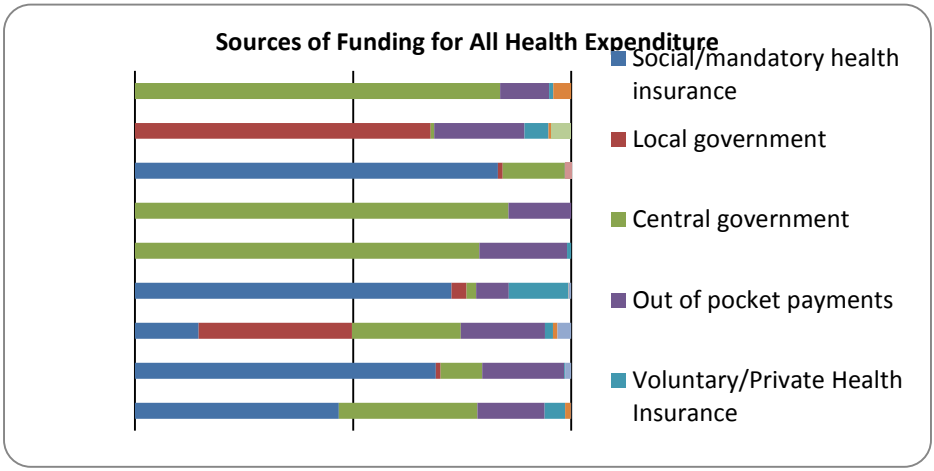
There are more methods to identify the health care funding systems. The most recent source for such methods can be found in the REFINEMENT project, in which a bespoke questionnaire was developed to ask questions about various aspects of the funding and organisation of health and social welfare systems in the nine countries. Responses to these questions were coupled with further literature analysis and investigation undertaken centrally for each of the nine countries, making use of a wide range of materials from international organisations such as the OECD, WHO European Observatory on Health Systems and Policies, Commonwealth Fund, Health Policy Monitor, World Bank, International Monetary Fund, as well as previous European funded projects including Euro-DRG. A separate search of relative country specific literature was also conducted. Questionnaires were undertaken during summer 2012.

According to this methodology developed in the REFINEMENT project, there have been obtained the following results:

- **Sources of funding for overall health care expenditure**

Figure 1 shows how all sources of funding for health expenditure in the 9 countries. There is a marked difference between a cluster of countries that are dominated by tax and a minority of countries where social health insurance plays a more substantial role. Central government revenue's dominate revenue sources in England (funds collected at UK level), Norway and Italy. In Spain the principal source of funding is revenue collected from each of the 17 autonomous communities that make up the country, with some redistribution of monies at central government level.

**Figure 1**




Source: calculations of the authors in the project REFINEMENT

The majority of funds for health in Finland are from governmental sources, being a mixture of central and local government revenue. Romania, France and Estonia rely on social health insurance funds, although in all three countries there is either one health insurance fund in place (or no competition between insurance funds in the case of France where the largest fund covers 87% of the population) collecting earmarked revenues largely from earned income. Austria is the only one of the nine countries where there are differentials between the multiple sickness funds that are in place. Private/voluntary health insurance accounts for less than 2% of total healthcare expenditure in all countries, with the exceptions of Austria, Spain and France. In Spain this is largely a specific fund for civil servants, while in France the main purpose of the fund is to provide insurance against out of pocket payments rather than to fund alternative services. In the UK non for profit charitable organisations provide funding for around 5% of all health care expenditure while Romania is the only country that receives any substantive sums of external aid for health care.

There is also much variation in the role of out of pocket payments; they account for between 10% and 20% of expenditure in seven of the countries,

with lower rates seen in France, in part due to the availability of insurance against co-payments, and in Romania.

- **Primary care in health and mental health**

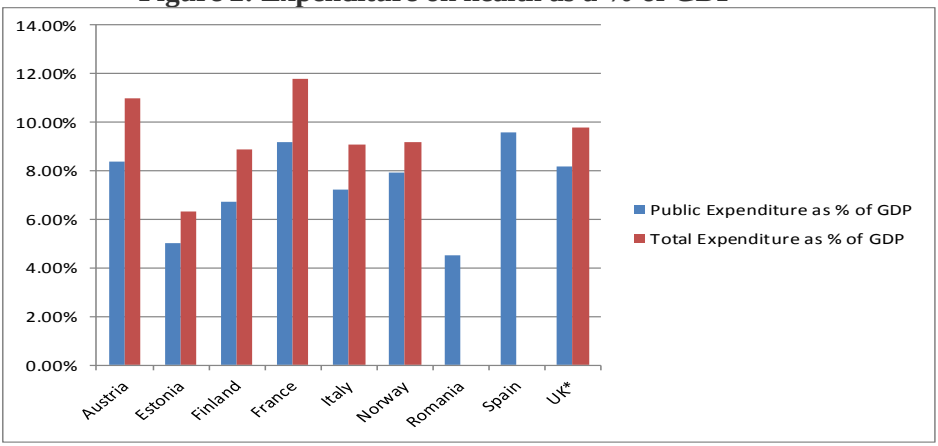
Primary health care should play a critical role in supporting people with mental health needs, particularly for those with mood disorders whose care in some systems may be entirely managed within primary care where appropriate, as for instance is indicated in guidelines from the National Institute of Health and Clinical Excellence in England. Our focus here was on general practitioners rather than other individuals, such as nurses, working in primary care.

Mental health services in many countries are currently subjected to change and are being reviewed and redesigned. These changes reflect, in part, the growing evidence of what constitutes cost-effective care, and also an acknowledgement of the failures of the system of care that was based on old-fashioned and remote institutions. Asylums do not offer the quality of care that is expected today, both by patients and their families. There is also an increasing worldwide focus on chronically disabling conditions, including mental disorders, rather than infectious and communicable diseases. This is reflected in the attention given not only to mortality but also to a wider concept of morbidity that goes beyond symptoms to attach importance to disability, quality of life and the impact of responsibilities on care givers (Thornicroft and Tansella, 2003).

The philosophy of psychiatric reforms in European countries has implicitly or explicitly been based upon some key principles of community psychiatry and incorporated actions along the following axes: i) the deinstitutionalization process and closure of old mental hospitals; ii) the development of alternative community services and programmes; iii) integration with other health services; and iv) integration with social and community services (Becker and Vasquez-Barquero, 2001). Wide differences are present within the member states of the European Union (EU), with different levels of implementation of the principles of community psychiatry.

Policies and general descriptions of the health and social services that provide care to mentally ill in the 9 Refinement countries have been described separately in details. Then, a comparison of the more relevant differences between countries has been prepared and available data for each country are summarized according the following figure:

**Figure 2: Expenditure on health as a % of GDP**




Source: calculations of the authors in the project REFINEMENT

In term of funding models and interfaces with social care services, there is a representative range of health care systems across Europe; these systems are at very different stages in the development of mental health care, ranging from heavily hospital reliant systems in Romania through different balances between community and institutional care found in countries including Austria, the UK and Norway to the highly community centered system seen in Italy.

## 3. Some models of mental health care financing

Financial models in the health sector are, in turn, a subgroup of the overall set of financial models. They provide a mapping of the complex interactions between financiers (contributors and taxpayers), third-party financial intermediaries (insurance schemes or the State), providers, and beneficiaries (patients) in the health sector.

Generally, health care schemes are often referred to as health care financing schemes. These schemes have a certain financial structure, which is the consequence of the interactions between care providers, patients, financiers, and other agents that define processes and set standards in the health care market (e.g. the State).

A financial model describes the financial structure of the system or subsystem and projects this structure into the future, or simulates the effect of a change in a selected parameter or parameters. A financial model for the health sector could be used, for example, to estimate the total amount of expenditure

for a component of the system, such as for mental health system, but to estimate the effects of the financing systems on the quality of menthal health care.

**3.1. Relevant Literature**

The health economics literature presents several theoretical models to analyze prevention and the effects of financing about health system.

The human capital approach emphasizes the similarity between the decision to invest in health capital and in other forms of human capital.

Some models used in the literature on mental health contain multi-equation and use disaggregated data that describe individual patients and those who care for them. These models permit the study of the durations of treatment found in actual episodes of clinical care and takes into account the concurrent improvement in the patient's condition, the use of medications, and the reasons for termination of care. In the model are considered three major groups of mental health specialists: psychiatrists, psychologists, and social workers.

The developed models were analyzed various aspects of the health system, in general, and of menthal health in particular. Thus, the influence of single variables on duration of treatment were analyzed by Pope et al., Balch et al.. Carpenter and Range considered the effect of patient fees, while May studied the role of the patient's sex. Sue et al. and Silverman and Beech included treatment termination and other variables in their analysis of duration of treatment.

Modelling the data provided by surveys conducted on a representative sample of psychiatrists allowed the separation McGuire's conclusion that the demand for psychiatric services was about twice as elastic as the demand for general medical services.

In another recent study, the authors (W. G. Manning, C. N. Morris et al.) analyzed the relationship between the decisions to seek treatment and its cost.

But, all of these studies have their limitations. The most serious are the problems attributable to shortcomings in available data resources and to econometric problems caused by missing explanatory variables or truncated dependent variables.

**3.2 The econometric model**

The econometric models elaborated by de Cross J.G., Knesper D.J. and Paul De Rooij J., has, as variables the number of hours of mental health care, the concurrent improvement in the patient's condition, the probability the patient will receive medications, and the reasons for treatment termination. The model permits the estimation of the average length of treatment, the average price and income elasticities, and the average cost of treatment.

Data used by the authors to describe the interdependences between practices of mental health specialists and the treatment, and costs come from the Mental Health Service Providers Survey (USA) and surveys.

The variables used in the model are presented in the Table 1

**Tabel 1: Variable list**

| ***Variable name*** | ***Description*** |
|---|---|
| **Endogenous variables:** | |
| LOT | Estimate of the length of an episode of care measured as the total number of hours of treatment with the same provider for a mental condition |
| IMPROV | Change in the severity of the mental condition until termination of treatment. |
| DRUG | Dummy variable indicating the use of drugs in treatment. |
| TERM | Dummy variable indicating the reason for termination of treatment. 1 = the patient terminated treatment after obtaining some or maximum treatment benefits. 0 = all other reasons |
| **Exogenous variables** | |
| TOT # PAT | Total number of patients with either physical or mental conditions seen by the provider over the past 60 days |
| PRIOFF | Dummy variable indicating that a private office is the principal work setting of the respondent provider |
| PUBLIC | Dummy variable indicating that either a CMHC or a public hospital is the principal work setting of the respondent provider |
| FEE%INC | Percentage of the providers' income from their practice emanating from fees |

| | |
|---|---|
| PATAGE | Age of the patient (PATAGE > 18 for all cases) |
| PATSEX | Sex of the patient (1 = female) |
| PATINCOM | Estimate of the patient's income as reported by the respondent provider |
| PATIMP% | Percentage of the treatment performed in an inpatient setting |
| ISEV | Patient's initial severity rating as perceived by the provider (100=superior functioning. 1= unable to function) |
| AVMINVIS | Average number of minutes per visit to the provider |
| NFEE | Net fee per 60 mitt of treatment. The portion of the fee actually paid by the patient NFEE = FEEHRS |
| FEE%PATY | Net fee per $100 of patient income. FEE%PATY = NFEE*l00/PATINCOM |
| INSUR% | The patient's average insurance coverage (in percent) |
| TOT%NEU | Percentage of all mental patients seen by the provider over the past 60 days with the same disorder as the observational unit |
| PROEXPER | Provider's experience, number of years since graduation from medical school or professional program |
| PRO%PSYCH | Average level of psychoanalytic influence in the treatment of mental disorders; 0 to 100% |
| PROSEX | Provider's sex (1 = male) |

Source: An Econometric Model of an Episode of Mental Health Care for Patients with Mild Conditions: Implications for Caregiver Substitution, Cross J.G., Knesper D.J. and Paul De Rooij, Socio-Econ. Plann. Sci. Vol. 24. No. 3. pp. 173-185. 1990

and the equations of models are:

$$\ln(LOT) = \alpha_1 + \alpha_2 IMPROV + \alpha_3 TERM + \alpha_4 PATINCOM + \alpha_5 PATINP\% + \alpha_6 NFEE + \alpha_7 TOT\#PAT + \alpha_8 PRIOFF + \alpha_9 PUBLIC + \alpha_{10} FEE\%INC + \alpha_{11} PROSEX + \alpha_{12} PRO\%PSYCH + u_1 \quad (1)$$

$$IMPROV = \beta_1 + \beta_2 LOT + \beta_3 LOT^2 + \beta_4 DRUG + \beta_5 DRIUG \cdot ISEV + \beta_6 PATAGE + \beta_7 PATINP\% + \beta_8 PROEXPER + \beta_9 TOT\%NEU + \beta_{10} ISEV + u_2 \quad (2)$$

$$\ln(D) = \gamma_1 + \gamma_2 PATAGE + \gamma_3 PATAGET^2 + \gamma_4 TOT\#PAT + \gamma_5 PUBLIC + \gamma_6 PRO\%PSYCH + \gamma_7 (E(IMPROV / DRUG = 1) - E(IMPROV / DRUG = 0)) + u_3 \quad (3)$$

$$\ln(T) = \delta_1 + \delta_2 IDRUG + \delta_3 PATSEX + \delta_4 FEE\%PATY + \delta_5 AVMINVIS + \delta_6 PRIOFF + \delta_7 PRIOFF \cdot ISEV + u_4 \quad (4)$$

where $D = P(DRUG = 1) / P(DRUG = 0)$

$T = P(TERM = 1) / DRUG) / P(TERM = 0 / DRUG)$

### 3.3. The Fixed-Effects Zero-Inflated Poisson Model

Count data models have become increasingly popular in many fields of empirical economics and other social sciences (Cameron and Trivedi (1998), Wooldridge (2002,), Winkelmann (2003), or Cameron and Trivedi (2005)). Applications include studies in health economics (on the number of doctor visits or hospital stays).

- ***Panel Data Models for Count Data***

A frequently applied model for the distribution of the count observations $Y_{it}$ in panel data is the Poisson (P) regression model. It assumes that the conditional distribution of $Y_{it}$ for individual (or cross-section unit) i in time period t, given (strictly exogenous) regressors $X_{it}$ and an individual $\alpha_i$, is a Poisson distribution with parameter $\mu_{it}$:

$$P_0(y; \mu_{it}) = \exp(-\mu_{it})\mu_{it}^y / (y)! \qquad for \quad y = 0, 1, 2, ... \quad (5)$$

where $\mu_{it} = \exp(x_{it}^{'}\beta + \alpha_i)$

$\beta$ is a vector of unknown parameters to be estimated.

$\alpha_i$ it is assumed that unknown parameters and are independent of all $X_{it}$ and follow a specific distribution (usually, a Gamma distribution)

The Poisson model has the properties:

$$E(Y_{iy} | X_{it}, \alpha_i) = Var(Y_{iy} | X_{it}, \alpha_i) = \mu_{it} \quad (6)$$

It therefore assumes that data are “equidispersed": the conditional variance is equal to the conditional mean.

The most common model allowing for over dispersion is the negative binomial model (NB). The NB model accounts for over dispersion through an additional parameter $\theta$ :

$$\Pr\left(\mu_{it}=y|\mu_{it},\theta\right)=\frac{\Gamma\left(y+\theta^{-1}\right)}{y!\cdot\Gamma\left(\theta^{-1}\right)}\left(\frac{\theta^{-1}}{\theta^{-1}+\mu_{it}}\right)^{\theta^{-1}}\left(\frac{\mu_{it}}{\theta^{-1}+\mu_{it}}\right)^{y};\quad for\quad y=0,1,2,... \quad (7)$$

- ***Zero-inflated Poisson Model***

Sometime, the data are characterized by a larger frequency of extra zeros than a Poisson regression model or a negative binomial model predicts, and that whether or not the outcome is zero is driven by different factors than the mean of the positive outcomes. In this case, the popular approach to account for these features of the data is the zero inflated Poisson regression model (ZIP; Lambert 1992).

For a Poisson distribution with parameter , this gives the following probability function:

$$f\left(y;\,\tilde{p};\,\mu\right)=\begin{cases}\left(1-\tilde{p}\right)+\tilde{p}\cdot P_0\left(0;\mu\right) & if\quad y=0\\ \tilde{p}\cdot P_0\left(0;\mu\right) & if\quad y>0\end{cases} \quad (8)$$

But, the ZIP distribution written in this way is two types of zeros: the extra zeros, and the zeros from the Poisson model. In this case, the problem can be avoided by writing the ZIP distribution in an alternative way: as a mixture of a truncated Poisson distribution and a degenerate distribution with all its mass at zero, with weights $p=\tilde{p}\left[1-P_0\left(0;\mu\right)\right]$ and $1-p$ :

$$f\left(y;\,p;\,\mu\right)=\begin{cases}\left(1-p\right) & if\quad y=0\\ p\cdot P_0\left(p;\mu\right)/\left(1-P_0\left(0;\mu\right)\right) & if\quad y>0\end{cases} \quad (9)$$

To obtain the (static) zero inflated panel data model, it is necessary to specific $p$ and $\left(\mu\right)$ for each observation (i; t) as follows:

$$\begin{cases}p_{it}=\dfrac{\exp(X_{it}^{'}\cdot\beta^{p}+\alpha_i^{p})}{1+\exp(X_{it}^{'}\cdot\beta^{p}+\alpha_i^{p})}\\ \mu_{it}=\exp(X_{it}^{'}\cdot\beta^{\mu}+\alpha_i^{\mu})\end{cases} \quad (10)$$

### 3.3. Model to determine the projected costs for health care and long-term care in OECD countries

In his book "Panel date methods and applications to health economics", Andrew M. Jones (2009) shows that individual-level data for medical expenses and the cost of treatment are usually characterized by an abrupt increase to the zero value if non-users exist and a strong asymmetrical distribution with a thick "tail". Such data are often used in two applied fields: risk adjustment and cost-effectiveness analysis.

In the first case, the emphasis is on predicting treatment costs for certain types of patients often based on very large datasets. Cost-effectiveness analyses use smaller data sets and the purposes of parametric modeling may be more limited.

The issue of a database with a high percentage of zeros is usually solved by using a model in two parts: one includes a binary indicator used to model the probability of any costs and the other is a conditional regression model for positive costs.

Due to a high degree of asymmetry, the least squares method applied to costs (y) can lead to poor results and often positive observations suffer changes before estimation. The most common transformation is the logarithm of y, although sometimes the square root is also used.

Since political interests usually focus on cost predictions on the original scale, it is necessary to transform back the regression results, which can be a problem if there is heteroscedasticity in the transformed data.

Lately, experts considered other estimators. Thus, Basu et al. (2005) compare logarithmic transformation models with with Cox's proportional hazard model.

Gilleskie and Mroz (2004) propose a flexible approach in which the data is divided into discrete intervals and discrete hazard models as sequential logit models are applied.

Generalized linear models specify a connect function for the relationship between condition mean, $\mu = E(y|x)$ and a linear function for the covariance and specify the conditional variance form $V(y|x)$ , assuming it can be specified as a simple function for the mean.

The most common specification for costs generalized linear models is log-link with gamma error. Basu and Rathouz (2005), as a response to the problem of selecting the appropriate link and variance functions, have suggested a flexible semiparametric extension of the GML model by incorporating a Box-Cox transformation in the link function which includes log-link as a special case with other exponential functions of y. The model, called extended estimation equations (EEE), allows for flexible specifications of variance using exponential and quadratic variance families for common distributions such as Poisson, gamma, inverse Gaussian and negative binomial.

*

* *

Our paper will be continued with the intention to identify innovative financial and non-financial incentives that influence the performance of the mental health system.

**4. Conclusions**

The overarching aim of our paper is to look at the different models of health care financing, their mental health care services in nine European countries: Austria, Marea Britanie, Estonia, Finlanda, Franta, Italia, Norvegia, Romania, Spania, takig into account their influence on the of high quality, equity, efficiency and better long term health outcomes.

Based on a special methodology it can be concluded that no major differences were found in any of the countries in the way in which mental health is funded compared with the health system in general, although these systems vary considerably.

Of fundamental concern to any economic analysis of mental health services is the cost-effectiveness of service providers. Issues of this sort have been difficult to address, however, because of the lack of adequate comparative data describing both providers and their patients.

The models presented in this paper can be adapted to the specific conditions of the mental health system in Romania, which is subject to the next stages of the project activities REFINEMENT.

**5. References**

- Amaddeo F., Barbui C., and Tansella M. (2012). State of psychiatry in Italy 35 years after psychiatric reform. A critical appraisal of national and local data. International Review of Psychiatry, in press.
- Balch P, Ireland J. F. and Lewis S. B. (1977) Fees and therapy: relation of source of payment to course of therapy at CMHC. J. consult. Clin. Psychol. 45(3), 504.
- Barzon G., De Gobbi G., Luciano F., Martinello E., Panizzolo L., and Thorogood L. (2010). Italy (Veneto Region): integration of social and health services for immigrants – the case of Padua. Poverty and social exclusion in the WHO European Region: health systems respond. Copenhagen, WHO Regional Office for Europe.
- Basu a. and Rathouz P.J (2005) Estimating marginal and incremental effects on health outcomes using flexible link and variance function models, Biostatistics, 6, 1, pp. 93–109
- Cameron C., and Trivedi P.K. (1998), Regression analysis of count data, Econometric Society Monographs, Cambridge University Press, Cambridge, UK.