Trends and transitions in fifteen years of psychiatric care utilization. A case register study

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Summary

This thesis describes the utilization of mental health care in the town of Assen between 1976 and 1990. Besides, it discusses some statistical methods which can be used for the analysis of case register data.

Chapter two is about developments which took place in the Netherlands and in Dutch mental health care during the study period (1976-1990).

The population of the Netherlands grew from 13.8 to 15.0 millions, with a proportional increase of the ageing population. The economic situation in the Netherlands was reasonably good, but not everyone participated in the favourable circumstances. A declining rate of employment reduced the basis of social security. In addition to a growing number of job-seekers, an increasing proportion of the population was declared disabled, with a disproportionate increase of the diagnosis of 'mental disorder'. Many of the employed population had to deal with greater pressure of work. The number of criminal offences doubled, resulting in a growing sense of insecurity among the population.

With regard to developments in mental health care the period from 1976 to 1990 was characterized by a large amount of acts, bills, memos, and policy plans. A recurring issue was deinstitutionalization, i.e., reducing the number of beds in mental hospitals and replacing them by day-and outpatient care. Despite all policy documents, however, no radical reforms took place in the Dutch mental health care system. Psychiatric hospitals maintained their position, and prevented far-reaching deinstitutionalization. Still there were changes in this period, but they were gradual rather than radical. Some long-stay patients were accommodated in more appropriate facilities such as psychogeriatric nursing homes or sheltered residences. Besides, the number of places for partial hospitalization were extended substantially, although the relative share of semimural care is still small compared to other mental health care sectors. Extramural services combined forces in regional institutes for ambulatory mental health (RIAGGs) in 1982 and grew

considerably in subsequent years. The total number of people employed in mental health care increased by some 25%.

The data analysed were gathered by the Groningen psychiatric case register. This register is described in *chapter three.* Psychiatric case registers collect information about all contacts of inhabitants of a geographically defined area with intramural, semimural, and extramural services. The information is linked per patient. The Groningen case register has existed since 1974. The town of Assen was chosen as register area, because of the stability of the Assen population. Assen has wide range of mental health care services. Besides the date of the contact, the Groningen register collects the name of the service, name and discipline of the mental health worker, and a number of patient characteristics (diagnosis, gender, age, marital status, living condition, and general practitioner).

Chapters four, five, and six concern time trends in the utilization of psychiatric services. *Chapter four* discusses some epidemiological frequency measures, and two methods for the analysis of time series.

Disease frequency is usually described by means of the measures incidence and prevalence. Incidence refers to new cases, and prevalence to existing cases. Different populations may be compared by means of standardized measures, which are adjusted for differences in the age and/or gender distribution.

An often-used model for the analysis of time series is the so-called ARIMA (AutoRegressive Integrated Moving Average) model. An ARIMA model rests on the assumption that time series are determined by a series of 'random shocks', which can be composed of thousands of variables. ARIMA models comprise (maximally) three different submodels. In an autoregressive model the expected value at any moment depends on the values at previous points in time. Integrated models concern time series with a trend or 'drift'. Moving average models assume that random shocks affect a limited number of observations, and have no effect after that. ARIMA models can incorporate seasonal effects (i.e., annually recurring fluctuations). An alternative approach is regression analysis. In general, regression models are simpler to apply and to

interpret than ARIMA models. Seasonal effects can be estimated by using a separate (dummy) variable for every month.

The main difference between ARIMA and regression models is that the latter are deterministic (that is, can be predicted without using observed values), while ARIMA models are stochastic: the future is partly determined by past values. Consequently, ARIMA models need more (at least 50) observations. The best model choice depends upon the question and the nature of the data.

Both the ARIMA and the regression model were used for the analysis of the monthly number of people (per 100,000 population) visiting a mental health care service for the first time. The results are presented in *chapter five*.

In the best fitting ARIMA model, the number of first contacts depended on the number of first contacts in the previous month, the number of first contacts in the same and previous month one year earlier, and on random shocks in the present and previous month. The regression model estimated an increase of approximately 0.2 first contacts (per 100,000 population) per month. There were significant monthly differences, with relatively many contacts in November, January, and February, and few in July, August, and December.

It is evident that the two models yield results which are hardly comparable, so one cannot tell right away which model is better. The ARIMA model was superior in forecasting a period of one year, while the regression model predicted a period of two years more accurately, and explained more variance in the observed values. A drawback of seasonal ARIMA models is that they are conceptually weak; the fact that the value at a given moment is determined by observations made a year before but not by observations in between does not fit well in a stochastic model.

Seasonal influences in mental health care utilization may be due to variations in the psychiatric morbidity of the population, but also to fluctuations in the supply of care (holiday effects). The degree of seasonal variation varied per diagnosis, and was significant for dependencies, neuroses, personality disorders, and 'other diagnoses' (for instance, eating disorders). The number of first contacts for schizophrenia, affective psychoses, organic

syndromes, and 'no psychiatric diagnosis' showed no significant seasonal fluctuation.

Chapter six describes trends in annual incidence and prevalence rates. I expected that the demand for care had grown by the proportional increase of the ageing population, the - at least for part of the population - diminished social circumstances, and possibly by altered illness behaviour as well. The pursuit of deinstitutionalization led me to expect that part of the intramural care was replaced by semi- and extramural care, namely for patients with relatively mild psychopathology. Because of the increased life expectancy I did not expect a decrease of intramural care utilization by the elderly.

As expected, the utilization of mental health care services rose during the study period: a growing number of people utilized a growing amount of mental health care. In the population under 75 the increase was primarily due to a rising use of day- and outpatient services. The use of outpatient care did not rise in the population of 75 years or more. The inpatient care utilization, however, grew considerably: the year prevalence almost doubled in this age group. The elderly made up a large part of intramural patient population: about one in every three patients was over 75 years old. The expectation that the use of intramural services would decrease among patients with relatively mild psychopathology was not sustained by the results undoubtedly. Perhaps the diagnostic classification used is not a proper way to distinguish between mild and severe psychopathology.

The next part of the book, consisting of chapters seven, eight, and nine, concerns episodes of care: how can we model their duration, and which patients have the longest care episodes? *Chapter seven* describes the criteria used to define the episodes of care, and discusses some methods for the analysis of their duration. A collective term for these methods is 'event history analysis'.

Data about the duration of episodes may be censored. In that case, we do not know the exact duration of the episode, for instance because it is not finished yet at the end of the study period. Another distinctive feature of duration data is that the value of predictive variables may change in time (time-dependent

covariates). Event history models can deal with both censored observations and time-dependent covariates.

Two important functions in event history models are the survivor function and the transition rate. The survivor function indicates how many patients are still in care at any point in time (counted from the start of the episode). The transition rate can roughly be described as the ending probability of the episode, giving that it has not ended yet. The survivor function can be derived from the transition rate and vice versa.

A good way to explore the properties of the data is to estimate the survivor function and represent it graphically in a so-called Kaplan-Meier curve. This curve shows, at a single glance, how many patients are still in care at each point in time from the start of the episode. However, Kaplan-Meier curves are not particularly functional for the estimation of the effect of multiple predictive variables. In that case, one may apply parametric transition rate models, which assume a specific time dependence of the transition rate. Chapter seven describes the (piecewise) exponential model, the Weibull model, the Gompertz-Makeham model, the log-logistic model, and the log-normal model. The choice for the best model is guided by theoretical consideration and the goodness-of-fit of the model.

A complicating factor with parametric transition rate models is unobserved heterogeneity: differences between patients which are not captured in the predictive variables. In case of unobserved heterogeneity the models may be statistically correct, but they cannot be generalized to populations with another distribution of factors affecting the transition rate.

Chapter eight concerns the duration of first admissions, investigated by means of a parametric transition rate model. Patients with an organic syndrome were excluded from the analysis. It is plausible that the transition rate of first admissions (i.e., the probability of discharge) first rises to a certain maximum and falls gradually after that. Of all models eligible to estimate such time dependence of the transition rate, the log-logistic model appeared to be the best choice.

Year of admission, diagnosis, gender, age, and living conditions were included in this log-logistic model as predictive

variables. The discharge probability for dependency patients reached a relatively high maximum soon after admission. The pattern for patients with a neurosis or personality disorder strongly resembled the pattern of patients with a functional psychosis, but the maximum probability of discharge (the peak) occurred sooner after admission. Females were less likely to be discharged than males, with a peak later in time. The probability of discharge was comparatively low for patients under 19 and patients over 75. People living together were discharged sooner than people living alone or in a special environment such as a home for the elderly. The time at which the probability of discharge reached its maximum varied between 4 and 50 days after admission. In general, the duration of first admissions increased during the study period.

The analyses described in *chapter nine* were not restricted to first admissions, but included second and third episodes as well. In addition to intramural episodes, I also investigated the duration of semi- and extramural care (merged into one category), and the time between two episodes of care. About 16% the all episodes of care were intramural. Whereas three-quarters of the patients had two episodes of care at the most, a small group of patients went through a great number of episodes. The higher the previous number of episodes, the higher the probability of a next episode of care.

The episodes were analysed with the piecewise exponential model. In this model, the transition rate is assumed to be constant during a specified period, but may vary between periods.

Old (75 or more) patients, young (below 20) patients, patients with an organic syndrome, and patients living alone had the longest intramural episodes. Semi- and extramural episodes lasted relatively long for people with a functional psychosis. As opposed to intramural episodes, old people and people with an organic syndrome had comparatively short episodes of outpatient care. Outpatient episodes were also short for people with a dependency problem. The time between episodes of care was longest for persons with relatively mild psychopathology (neuroses, personality disorders, psychosocial problems). Persons living alone utilized more (longer episodes) and more often (shorter periods between care) psychiatric care than persons living together. Living together

seemed to prevent relapses in males, but not in females. Not surprisingly, people with a history of inpatient care were much more likely to be readmitted into hospital than patients without previous inpatient care. In general the duration of second and third episodes of care was equal to or slightly shorter than the duration of first episodes. During the study period, episodes of care became longer and the time between two care episodes became shorter.

Chapter ten contains a review of the main results and some comments on the study described in this thesis.

Psychiatric case register data have many strong features: they are based on a known population, they are patient-related, they are no (extra) burden on patient or family, they are not sensitive to response sets, and they are cheap. Research on disorders with a low incidence or outcomes demanding a long follow-up period is often not feasible without case registers. On the other hand, utilization of care may not overlap completely with the true morbidity, and inhabitants of Assen do not form a random sample of the Dutch (or world) population, implying that generalization of the results to other populations largely rests on assumptions. This is also true for generalization to other periods than the study period.

Assen is a small register area, which has affected the accuracy and reliability of the models. At present, the register area covers the whole province of Drenthe, allowing more reliable, more accurate, and hence more practically applicable models and predictions.

Psychiatric case registers are descriptive instruments and virtually unsurpassed as such. They are highly valuable for comparative and evaluative studies. However, the information of case registers is not particularly appropriate for causal deduction or normative statements.

Mental health care is in a state of flux, blurring the boundaries between different kinds of care. The classification used in this thesis will probably not be adequate to describe the care provided in the future. A possible alternative is De Jong's module classification system, in which the content of care, rather than the kind of care, is rated on a number of dimensions.

Epidemiological duration data are often analysed by means of the semi-parametric Cox regression model. Provided the model

fits the data well, a parametric model is preferable, because it does not only render information about the influence of predictive variables, but also about the absolute ending probability (for every point in time) of the episode.

Statistical models have often been criticized in medical sciences, and sometimes even been judged superfluous. In my opinion, however, they are highly serviceable in the case of multiple predictive variables, serial correlation, and/or censured observations.