



## Productivity growth in outpatient child and adolescent mental health services: The impact of case-mix adjustment

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### ABSTRACT

The performance of health service providers may be monitored by measuring productivity. However, the policy value of such measures may depend crucially on the accuracy of input and output measures. In particular, an important question is how to adjust adequately for case-mix in the production of health care. In this study, we assess productivity growth in Norwegian outpatient child and adolescent mental health service units (CAMHS) over a period characterized by governmental utilization of simple productivity indices, a substantial increase in capacity and a concurrent change in case-mix. We analyze the sensitivity of the productivity growth estimates using different specifications of output to adjust for case-mix differences. Case-mix adjustment is achieved by distributing patients into eight groups depending on reason for referral, age and gender, as well as correcting for the number of consultations. We utilize the nonparametric Data Envelopment Analysis (DEA) method to implicitly calculate weights that maximize each unit's efficiency. Malmquist indices of technical productivity growth are estimated and bootstrap procedures are performed to calculate confidence intervals and to test alternative specifications of outputs. The dataset consist of an unbalanced panel of 48–60 CAMHS in the period 1998–2006. The mean productivity growth estimate from a simple unadjusted patient model (one single output) is 35%; adjusting for case-mix (eight outputs) reduces the growth estimate to 15%. Adding consultations increases the estimate to 28%. The latter reflects an increase in number of consultations per patient. We find that the governmental productivity indices strongly tend to overestimate productivity growth. Case-mix adjustment is of major importance and governmental utilization of performance indicators necessitates careful considerations of output specifications.

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### Introduction

The task of correctly specifying output is inherently complex in health care production. Therefore, increased attention to model construction and outcome measurement has been recommended in analyses of health services efficiency (Hollingsworth & Street, 2006). While efficiency analyses of hospitals, nursing homes and primary care are numerous (Hollingsworth, 2003), efficiency analyses of mental health care services are few (see e.g., Frank & Taube, 1987; Halsteinli, Kittelsen, & Magnussen, 2001; Healey, Miranda, Ammaddeo, Bonizzato, & Tansella, 2000). The task of measuring output from mental health services may be even more complex than in many other areas of health care. Therefore,

a crucial question is whether or to what extent empirical estimates of productivity are feasible and can be utilized for policy purposes in the mental health care sector.

The setting of this study is outpatient child and adolescent mental health service units (CAMHS) in Norway. CAMHS provide diagnostic assessment and treatment to a heterogeneous group of patients, interacting with the patients' environments (relatives, schools etc). The general view has been that this sector is characterized by low levels of efficiency (Ministry of Health and Care Services, 1997) and, therefore, increased productivity was suggested as an inexpensive way to increase access to outpatient services. More specifically, the government stated that, in the period 1999–2006, productivity growth should be delivered in terms of an increase in the number of consultations per therapist (Ministry of Health and Care Services, 1998). However, the question is whether the partial indicator “consultations per therapist” reflects true productivity growth and, specifically, whether the

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number of consultations adequately reflects output from the production process.

The purpose of this paper is threefold. First, our aim is to assess to what extent CAMHS responded to the governmental pressure for higher productivity. In this respect we provide a follow up to previous work (Halsteinli, Kittelsen, & Magnussen, 2005). Second, we expand the analysis by focusing specifically on how to adjust adequately for case-mix changes and on the relationship between case-mix measurement and measured productivity growth. Third, we provide a further illustration of the importance of adjusting for case-mix by assessing the association between productivity growth and two policy issues: a recent recentralization of hospital ownership and the skill mix in the CAMHS staffing in terms of the proportion of psychiatrists and psychologists.

Ideally, we would like to measure output in terms of patient outcomes to incorporate health gains and the quality aspect. Routine mandatory outcome measures have been introduced in countries like Australia, New Zealand and Denmark (Hanssen-Bauer et al., 2007). However, in Norway, no routinely used outcome measure has yet been implemented. Lacking information about the quality of life improvements for patients and, thus, the actual value to society (“prices”) of the treatment of patients, the best conceptual method to measure output would be to use the number of patients, adjusted for case-mix. If we assume that the mean number of consultations reflects relative costs related to illness severity and complexity, an aggregated number of consultations for a CAMHS might be viewed as case-mix adjusted number of patients (Halsteinli et al., 2005). However, in the Norwegian context, CAMHS developments indicate that the use of consultations as an output measure should be considered carefully. First, from 1998 to 2006, the mean number of consultations per patient increased by close to 40%. It seems unlikely that this reflects a similar increase in mean patient illness severity, especially as the increase mainly took place over a two-year period (2002–2003). The increase might be interpreted as indicating increased quality, e.g., in terms of more intensive treatment. However, the observed trend may also indicate inefficiency with too many consultations for each patient. Second, one can speculate whether the observed shift in consultations per patient could be explained partly by changes in record-keeping practice. Such changes might represent a more thorough and accurate and, thus, more legitimate documentation, but render data less comparable over time. The problem of upcoding related to financial incentives is well known from the hospital sector (Steinbusch, Oostenbrink, Zuurbier, & Schaepkens, 2007).

Uncertainty regarding the interpretation of the increased number of consultations per patient motivates an alternative choice of output specification. In the present analysis, we have chosen the aggregated number of treated patients as our starting point. Case-mix adjustment is achieved by distributing patients into presumably homogenous groups. The different outputs are weighted together by estimates of the relative cost or resource use in the production of each output, paralleling the cost base of the diagnosis related group (DRG) weights widely used in the somatic sector, which have facilitated the calculation of case-mix adjusted number of patients as a single output (see e.g., Linna, Häkkinen, & Magnussen, 2006). However, while DRG weights represent a fixed set of weights for all units based on prior information on relative costs, such prior information is lacking in the present case. Instead, we have utilized the nonparametric Data Envelopment Analysis (DEA) method to calculate weights that maximize each unit's efficiency, imposing only the restriction that, using the same set of weights, none of the units can have an efficiency score higher than one. An example of further weight restrictions is given by Giuffrida (1999) in an analysis of productivity changes in the UK primary care sector, where higher weights were given to high-consumption

patient groups. Lacking empirical evidence to impose weight restrictions, our choice has been to treat each CAMHS unit in the best possible light according to data. The aim is to estimate the magnitude of productivity growth and explore how sensitive estimates are to different specifications of output. Malmquist indices of technical productivity growth are estimated and bootstrap procedures are performed to allow for uncertainty owing to sampling error and for statistical inference.

We provide a further illustration of the importance of adjusting for case-mix by exploring the association between productivity growth and two policy-related questions. First, we ask whether a major hospital reform in 2002, involving recentralizing the responsibility for specialized health care from the county to the state level (Magnussen, Hagen, & Kaarboe, 2007), was associated with a subsequent shift in productivity improvement. Second, we assess the influence of skill mix. In an earlier analysis (Halsteinli et al., 2005), we found that an increased proportion of psychiatrists and psychologists was associated with increased CAMHS productivity. The question is whether skill mix seems to be a robust determinant of productivity growth throughout the period.

In the next section, we describe the Norwegian context for CAMHS production. Section 3 describes the data and methodology, including a specific discussion of alternative specifications of output, and results are presented in Section 4. The discussion of the results is included as Section 5, while some concluding remarks complete the paper.

### The Norwegian context

Outpatient CAMHS are multidisciplinary treatment environments. They are part of the public secondary specialized health care system and responsible for serving the population of a specific catchment area. The main objective is to diagnose and treat patients referred by general practitioners and, in addition, provide counseling services to primary health care. Time studies indicate that patient-related activities (including administrative tasks) occupy between 80% and 90% of therapist time (Hatling, Røhme, & Bjørngård, 2005). To a large extent, the decision to admit a patient to treatment, the choice of therapeutic approach and the amount of treatment supplied have been subject to local discretion, but in recent years, governmental initiatives in terms of treatment guidelines and priority rules have emerged.

By the mid 1990s, it was agreed generally that there was a large unmet need for mental health treatment to children and adolescents. In 1999, the Norwegian government implemented a 10-year national mental health plan (Ministry of Health and Care Services, 1998), under which the main objective of increased access to services was to be achieved both through a substantial increase in the number of therapists and an increase in productivity (a 50% increase in consultations per therapist). The hospital reform in 2002 strengthened the productivity goal by anticipating a 30% increase in two years (Ministry of Health and Care Services, 2003). The observed number of consultations per therapist did indeed increase from 1999 and the annual increase accelerated in 2002–2003. A more than 70% increase was observed for the period from 1998 to 2006 (Pedersen, 2007) and, hence, the implemented policy appeared to be successful. The annual number of treated patients increased by 142% and a substantial case-mix change took place through growth in the share of low priority patients (Pedersen, Lilleeng, & Sitter, 2008).

The hospital reform implied that ownership of hospitals was transferred from the 19 counties to the state, and regions and hospitals were organized as health enterprises. These are independent legal subjects owned by the Ministry of Health (Magnussen et al., 2007). CAMHS became organizational units within health enterprises. The reform implied an increased focus on professional

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