**Discussion Papers No. 288, November 2000**
**Statistics Norway, Research Department**

*Audun Langørgen*

# Revealed Standards for Distributing Public Home-Care on Clients

**Abstract:**

When private goods are publicly provided at subsidized prices, government authorities have to determine the distribution of services on recipients. Such distributions are commonly based on legal regulations and professional guidelines. Thus governments are assumed to develop service standards that are incorporated in the preferences for allocation of services. The purpose of this paper is to analyse the behavior of local governments when they are allocating home-care services on elderly and disabled clients. Based on Norwegian data it is demonstrated that service standards as well as economic constraints have an impact on the supply of home-care. As expected the supply to individual clients increases with the degree of disablement. The model estimates also show that service standards vary substantially between different client groups. For instance, service levels for mentally retarded are rather high compared to elderly clients in non-single households. Individual service standards are derived from observed behavior by means of model simulation, where the standards are defined for an average level of municipal incomes and prices. The results are used to evaluate the degree of mismatch between service supply and common service standards in different local communities.

**Keywords:** Local public finance, care for the elderly and disabled, service production standards

**JEL classification:** H42, H72, I18

**Acknowledgement:** This project was supported by The Ministry of Finance, The Ministry of Health and Social Affairs, and The Ministry of Local Government and Regional Development. I would like to thank Rolf Aaberge, Heikki Loikkanen and Rune Sørensen for useful comments.

**Address:** Audun Langørgen, Statistics Norway, Research Department.
E-mail: audun.langorgen@ssb.no

| | |
|---|---|
| **Discussion Papers** | comprise research papers intended for international journals or books. As a preprint a Discussion Paper can be longer and more elaborate than a standard journal article by including intermediate calculation and background material etc. |

Abstracts with downloadable PDF files of
Discussion Papers are available on the Internet: http://www.ssb.no

For printed Discussion Papers contact:

Statistics Norway
Sales- and subscription service
N-2225 Kongsvinger

Telephone: +47 62 88 55 00
Telefax: +47 62 88 55 95
E-mail: Salg-abonnement@ssb.no

# 1. Introduction

The use of in-kind transfers from governments to individuals is extensive in most developed countries. Whatever the reason for public provision of private goods, such policies may have distributional consequenses. A government providing a subsidized private good must determine the extent of support for each household. Moreover, it is usually required that the distribution should be justified on the grounds of general principles. This is because decisions are required to be legitimate in a democratic welfare state, and clients who think themselves disfavored by a government official may complain to a higher level of government or take the case to a court. However, as pointed out by Sen (1992), the basic diversity of human beings implies that equal consideration for all may demand very unequal treatment in favor of the disadvantaged. It is thus widely accepted that individuals with unequal capabilities or needs should be given unequal treatment. Since clients are heterogenous, the general principles that govern the distribution of services are likely to be rather complex and leave considerable discretion to the decision-maker.

This paper deals with public production of home-care for the elderly and disabled. The diversity of client capabilities and needs is a particularly important feature of this service sector. An interesting question is how the client heterogeneity affects the public distribution of home-care. Since disabled persons differ from each other in their capability to fulfil needs by their own effort, we expect that clients are given unequal treatment in order to provide an acceptable level of welfare for all. The purpose is to satisfy basic human needs, like beeing adequately nourished and clothed, or enjoying social relations to other people. Public home-care services are thus introduced to fulfil those basic needs that are otherwise left uncovered. It is assumed that the assessment of (uncovered) needs differ with individual characteristics like the degree of disablement, age, type of household and access to private (informal) care. The standards for assessment of needs are incorporated in the preferences of local public authorities who are the suppliers of home-care.

The assessment of basic needs that should be covered is determined in a social and political process, and may change with changing prosperity and overall standards of living in the society. Since home-care services in Norway are provided by local governments, the service standards may also vary across local communities with different capacities to finance the services. Consequently, the service standards that emerge in different communities are not independent of the local government budget constraint. However, in this study we introduce a common service standard which is based on an empirical model of home-care supply. The service standard (need for home-care in hours per week) is

defined for an average level of local public incomes and prices, and vary as a function of individual characteristics that enter into the assessment of needs.

Many researchers in welfare economics have considered issues of equity to be important in the evaluation of policy outcomes. While such policy analysis incorporates economists' judgement of equity, it often ignores the concerns for equity of the economic actors being studied. In this paper positive and normative analysis is more closely integrated. First, the positive analysis takes into account that the behavior of public decision-makers is affected by service standards and normative judgements. Second, the normative analysis is based on service standards that are derived from empirical analysis of local government behavior. Thus we are able to evaluate the distribution of services according to normative judgements that are established within the decision process.

The paper is organized as follows. Section 2 elaborates a theory of local government behavior with particular focus on the distribution of publicly provided private goods. A corresponding empirical model for the supply of home-care to clients in Norway is estimated in Section 3. The empirical model is used to simulate a common service standard in Section 4, and the observed distribution of home care is compared to the revealed service standard. A brief summary and conclusion is given in Section 5.

# 2. Theoretical framework

Private goods are distinguished from public goods by the properties of excludability and rivalry in consumption. Since many goods do not fit perfectly into this dichotomy, goods have also been classified along a continuum measuring the degree of publicness. Borcherding and Deacon (1972) show that the degree of publicness for publicly provided goods can be analysed within a median voter model of local government behavior. To achieve identification Borcherding and Deacon assume that goods are provided in a nondiscriminatory manner, by referring to the argument that constitutional restrictions may prevent an unequal distribution of publicly provided goods. It is plausible to assume that public goods are equally distributed since governments are neighter induced nor able to discriminate between recipients in the case of non-rivalry and non-excludability. For private goods like education and health care, however, public providers frequently give unequal treatment to client groups with different opportunities or needs. For example, the public distribution of health services is compensatory towards groups with a high degree of disablement or particularly poor health. Nevertheless, it has become conventional to assume that publicly provided private goods are equally distributed on citizens.

In the economic literature there has been an extensive debate on why private goods are provided publicly at subsidized prices. Normative theories call attention to externalities, scale economies or imperfect information that may imply an efficency case for public provision. Blomquist and Christiansen (1995) and Boadway and Marchand (1995) assume that governments are not able to observe the identity of high-skilled and low-skilled individuals. Due to asymmetric information redistribution from the high-skilled to the low-skilled is hampered by a self-selection constraint. The potential role of public provision of private goods is to alleviate the self-selection constraint. In the context of Nichols and Zeckhauser (1982), there is an interesting possibility that information asymmetries can be reduced when governments are able to observe some individual indicators that influence welfare. Such an indicator is consumption of medical care, since poor health or disablement reduces earning capability. When individual consumption bundles depend on ability or medical condition, it is optimal to subsidize goods that are demanded by individuals with high marginal utility of income. It is argued that the state of health affects the marginal utility of income. For instance, a handicapped individual who needs the services of an aide in his home is likely to have a higher marginal utility of income than his nonhandicapped counterpart with the same ability to earn income.

Positive theories emphasize public provision as a means for some groups in the economy to redistribute income to themselves, especially in the case of restrictions on the available tax and transfer instruments. Epple and Romano (1996) is an example of this type of analysis. To simplify matters, it is assumed that consumers obtain the same level of public services. In such a case, however, there is less scope for redistribution than would be the case if discriminatory policies were permitted. The incentives for particular interest groups to support public provision may increase with the degree of unequal distribution of services. Moreover, one would expect that those with high in-kind benefits have a strong power basis in the political system, with high ability to promote their interests. However, it is questionable whether the groups that receive large shares of publicly provided services are particularly well-organized and powerful. In most developed countries recipients of subsidized services like education and health care are mainly children, elderly, disabled or (temporary) ill. Different types of disadvantages of the recipients are in general not accounted for in welfare analysis of the public provision of private goods.

Recipients are frequently distinguished from non-recipients by their need for services. To explain this fact welfare policy can be seen as a social insurance sceme, as discussed by Sinn (1995). Public in-cash and in-kind transfers are designed to make lifetime careers safer. Public education can be seen as subsidies in order to equalize opportunities of income earning, see e.g. Roemer (1998). Public health care has the effect to redistribute welfare from the lucky to the unlucky, or from healthy people to people who are ill or disabled. Welfare and quality of life is affected directly by the state of health. In

redistribution policies it is thus possible to improve other welfare components than income. This may motivate in-kind transfers in health care since policy-makers may want to improve that particular welfare component. The services that are offered are also different for different diagnosises, meaning that observable variation in individual needs yields arguments for unequal treatment.

Individual needs are not only important for the local public distribution of services on recipients. The distribution of intergovernmental grants is frequently related to evaluations of needs. Fiscal equalization policies are designed to compensate local jurisdictions with low per capita fiscal capacity or high per capita expenditure needs. Expenditure needs are defined as the costs to provide a standard package of public services, and are measured on the level of local government. Bradbury et al. (1984) use a model of expenditure determination to estimate variations in expenditure needs as a function of sociodemographic characteristics. A structural approach for measuring expenditure needs is developed by Langørgen and Aaberge (1999). Their model shows that expenditure need for health care in a local jurisdiction increases with the number of elderly and disabled among the residents. A limitation of such models is that expenditure need is estimated on the aggregate level, and individual heterogeneity in needs is not completely captured by indicators like age structure and the number of disabled.

Shoup (1964) and Behrman and Craig (1987) analyse the distribution of police resources across neighborhoods. They do not account for service supply to individuals, since police services like crime prevention are goods with a certain degree of publicness. However, they provide a theoretical framework which can be extended to account for the distribution of local public services among households. We also extend the model to account for local public provision of public and private goods. For the sake of expositional simplicity, the model is restricted to only one good of each type. The approach is based on the "community preference" tradition which assumes that a local authority can be treated like a household that maximizes utility for a given budget constraint.[1] Thus the local government derives utility from the production of a public and a private good. Preferences are also defined over the distribution of the private good on recipients. Since nobody is excluded from using the public good, preferences are only defined for total production of the public good.[2] Consequently, the preferences of the local government are represented by the utility function

$$U = U(x, \mathbf{q}; \mathbf{z}), \tag{2.1}$$

[1] For a discussion of the community preference model, see Wildasin (1986).

[2] We assume that x is a *local* public good like (for instance) public parks or roads. An important attribute of such a good is the location of the good. Everyone is allowed to use it, but the users are mostly local residents because the travelling costs to the location of the public good increase with distance.

where x is total production of the public good in the local jurisdiction,[3] and $\mathbf{q} = (q_1, q_2, ..., q_n)$ is a vector that shows the distribution of the publicly provided private good on n local residents. Total production of the private good (q) is equal to the sum over recipients (j=1,2,...,n) of client-specific production ($q_j$). The vecor **z** is specified for each local resident, and may include characteristics that enter into the evaluation of needs for the private good. Potential clients are thus given unequal weights in the utility function of the local government. This formulation makes it possible to test the hypothesis that public decision-makers are unequally concerned about the welfare of different types of clients. For instance, we expect that the utility weight that is given to a disabled person increases with the degree of disablement. Also it is likely that the marginal utility for provision of public health care to those who are perfectly healthy is approximately zero. Thus we assume that residents with different needs are given unequal treatment by the local government. Utility is maximized subject to the local government budget constraint

$$y = p_x x + \sum_{j=1}^{n} p_j q_j \ , \tag{2.2}$$

where y is total exogenous income of the local government, $p_x$ is price per unit of the public good, and $p_j$ (j=1,2,...,n) are unit costs for the publicly provided private good, which may vary across recipients. For example, in production of home-care services the staff is visiting the clients in their homes, so the services are provided where the homes are located. Consequently costs per unit of service production depend on distances from service agency to each client, and/or distances between different clients. However, prices on public services are not observed directly since the market mechanism is not functioning. Although we do observe the allocation of production (hours of home-care) on recipients, the information on how total expenditures are divided among clients is incomplete. Moreover, to include the unit costs as explanatory variable may introduce simultaneity biases in the model, since expenditures as well as production are determined endogenously. It is thus relevant to deal with these limitations by treating prices as latent variables. Individual unit costs are assumed to vary as a function of observables, like indicators of the settlement pattern. By including such indicators in the model we are able to test the response of local governments to variations in costs that owe to exogenous local conditions. Define the latent variable function for prices by

$$\mathbf{p} = \mathbf{f}(\mathbf{v}) \ . \tag{2.3}$$

[3] Alternatively x can be interpreted as a composite good including all other goods than home-care.

This function shows how the price vector $\mathbf{p} = (p_x, p_1, p_2, ..., p_n)$ depends on a set of exogenous indicators **v**. By maximization of utility the local government supply of the private good to client j is derived from equations (2.1)-(2.3).

$$q_j = g_j(\mathbf{p}, y, \mathbf{z}) = g_j(\mathbf{f}(\mathbf{v}), y, \mathbf{z}), \quad (j = 1,2,...,n). \tag{2.4}$$

Client-specific production depends on local production prices, exogenous income of the local government and individual characteristics. Supply of a normal good increases with the level of per capita income, and decreases with unit costs. The expected effects of individual characteristics depend on legal and professional guidelines for the assessment of needs, and are discussed in more detail in the next section.

# 3. Empirical model

Local governments in Norway have the responsibility to provide the elderly and disabled with sufficient nursing and care. A pronounced majority of the clients receive care services in their own home, while some of the elderly are taken care of in particular nursing homes. A market for private care is almost absent in Norway, but there is an informal caregiving sector which is based on close kinship or matrimony. Although the home-care clients are charged with user fees, these user fees are means tested, and services are highly subsidized by local governments. Since user charges are low as compared to service production costs, it is appropriate to assume that production is constrained from the supply side.

The theoretical model in section 2 assumes that the number of potential clients in each local jurisdiction is exogenous. This condition would be violated if citizens were allowed to "vote by their feet". Such a mechanism could create migration by the elderly and disabled from municipalities with low service levels to municipalities with high service levels. The number of demanders is thus affected by the supply of home-care. However, since migration rates in Norway are quite low, such a role for the demand side is not included in the model. For instance, the share of the elderly (67 years and above) that moved across municipality borders in 1997 was only 0.6 percent. We assume that most clients do not move because they are attached to their homes and their local environment.

The endogenous variable in equation (2.4) is client-specific service supply. Home-care for the elderly and disabled is a type of service which is quite labor-intensive, and the welfare that is produced is closely related to labor inputs. Thus as a measure of production we use hours of direct care per week. This corresponds to the time that the staff is employed in service production in each client home, while

the time that is employed in administration and travelling between clients is not included. Of course, the quality of labor may vary within the nursing staff, but since this is difficult to observe, and since information about the staff is scanty in the data, we simplify by assuming that labor is homogenous.

The analysis below utilizes a rich set of data for clients of public home-care services. We have data on hours of direct care per week received by each home-care client in a sample of 54 local authorities (municipalities and city districts). Moreover, the data contain information on dimensions of functional abilities, age, type of household, type of neighborhood, and access to private care for each client.

## 3.1 Indicators of individual needs

The data contain comprehensive information about functional abilities of the clients. As many as 17 indicators of functional abilities have been reported for each client. Correlations between some of the indicators are quite high, which suggests that the number of dimensions can be reduced without considerable loss of information. To this end the 17 indicators of functional abilities have been grouped into 5 dimensions:

1. Toilet visits, eating, dressing and undressing
2. Indoor and outdoor mobility, personal hygiene, cooking
3. Cleaning, purchasing
4. Cognitive abilities, which include sense of time and place, memory, concentration, knowledge of own situation, responsibility, ability for self-care, initiative and ability to communicate
5. Social abilities, which include social network and sense of security

The first three dimensions describe the physical abilities of the client. The first dimension represents activities that are carried out several times a day, the second dimension represents activities that are carried out daily, and the activities in the third dimension are carried out less than daily. The fourth and fifth dimensions account for the cognitive and social abilities of the client, respectively. To derive indicators of functional abilities that correspond to the five dimensions, we use the average value of the composite indicators in each dimension. All the indicators have been measured on a common scale which vary between 0 and 3. The value 0 is the highest functional ability, which means that the client needs no help in order to carry out a particular activity or function. The value 3 denotes an extremely low functional ability, which means that the client depends entirely on help from others to perform a task. Values between 0 and 3 signify a functional ability that is intermediate. One should recall that the indicators increase with the degree of disablement.

In addition to functional abilities, we also expect that the evaluation of need is affected by other characteristics like whether or not the client is mentally retarded, the age of the client, type of household, and access to private (informal) care. In a national reform in the early 90s institutions for the mentally retarded were closed down and the clients were transferred to home-care services. The reform introduced extended legal rights for the mentally retarded. Although some clients may have felt more comfortable in the earlier institutions, the new regime has probably improved the overall service level received by the mentally retarded, at least as measured by hours of direct care per week. This is an example of how output levels are affected by national regulations. Such regulations may also justify that different service standards are established for different client groups.

Home-care for younger clients may differ from the service supply to elderly people, even after controlling for the level of functional abilities. On average it is likely that younger clients have a larger potential for rehabilitation than the elderly. Rehabilitation increases the welfare of the rehabilitated, and may save costs in the long run because the number of disabled (or their degree of disablement) is reduced. If additional resources are required to rehabilitate the clients, this may induce a higher priority of younger clients. Furthermore, the utility weights that are given by local governments to younger and elderly clients may differ even if there is no potential for rehabilitation. In this case the service provider is unequally concerned about the welfare of the permanently disabled in different age-groups.

The size of households is likely to affect the assessment of need for public home-care. Clients that live in single households need more public services than clients who are members of a family (or non-single) household. This is due to scale economies and informal caregiving in non-single households. While production of home-care is a private good on the household level, there is a certain degree of publicness within each household. For example, the time per client required for activities like cleaning, purchasing and cooking is larger for a single client than for a married couple who are both disabled. Besides, the social needs of clients who live alone may not be covered fully by their private network.

In the analysis three dummy variables are included to account for group specific effects. These three variables take the value 1 either for clients who are mentally retarded, younger than 67 years of age, or live in a single household, respectively, and the value 0 otherwise. An indicator for the access to private (informal) care is also included. This variable is given values (0,1,2,3), where the value 0 denotes no access, the value 3 denotes high access, and 1 and 2 are intermediate values. One should recall that the indicator increases with the access to private care. We expect that the supply of public care decreases with the access to private care, since public and private care are substitutes. We assume

that the access to private care depends mostly on family relationships, and is determined independently of the supply of public care.

Statistics for the number of clients and the supply of home-care for separate groups is shown in Table 3.1. The largest group consists of elderly people who live alone. Mentally retarded is a relatively small group with a quite high average supply of home-care as compared to other groups. Elderly people who do not live alone receive a lower supply per client than other groups. It should be kept in mind, however, that there is variation in other explanatory variables like functional abilities both within and across the groups in Table 3.1. Consequently the deviations in average supply is not a precise measure of the assignment of service standards to different groups.

**Table 3.1. Summary statistics for hours per week of direct home-care, and the number of clients in separate groups, 1997***

| | Number of Clients | Hours per week | |
|---|---|---|---|
| | | Mean | Standard dev. |
| Clients in the model population | 17437 | 5.5 | 11.9 |
| Mentally retarded | 607 | 37.0 | 37.5 |
| Younger in single household | 1439 | 5.7 | 12.8 |
| Younger in non-single household | 1170 | 3.9 | 7.2 |
| Elderly in single household | 10850 | 4.4 | 7.2 |
| Elderly in non-single household | 3371 | 3.7 | 5.8 |

* The table only includes observations that are used in estimation of the model. The division between younger and elderly clients is fixed at 67 years of age. The mentally retarded are not included in the other groups in the table.

## 3.2 Indicators of prices and local public income

The local public capacity to satisfy individual needs is constrained by local production prices and local government disposable income. The major part of local government income in Norway is general grants-in-aid from the central government and local income and property taxes. The tax rates as well as the tax bases are determined by the central government. For this reason both grants and tax incomes are treated as exogenous in our model.

Variations in the price of home-care are captured by a dummy variable that equals 1 for clients in urban districts and 0 for clients in rural districts. Higher population density in urban districts is assumed to reduce the travelling costs, so the price per unit of home-care is higher in rural than in urban districts. Due to a substitution effect we expect that the supply of home-care is higher for clients in urban than in rural districts. Since a larger part of the working time is non-productive in sparsely populated areas, it is possible to increase total output of home-care by distorting the distribution towards densely populated areas. When local government preferences are characterized by (needs-

adjusted) inequality aversion, the gain in total production has to be traded off against unequal treatment of clients in urban and rural districts.[4]

According to the theoretical model in section 2 service supply for home-care also depends on prices on other services. Local governments in Norway provide several services to their residents, like kindergartens, primary schools, health care, social services, culture and infrastructure. In general it is difficult to observe prices on public services. However, Langørgen and Aaberge (1999) have estimated expenditure needs for eight different service sectors when expenditure needs are interpreted as minimum required expenditures within a linear expenditure system (LES). The estimated expenditure needs show to vary with a number of sociodemographic and geographic variables that account for service standards and unit costs in local public services. In terms of equation (2.4) the variables are included in the vector **z** which affect the evaluation of needs or in the vector **v** which account for variations in unit costs. For instance, expenditure need in kindergartens increases with the number of children in pre-school age, especially for children with a lone mother or father. Expenditure need in primary schools increases with the number of children in school age. Moreover, a national norm of maximum travelling distance to school increases expenditure need for education in sparsely populated areas.

For a given level of local public income per capita, we expect that residents in a community with high per capita expenditure needs receive lower service standards than those in a community with low per capita expenditure needs. High expenditure needs reduce the opportunity set, and this is why expenditure needs are compensated for through the national system of intergovernmental grants. We define *discretionary income* by exogenous income above a minimum required expenditure level, which is measured by the difference between exogenous income and estimated expenditure needs. In the LES model estimated by Langørgen and Aaberge (1999) discretionary income accounts for available economic resources that are not restricted to satisfy minimum standards. By including discretionary income in the present analysis the income concept has been adjusted for expenditure needs. This method takes into account economic constraints that are related to sociodemographic and geographic characteristics of the local environment.

[4] Needs-adjusted inequality aversion means that local governments prefer equal treatment of clients with equal needs (horizontal equity) when total output is given. Exogenous total production corresponds to a situation in which total costs in home-care are given and the price of home-care is constant across neighborhoods and clients. In this case total output is not affected by the distribution of home-care.

## 3.3 Empirical results

Only those who are disabled or have special needs are entitled to receive public home-care. However, in some cases persons who are (slightly) disabled are deprived of public home-care. They have to do their own household work or depend on private help from familiy or friends. Unfortunately we do not have information about these potential clients since they are not accurately recorded in the data. Certainly about 4000 registrations indicate zero supply of home-care, but most of these registrations are faulty since missing data have been recorded with a zero value. We are not able to determine exactly which of the zero observations are missing data and which are zero supply. Consequently all registrations of zero hours per week are treated as missing and these observations are deleted before estimation of the model. Moreover, the data is probably incomplete by not including all the disabled persons that are non-recipents of public home-care. This may introduce biases in the parameter estimates since we are not able to account for corner solutions in the model. However, such biases are not considered as very serious since a large majority of the potential clients are in fact recipients in a welfare state like Norway.

The estimated model is a reduced form approximation to the supply function (2.4), which also includes a stochastic error term to account for unobserved heterogeneity. The empirical model specification for home-care supply (q) is given by

$$q_j = \gamma_0 + \sum_{h=1}^{5}\gamma_h s_{hj} + \sum_{m=1}^{4}\theta_m t_{mj} + \varphi_0 v_j + \beta y + \kappa d + \bar{s}_j\left(\sum_{m=1}^{4}\tau_m t_{mj} + \varphi_1 v_j\right) + t_{1j}\sum_{m=2}^{4}\pi_m t_{mj} + \varepsilon_j \quad (3.1)$$

where the subscript j refers to different clients. The vector **z** of variables that accounts for individual needs is now represented by two subsets **s** and **t**. The five indicators of functional abilities are included in $\mathbf{s}=(s_1,s_2,...,s_5)$, while other indicators of needs are included in $\mathbf{t}=(t_1,t_2,t_3,t_4)$. For instance, the access to private care is denoted by $t_1$. The urban-rural dummy which captures price variation is denoted by v, and municipal discretionary income per capita is given by y. A dummy for clients in Oslo is also included by the symbol d, and $\varepsilon$ is the error term. A detailed overview of variables and symbols is given in the Appendix.

The empirical model includes both direct effects and interaction effects for the explanatory variables. It is hypothesized that the deviations in supply to different client groups increase with the degree of disablement. A client who is only slightly disabled receives relatively few hours of care per week irrespective of group status as concerns mental retardation, age, type of household and type of

neighborhood. For clients with "heavy" disablement we find more variation in hours of care per week, and this variation is partly explained by the clients' membership in different groups. The *degree of disablement* variable ( $\bar{s}$ ) which interact with the group dummies is defined by a weighted average of the five indicators of functional abilities. The direct effect of each functional indicator is given by the parameters $\gamma_h$ . The degree of disablement variable is derived by using these parameters to weight the five indicators

$$\bar{s}_j = \frac{\sum_{h=1}^{5} \gamma_h s_{hj}}{\sum_{h=1}^{5} \gamma_h}. \tag{3.2}$$

These weights can be interpreted as marginal effects on hours of care when all group indicators (**t** and v**)** equal zero. Since the sum of the weights is normalized to 1, it follows that the degree of disablement is measured on the scale from 0 to 3. The derived model formulation is non-linear in the parameters. This formulation accounts for interactions between functional abilities and other explanatory variables. The purpose of the non-linear formulation is to summarize information about functional abilities in a single indicator, which makes it possible to reduce the number of interaction effects between functional abilities and other variables. By imposing this structure we are able to avoid serious problems with multicollinearity. In addition to the degree of disablement, the access to private care ($t_1$) is also tested for interaction with other variables. We test whether the effect of access to private care differs between separate groups of recipients.

The data for 1997 are reported by 54 different local authorities, including 41 municipalities and 13 city districts. Subordinate levels of local government are organized for city districts within some of the larger cities in Norway. Municipalities and city districts are responsible for public production of home-care. In the estimation we have to leave out observations with missing data. We also omit home-care clients who received additional services like a temporary stay in a nursing institution or a personal attendant, since such services may partly substitute for home-care. Finally, children below 16 years of age and a few outliers with extremely high reported supply of home-care are excluded in the estimation. After these reductions the remaining sample includes 17437 clients.

Discretionary income per capita (y) is assumed to be constant across city districts within the same city. The capital city Oslo has a special status as both county government and local government. Because of this special status we have not been able to obtain a measure of discretionary income for Oslo which is comparable to that of other municipalities. To handle this problem the discretionary income per capita for Oslo is fixed on the level observed in the second largest city in Norway (which is Bergen). To

account for a possible measurement error in income we also include a dummy variable (d) for Oslo in this model version. The dummy equals 1 for clients in Oslo, and is otherwise 0.

Estimation results are reported in Table 3.2. Model 1 represents the specification in equation (3.1). Model 2 is a simplified version which excludes coefficients that are statistically insignificant. Model 3 includes community-specific effects in addition to the effects in model 2. Community-specific effects are accounted for by a dummy variable for each community, and the dummies are included both additively (as heterogeneity in the constant term) and multiplicatively (in interaction with the client-specific variables). In model 3 the constant term and the effects for Oslo and for discretionary income are excluded, since these effects are picked up by the additive community dummies. Coefficients for the multiplicative community dummies indicate whether or not different local authorities give different priority to "light-care" and "heavy-care" clients.

As expected it is found that the supply of home-care increases with the indicators of functional abilities. Clients with severly diminished functional abilities typically receive more care than clients with slightly diminished functional abilities. There is one exception for indicator 3 (ability to carry out cleaning and purchasing) which is insignificant and thus not included in model 2. Cleaning and purchasing are basic services which are provided to most of the recipients, and it seems that functional ability along this dimension has little impact on supply. The highest marginal effect on supply of home-care per week is found for indicator 1, followed by indicator 4 and 2. Indicator 1 accounts for functions that are carried out relatively frequently, which implies a strong response in the supply of home-care to a change in capability. As one could expect supply of home-care is also quite responsive to changes in cognitive abilities.

The results show that interaction effects play an important role in the determination of local government supply to recipients of home-care. The direct effects for access to private care and the dummy for single households are insignificant, while some of the interaction effects are significant. Access to private care interacts with mental retardation to decrease the supply of care. Since other effects from access to private care are insignificant, this implies that the mentally retarded is the only group which is exposed to reductions in public supply as a response to increases in private (informal) care.[5]

[5] After the model has been simplified, the coefficient for interaction between access to private care and the degree of disablement is insignificant.

**Table 3.2. Model estimates for the supply of public home-care in hours per week***

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Constant | 1.60 (3.08) | 1.19 (6.52) | |
| *Functional abilities:* | | | |
| Indicator 1 (Toilet visits, eating, dressing) | 1.42 (9.88) | 1.52 (17.76) | 1.34 (17.72) |
| Indicator 2 (Mobility, hygiene, cooking) | 0.65 (9.19) | 0.69 (15.16) | 0.78 (15.41) |
| Indicator 3 (Cleaning, purchasing) | 0.03 (1.07) | | |
| Indicator 4 (Cognitive abilities) | 0.90 (9.75) | 0.95 (16.50) | 1.04 (16.90) |
| Indicator 5 (Social abilities) | 0.19 (7.31) | 0.19 (9.27) | 0.03 (1.98) |
| *Other indicators of need:* | | | |
| Access to private care | 0.12 (0.66) | | |
| Single household | -0.69 (1.87) | | |
| Mental retardation | 3.56 (8.06) | 3.78 (9.49) | 6.37 (16.61) |
| Younger than 67 years of age | -0.87 (2.36) | -1.05 (3.34) | -1.02 (3.38) |
| *Prices and local public income:* | | | |
| Urban district | -0.28 (0.77) | | |
| Discretionary income | 0.05 (2.16) | 0.06 (2.32) | |
| Dummy for Oslo | -0.58 (2.16) | -0.72 (2.71) | |
| *Interaction with access to private care:* | | | |
| Single household | 0.16 (1.08) | | |
| Mental retardation | -1.77 (10.29) | -2.01 (17.61) | -2.52 (23.44) |
| Younger than 67 years of age | -0.28 (1.84) | | |
| *Interaction with degree of disablement:* | | | |
| Access to private care | -0.22 (2.49) | | |
| Single household | 5.22 (27.05) | 4.92 (49.30) | 4.99 (47.32) |
| Mental retardation | 14.08 (61.02) | 14.27 (65.83) | 11.24 (49.42) |
| Younger than 67 years of age | 5.18 (23.89) | 5.06 (23.99) | 5.70 (26.75) |
| Urban district | 1.27 (4.96) | 1.04 (7.39) | 1.63 (12.21) |
| Community-specific effects | No | No | Yes |
| $R^2$ | 0.55 | 0.55 | 0.60 |
| Number of observations (N) | 17437 | 17437 | 17437 |

* T-statistics i parenthesis. The parameters of the non-linear model are estimated by the method of maximum likelihood.

Households of single clients receive more hours of care per client than households with more than one dweller, and the difference increases with the degree of disablement. Similar interaction effects with the degree of disablement are found for the mentally retarded and clients below 67 years of age. This shows that these groups are given a high priority, especially for clients with a high degree of disablement. For mentally retarded we also find a positive direct effect, which contributes to increase the supply of care to mentally retarded relative to other groups independently of the degree of disablement. For clients below 67 years of age there is a negative direct effect working in the opposite direction of the interaction with the degree of disablement. In sum the two counteracting effects imply that for a quite low degree of disablement younger clients receive less home-care than elderly clients,

but the total effect is reversed for higher degrees of disablement. For a high degree of disablement younger clients receive markedly more home-care than elderly clients.

Different population density in urban and rural districts has no direct effect on the supply in model 2, but there is an effect of the interaction with the degree of disablement. As expected clients in urban districts tend to receive more home-care than clients in rural districts, especially when the degree of disablement is high. We are not able to compute price elasticities in the model since the urban-rural dummy is an instrument for price variations. Moreover, the dummy variable is not suitable for marginal evaluations. However, a measure of the total impact of population density is based on model simulations with alternative assumptions about density. In the urban alternative it is assumed that everyone live in urban districts. In the rural alternative everyone live in rural districts. The two alternatives are simulated for each client, and production is aggregated within each local authority. The percentage deviation in total production between the two alternatives give a measure of supply sensitivity to changes in population density. Results from the simulations are reported in Table 3.3. Since the two alternatives span the extremes of population density, the figures imply that sensitivity of supply to density is rather small.

**Table 3.3. Percentage deviation between the urban and the rural alternative in total home-care production. Summary statistics for local authorities**

| Number of authorities | Mean | Standard dev. | Minimum | Maximum |
|---|---|---|---|---|
| 54 | 8.08 | 1.51 | 4.39 | 12.32 |

Estimates for the Oslo dummy variable is significantly negative, and may imply that discretionary income per capita is lower for Oslo than Bergen. However, the dummy variable may also capture an impact of omitted variables. Model 1 and 2 include a direct effect of discretionary income.[6] The coefficient for discretionary income is positive and significant. Local governments with high per capita income provide more home-care services to their clients than local governments with low per capita income. Income elastisities can be computed for the supply to each client, but here only aggregate income elasticities are reported. These elasticities are computed by first simulating the supply effects of a 1 per cent increase in discretionary income, and then aggregating supply over clients in the same local community. The percentage increase in total production is reported in Table 3.4. On average the income elasticity equals 0.20, which shows that the supply of home-care is not very sensitive to income changes.

[6] In a more general model specification various interaction effects with discretionary income were included. Due to multicollinearity and insignificant results, these effects have been excluded from the model.

**Table 3.4. Income elasticities for total home-care production. Summary statistics for local authorities***

| Number of authorities | Mean | Standard dev. | Minimum | Maximum |
|---|---|---|---|---|
| 50 | 0.20 | 0.10 | 0.09 | 0.56 |

* City districts in Oslo are not included in the Table.

## 3.4 Community-specific effects

Model 1 and 2 in Table 3.2 are based on the assumption that heterogeneity in local government preferences are captured by the included variables and interaction terms. In model 3 we test whether unobserved local characteristics may explain some of the residual variation in the supply of home-care. Two related hypotheses are of interest:

1. After need indicators have been controlled for, clients that live in different local jurisdictions receive different levels of home-care supply
2. Different local authorities give different priority to "light-care" and "heavy-care" clients

If one or both hypotheses are confirmed, one may conclude that clients are provided with service standards that differ between local communities. The first hypothesis is already confirmed in model 1 and 2 since the effect of discretionary income is significantly positive. In model 3 the two hypotheses are tested by including dummy variables for each local community in the model. It follows from the hypotheses that both additive and multiplicative dummies are relevant. The estimation results show that $R^2$ is increased from 0.55 to 0.60 when community-specific effects are included. Thus the goodness of fit is slightly improved by including community-specific parameters.

In model 3 two distinct parameters are estimated for each local authority. Summary statistics for the community-specific coefficients is reported in Table 3.5. The table shows considerable variation across communities in the estimates. The community-specific constant terms are positive in most communities. A negative coefficient estimate for the additive dummy means that the model may predict negative supply for some clients with a low degree of disablement. However, these coefficients are significantly negative in none of the communities, and significantly positive in 21 communities on the 5% level.

When the coefficient for the multiplicative dummy is greater than -1, the model predicts that supply is increasing with the degree of disablement. Estimation results are consistent with this requirement. The multiplicative coefficients are significantly positive in 13 communities and significantly negative in 28

communities on the 5% level. This implies that different service standards are established by different local governments, and it follows that the hypotheses 1. and 2. are not rejected.

**Table 3.5. Model estimates for community-specific parameters. Summary statistics for local authorities***

| Model 3 | Mean | Standard dev. | Minimum | Maximum |
|---|---|---|---|---|
| Additive dummy | 1.45 | 1.12 | -1.45 | 3.82 |
| Multiplicative dummy | -0.10 | 0.34 | -0.93 | 0.65 |

* The table includes 54 local authorities.

# 4. Service standards and the distribution of home-care

In order to evaluate the distribution of public services on recipients we start by defining the basic principles of the normative analysis. The first principle is *horizontal equity*, which means that people in equal need should receive the same treatment. Based on the model in section 3, two individuals can be assumed to have equal needs if they are equally disabled and if they are also equal along other individual characteristics. A necessary condition to receive the same treatment is that the direct home-care received is equal in hours per week. The second principle is *vertical equity*, which means that people in unequal need should be treated unequally according to their need. It is argued that different treatment of unequals should be compensatory towards those with higher disadvantages. However, as pointed out by Wagstaff et al. (1991), the issue of how those in unequal need should be treated, rarely gets discussed in the health economics literature. To determine the distribution of services on unequals, it is necessary to define service standards which involve the assessment of the needs of different types of clients. Such service standards are not uncontroversial, but nevertheless local governments have to develop their own standards in the process of distributing public services on recipients. Thus we propose that service standards for different types of clients can be derived from the observed behavior of local governments. These service standards are based on the typical priorities of local governments, and can thus be interpreted as the norms which are predominant in the decision process within local governments.

The estimation results in section 3 confirm that the assessment of individual needs play an important role in the determination of home-care supply. Although service standards may differ from one local authority to another, it is of particular interest to define and measure the average service standard that is provided to a client with given characteristics. Such a standard can be derived from observed behavior by means of model simulation. The object is to reveal the impact of underlying legal and professional guidelines for distributing home-care to different types of clients. In order to define the average service standard, it is appropriate to level out the impact of incomes and prices on supply. The

*need for home-care* is defined by the level of supply that would appear in a community with average levels of incomes and prices. Our measure of need is derived by simulation of a model version which includes no community-specific parameters, except for the Oslo dummy.[7] To represent average levels in the simulation, the Oslo dummy is fixed at the share of clients (in the sample population) that live in Oslo. The urban-rural dummy which captures price variation is similarly adjusted to the share of clients in urban districts. Per capita discretionary income is assumed equal to the average level which is weighted by the number of clients in each community. Thus the simulated need for home-care ($q_j^*$) is given by

$$q_j^* = \hat{\gamma}_0 + \sum_{h\neq 3}\hat{\gamma}_h s_{hj} + \sum_{m=3}^{4}\hat{\theta}_m t_{mj} + \hat{\beta}\bar{y} + \hat{\kappa}\bar{d} + \hat{\bar{s}}_j\left(\sum_{m=2}^{4}\hat{\tau}_m t_{mj} + \hat{\varphi}_1\bar{v}\right) + \pi_3 t_{1j} t_{3j} \quad (4.1)$$

where $\bar{y}$, $\bar{v}$ and $\bar{d}$ are average values of discretionary income, the urban-rural dummy and the Oslo dummy. The parameter estimates in equation (4.1) correspond to model 2 in Table 3.2, which is a simplified version of equation (3.1).

The need for home-care varies as a function of individual characteristics, like functional abilities, age, type of household and access to private care. A dot diagram of the relationship between need for home-care and degree of disablement is displayed in Figure 4.1. The degree of disablement variable is defined in equation (3.2), and is estimated by using coefficients from model 2 in Table 3.2. Both the level and the spread in the need for home-care increases with the degree of disablement. The increasing spread is due to different service standards for different client groups. Since the group dummies interact with the degree of disablement variable in the model, the deviation in service standards are particularly large for a high degree of disablement.

Each client is represented by a dot, and most clients are scattered along four separate lines in the diagram. The four lines are composed of different client groups as follows:

[7] In an alternative definition of need, service standards are allowed to vary across communities, and need is derived from model 3 in Table 3.2. However, since the different measures of need are highly correlated, we only report results for the definition above.

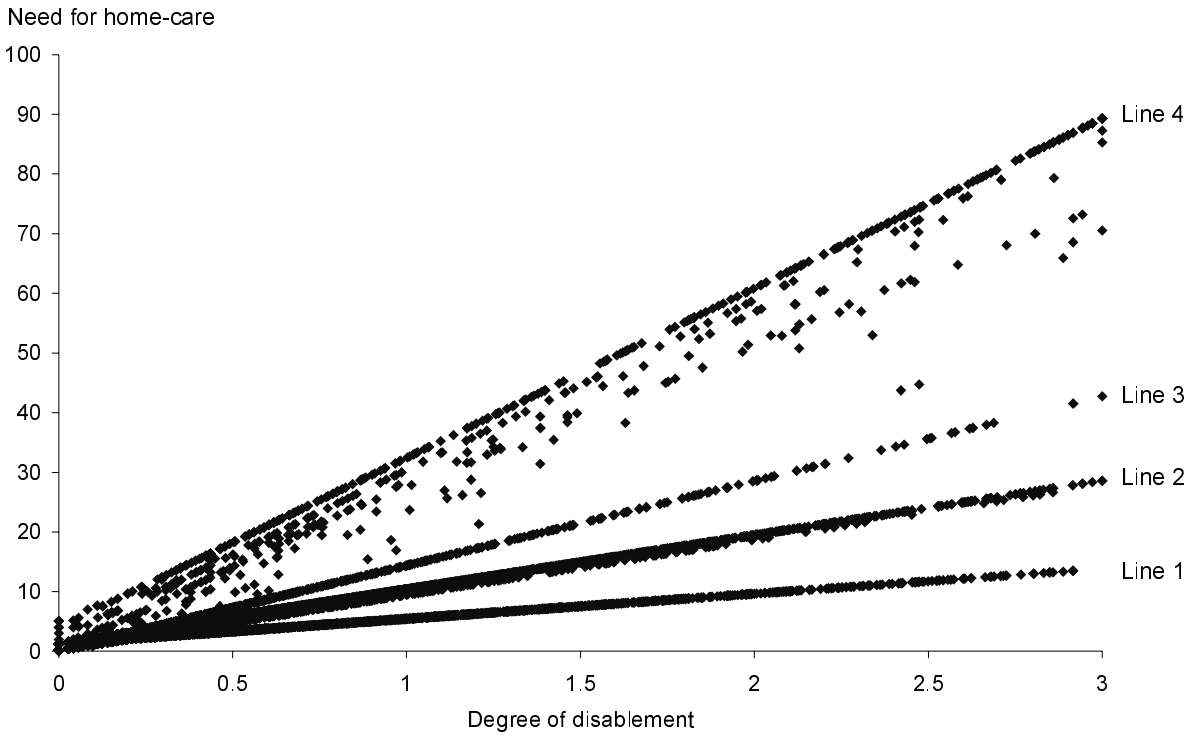
Line 1: Elderly clients in non-single households

Line 2: Elderly clients in single households and younger clients in non-single households

Line 3: Younger clients in single households

Line 4: Mentally retarded clients below 67 years of age, who live in a single household with no access to private care

**Figure 4.1. Simulated need for home-care (in hours per week) as a function of the degree of disablement**




The fact that two groups are collected along line 2 is purely a result of the estimation. The clients that are scattered between line 3 and line 4 are mentally retarded who either live in a non-single household, or have access to private care, or exceed 67 years of age. It is demonstrated that the mentally retarded are given a high priority as compared to other groups. The high standards for the mentally retarded may partly originate from regulations that were introduced in a national reform in the early 90s.

The difference between supply and need for home-care can be interpreted as a mismatch between a national standard and local public decisions. This interpretation is based on the assumption that the residuals of the estimated model are not seriously affected by measurement errors and omitted variables. Then it follows that clients who receive more than their stipulated need have been favored, while clients who receive less have been disfavored as compared to a national standard. When the

mismatch is large, there is reason to question whether the reported distribution of home-care is desirable. Let the *supply-need gap* be defined by

$$u_j = q_j - q_j^*, \tag{4.2}$$

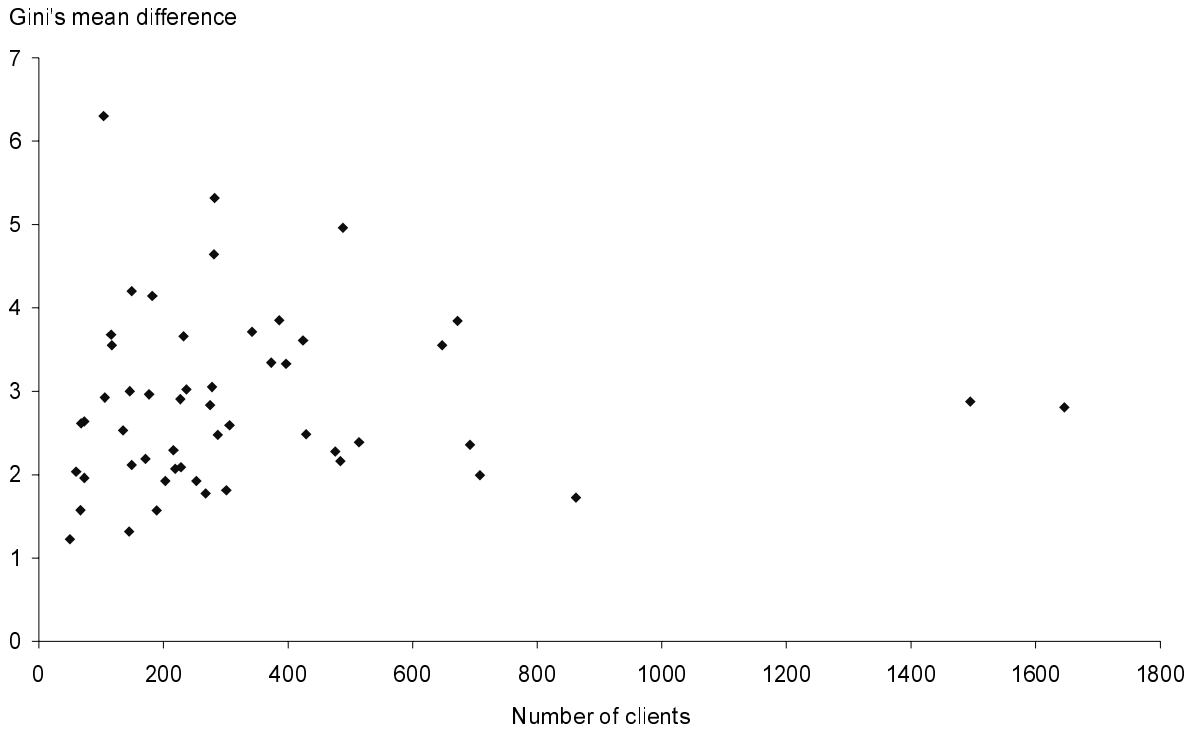
where $q_j$ is supply and $q_j^*$ is need for home-care. The supply-need gap is specified for each client j. Basic information about resource allocation in home-care is provided by the distribution of the supply-need gap across municipalities and city districts. It is helpful to summarize the distribution within different communities by the mean and a measure of spread. For the whole sample the mean of the supply-need gap is approximately zero. A high mean value for a given community may result from local service standards that are higher than average. Thus the mean value within communities is related to the community-specific effects reported in Table 3.5.

On the other hand, high spread in the gap within a community may imply that the local authority is severely affected by chance elements and follows an accidental practice in the allocation of home-care. In such a case the connection between need and supply of home-care is relatively weak. By contrast, low spread in the supply-need gap indicate that there is a strong connection between individual need and supply to each client.

The spread of the supply-need gap across communities is reported in Figure 4.2. As a measure of spread we use Gini's mean difference. This measure of spread is closely related to the Gini coefficient (G), which is equal to Gini's mean difference divided by the mean ( $\mu$ ) of the distribution.[8] Furthermore, Gini's mean difference is less sensitive to outliers than the standard deviation. In the diagram each municipality (or city district) is represented by a dot. Our measure of spread varies from a minimum of 1.2 to a maximum of 6.3 hours per week. Thus we are able to indicate which local authorities are more and which are less apt to comply with a common assessment of needs. The diagram shows that both a low, intermediate and high spread is found among small municipalities (with few clients), while the spread is intermediate in larger communities (with many clients).

[8] Since the supply-need gap takes both positive and negative values, the Gini coefficient is not restricted to its domain interval from 0 to 1, so it makes little sense to employ the Gini coefficient as a measure of inequality in this case.

**Figure 4.2. Spread of the supply-need gap for clients within different local communities**




# 5. Summary and conclusion

In this paper a theoretical model is developed by assuming that a local government derives utility from the production of a public and a private good. The local government also has preferences over the distribution of the private good (hours of home-care) on recipients. Each potential client is given a weight in the utility function which depends on individual characteristics. This means that different service standards that account for variation in needs are established for different client groups. Utility is maximized subject to a budget constraint, which allows prices per unit of home-care to vary across clients in different districts. Home-care services are allocated to clients according to the supply function of the local government. Thus, client-specific production depends on exogenous income of the local government, local production prices and individual characteristics.

An empirical model for the supply of home-care in Norway is estimated on a cross-section of more than 17000 home-care clients in 1997. As expected it is found that supply of direct care to a client increases with the degree of disablement. The physical, cognitive and social abilities of the clients are significant for the allocation of services. However, we find that service levels also differ between separate groups of clients. At comparable levels of functional abilities the elderly tend to receive less care than the disabled below pension-age, which may result from more efforts to rehabilitate younger clients. Care for the mentally retarded is quite generous as compared to other groups, especially after a

national reform in the early 90s that introduced extended legal rights for the mentally retarded. Households with more than one dweller tend to receive less hours of care per client than households of single clients. This is probably due to scale economies and informal caregiving in non-single households. For the mentally retarded we find that the public supply of care decreases with individual access to private care.

The effects of budget constraints and prices on the supply of home-care are statistically significant, however modest in economic terms. Local jurisdictions with higher per capita income provide more home-care services to their residents than those authorities with lower per capita income. Clients in densely populated areas tend to receive more hours of care per week than clients in sparsely populated areas. Higher population density is assumed to reduce unit costs in home-care, because the travelling time of the staff between client homes decreases with density. Thus we find a substitution effect in the allocation of home-care on clients with different prices that derive from travelling costs.

Our results are consistent with the view that local government behavior is partly affected by economic constraints and partly by legal and professional guidelines for the assessment of individual needs. Thus it is relevant to derive individual service standards from observed behavior by means of model simulation. For this purpose it is appropriate to level out the impact of income and prices on supply. To estimate a common standard of service production the supply to each client is simulated at fixed levels of income and prices, while individual characteristics that affect needs assessment are allowed to vary. This method may reveal national service standards which are independent of the service producing unit. Although the results imply that different local service standards also have some impact on supply, it is still of interest to identify a national average of the standards that prevail in local communities. This common (or average) standard is derived from a model of local government behavior, which is based on the assumption that service standards are incorporated in local government preferences.

The simulated service standard is measured in hours of care per week, and varies as a function of individual characteristics that are assumed to account for needs. Consequently we are able to compare the observed distribution of home-care to the distribution of standardized needs. In order to evaluate the distribution of home-care it is important to take into account the diversity of clients and their needs. Therefore the analysis of service distribution is based on the supply-need gap, which is the difference between the supply and the simulated service standard. The spread in the supply-need gap is found to vary substantially across communities, which may imply a varying degree of mismatch between supply and need. Large spread in the supply-need gap is taken as an indication of a high degree of mismatch.

A further possibility is to use the simulated need for home-care as a base for cost reimbursements in home-care production. Such a sceme takes into account information about both the number of clients and individual characteristics that affect their needs. Thus compensation from the national government to local authorities should be related to the needs of the clients. Otherwise those communities with a high share of "light-care" clients would be overcompensated, which would create incentives to discriminate against "heavy-care" clients. A similar system called the Resource Utilization Group System (RUG) has been introduced in U.S. for the nursing home sector, see Schneider et. al. (1983). An advantage of the approach in the present paper is that the need for home-care is derived from a theory of local government behavior and the estimated parameters of a corresponding empirical model. Service standards that in this manner are based on observed behavior can be interpreted as predominant social norms for service supply. Moreover, the need for home-care is measured on a continuous scale, whereas reimbursement in the RUG system is based on a classification of clients in 16 case-mix groups.

By aggregation of needs for home-care a measure of total standardized production can be computed for each local community. This measure summarizes comprehensive information about the clients, and permits an integrated analysis of service production on the micro and macro level. For instance, the proposed concept of standardized production could be included in analyses of efficiency variation among home-care producing units. Thus the approach has the potential to introduce extended perspectives on both distribution and efficiency issues.

# References


Behrman, J.R. and S.G. Craig (1987): The Distribution of Public Services: An Exploration of Local Governmental Preferences. *The American Economic Review* 77, 37-49.

Blomquist, S. and V. Christiansen (1995): Public Provision of Private Goods as a Redistributive Device in an Optimum Income Tax Model. *Scandinavian Journal of Economics* 97, 547-567.

Boadway, R. and M. Marchand (1995): The Use of Public Expenditures for Redistributive Purposes. *Oxford Economic Papers 47, 45-59.*

Borcherding, T.E. and R.T. Deacon (1972): The Demand for the Services of Non-Federal Governments. *The American Economic Review* 62, 891-901.

Bradbury, K.L. H.F. Ladd, M. Perrault, A. Reschovsky and J. Yinger (1984): State Aid to Offset Fiscal Disparities Across Communities. *National Tax Journal* 37, 151-170.

Epple, D. and R.E. Romano (1996): Public Provision of Private Goods. *Journal of Political Economy* 104, 57-84.

Langørgen, A. and R. Aaberge (1999): A Structural Approach for Measuring Fiscal Disparities. Discussion Paper 254, Statistics Norway, Oslo.

Nichols, A.L. and R.J. Zeckhauser (1982): Targeting Transfers Through Restrictions on Recipients. *American Economic Review Papers and Proceedings* 72, 372-377.

Roemer, J.E. (1998): *Equality of Opportunity*. Harvard University Press, Cambridge.

Schneider, D., B. Fries and M. Desmond (1983): Incentives and Basic Principles for Long-Term Care RUG-II Case Mix Reimbursement System. Rensselaer Polytechnic Institute, New York.

Sen, A. (1992): *Inequality Reexamined*. Russel Sage Foundation, New York.

Shoup, Carl S. (1964): Standards for Distributing a Free Governmental Service: Crime Prevention. *Public Finance* 4, 383-392.

Sinn, H.-W. (1995): A Theory of the Welfare State. *Scandinavian Journal of Economics* 97, 495-526.

Wagstaff, A., E. van Doorslaer and P. Paci (1991): On the Measurement of Horizontal Inequity in the Delivery of Health Care. *Journal of Health Economics* 10, 169-205.

Wildasin, D.E. (1986): *Urban Public Finance*. Harwood Academic Publishers, New York.

# Variables in the empirical analysis

| | |
|---|---|
| q | Supply of home-care in hours per week |
| $s_1$ | Functional ability for toilet visits, eating and dressing |
| $s_2$ | Functional ability for mobility, hygiene and cooking |
| $s_3$ | Functional ability for cleaning and purchasing |
| $s_4$ | Cognitive abilities |
| $s_5$ | Social abilities |
| $t_1$ | Access to private care |
| $t_2$ | Dummy for single household |
| $t_3$ | Dummy for mental retardation |
| $t_4$ | Dummy for younger clients (below 67 years of age) |
| $v$ | Dummy for homes in urban districts |
| $y$ | Municipal discretionary income per capita |
| $d$ | Dummy for the municipality of Oslo |