

2 DEALING WITH MICRO-MACRO RELATIONS: A HEURISTIC APPROACH WITH EXAMPLES FROM HEALTH SERVICES RESEARCH

Peter Groenewegen

2.1 Introduction

The relations between levels of analysis, ranging from individuals to society at large, are at the core of the social sciences. By implication, an understanding of these relations is important in the application of the social sciences to issues of health and health care. This paper outlines a heuristic approach to the relations between micro and macro levels. That approach, which is derived from the social sciences -- sociology in particular -- is discussed using health services research as an example.

Health services research is concerned with relationships between populations and their health resources (White et al., 1992). It studies the mutual relations between the demand for and the supply of health care, on the one hand, and the structure and organization of the health care system that influences these relations, on the other (Groenewegen et al., 1994). It is policy-oriented, applied research. Policy-oriented means that health services research aims to improve the level of care a country provides for people. Its applied nature comes to the fore in answering research questions by using theoretical insights and methodologies from a number of disciplines. The disciplinary roots of health services research lie in the social and behavioural sciences -- such as geography, sociology, economy, and psychology and in epidemiology and medicine.

At the macro level, health services research deals with topics such as the geographical distribution of health services in a country. According to the heuristic approach, macro-level phenomena can only be explained by specifying a micro-level mechanism. In the case of this example, that mechanism would be the locational behaviour of health care providers. The relation between the macro level and the micro level has two dimensions. On the one hand, health services research is concerned with the influence of the availability of services (macro) on people's use of health care (micro). On the other hand, people's behaviour at the micro level also constitutes macro-level phenomena. For instance, at the macro level, their behaviour shows up as an increase in health care expenditure due to increased utilization, which itself is a consequence of a change in co-payments.

In the next section, these approaches to micro-macro relations will be described as general heuristics. First, a general approach to the explanation of macro-level relationships will be described by relating structural and institutional circumstances to individual behaviour and by relating individual behaviour to collective outcomes. Second, an approach to analysing social change will be discussed. And finally, the issue of the unintended consequences of behaviour will be considered.

The steps in the general heuristic approach -- behaviour at micro level, the step from macro level to micro level, and the step going the other way around -- will be discussed in the sections to follow. Each step will be illustrated using examples from health services research.

2.2 The relation between micro and macro level

This section looks at micro-macro problems from three perspectives. It begins with a discussion of the general approach to the problem, as developed by Coleman (1986; 1990). Then, the analysis of social change is discussed, according to the heuristics of Boudon (1981). Finally, a special topic is considered, namely the unintended consequences of behaviour.

The general approach

Coleman's thesis is that the analysis of relations between macro-level phenomena is central to the social sciences. The explanation of macro-level relations requires the specification of a behavioural mechanism at the micro level and the transformation of micro level outcomes back to the macro level. Figure 2.1 shows the basic scheme.

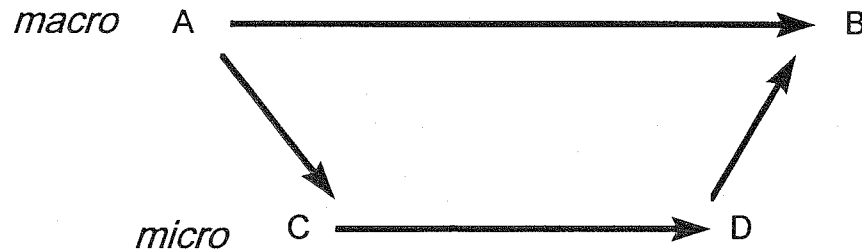


Figure 2.1 Coleman's scheme of the relations between micro and macro level

This scheme depicts the relation between two macro-level phenomena, A and B. An example from the field of health services research is the issue of the spatial distribution of health care facilities. Consider the following research question: Why is the provision of health care more evenly spread in centrally governed and funded health care systems? (Smith 1979). This research question makes a connection between two phenomena: the organization of health care systems, and the distribution of health care provision. The micro-level mechanism to explain a relation like this one is locational decision-making by health care providers. The institutional structure of health care systems (A) influences the range of options open to health care providers and facilities (C) upon which locational decisions (D) are made. Individual locational decisions aggregate to patterns of distribution (B). In sum, the explanation of a macro-level relationship between A and B requires the steps from A to C, from C to D, and from D to B.

This heuristic integrates macro- and micro-level analysis. These two levels sometimes appear to be unrelated fields of research:

"There appear to be two mutually exclusive approaches to investigation, one *ecological*, the other *behavioural*. The ecological approach poses questions such as: 'what sorts of characteristics are associated with a favourable ratio of physicians relative to population?' The behavioural approach, by contrast, seeks to establish the nature and relative importance of factors relevant to the locational decision making of individual physicians." (Joseph and Phillips 1984).

Analysing social change

Coleman's heuristic shows the basic structure of the explanation of macro-level relations. It is, however, more easily applied to comparatively static problems than to problems involving social change. Boudon intentionally designed a heuristic to analyse processes of

social change. He distinguishes between *environment*, which includes the social and institutional structure, the *interaction system*, which includes the relevant actors, and the *outcomes*, which is a distribution, e.g. of scarce resources. These elements correspond to Coleman's A, C and D, and B respectively: the environment influences the interaction system which produces certain outcomes. However, Boudon's next step, which makes the system a dynamic one, is that outcomes might feed back to the processes in the interaction system or to the environment. Boudon distinguishes three processes of social change. In the first, called reproduction, there are no feedbacks, and outcomes stay the same. In the second, there is feedback from outcomes to the interaction system, causing a process of cumulation or the gradual change of a distribution. Finally, if there is also feedback to the environment, a process of transformation is occurring.

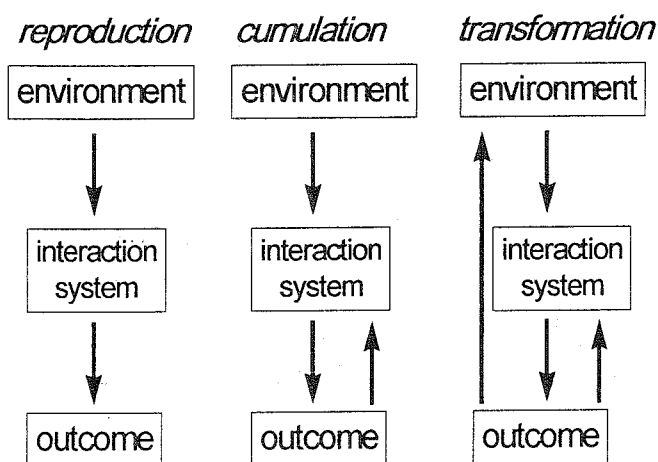


Figure 2.2 Boudon's scheme for analysing processes of social change

As an example of these processes of social change, one could look at the system of care surrounding childbirth (Schuller 1995). As outcomes, we are interested in the changing distribution of the place where women bear their children. By the end of the last century and the beginning of this century in Western countries, most children were born at home with assistance of a midwife. With the single exception of the Netherlands, where approximately 30 percent of the children are still born at home, childbirth has become a hospital affair in Western countries. How did this change come about? The interaction system consists of child-bearing women and their direct social environment, midwives, and physicians. The environment consists of the broader health care and hospital system. That system should be understood both in the structural sense of accessibility and supply and in the institutional sense of the regulation of professions involved. Furthermore, the environment also consists of developments in medicine and medical technology. Until the early 20th century, the system was in equilibrium and could be characterized as a reproduction process. There was not much choice; nearly all women had their babies at home, attended by a midwife. However, with the development of the modern hospital, improved hygiene, and new medical technology, the outcome of hospital deliveries in terms of the health of child and mother became as good as the outcome of home deliveries and under some conditions even better.

From that time on, there was a choice. Generally speaking physicians developed an interest in doing hospital obstetrics; their safety arguments appealed to women, and midwives were not in a position to counteract. These good and sometimes better results of hospital births feed back to the interaction system and influence the decision-making process on the place of birth, especially in the case of a first child. The declining of family size during the 20th century resulted in relatively more first children per family. Combined with the changing decision-making on place of birth, the share of hospital births started to increase rapidly: a process of cumulation. In most European countries, sometime in the 1960s the number of home births was so low that having one's baby at home virtually disappeared as an alternative. Market shares became too low for self-employed community midwives. Physicians doing home deliveries would be scandalized within their profession. So in the end, even the environment is affected. Again, there is no choice whatsoever: hospital birth has become the rule. Among Western industrialized countries, the Netherlands is the only exception, probably due in part to the stronger legal position of midwives, their professional education, and the reimbursement rules of public insurance.

Generally, in this heuristic, the interaction system is the micro-level process. The environment is the macro-level, determining the range of options of the actors within the interaction system. And the outcome is the macro-level result of (inter-)action.

Unintended consequences of behaviour

Unintended consequences are part and parcel of social change. Decreasing family size, for instance, the unintended consequence of speeding up the cumulation process of the share of hospital deliveries.

Unintended consequences of behaviour are at the centre of interest among social scientists (Popper 1963; Wippler 1981; Boudon 1982). If, as a first approximation, human behaviour is seen as goal-oriented, the question arises why people do not always reach their goals. Part of the answer lies in the transformation from the micro to the macro level. Two important sources of unintended consequences are interdependencies of individual behaviour and incorrect anticipation of the reactions of others. An example of interdependencies leading to unintended consequences can be found in what has been called fee inflation. This occurs when there is a macro budget for, say, specialist care, and individual specialists are paid on a fee-for-service basis. If they bill too many services, they overrun the budget and have to adjust their fees downward. If individual physicians want to maintain their income level, they have to increase the number of services they provide. While all the others do the same, the unintended consequence arises that they all have to work harder to earn the same income (Delnoij 1994).

Health policy struggles with unintended consequences due to the incorrect anticipation of the reactions of policy subjects. Take, for example, the response to the announcement of the basic ideas for health system reform in the Netherlands in the second half of the 1980s. The aim of the intended reforms was to improve the performance of the system by introducing market elements and competition in health care. Health insurance organizations preempted this policy by a series of mergers. This, in turn, made it very difficult to attain the original aims of the policy when competition was actually introduced because of the low number of competitors (Groenewegen 1994).

In sum

This section has briefly discussed three heuristics to connect the micro and the macro levels. Macro-level structures and institutions influence individual behaviour and the interaction between individuals. At the same time, individual behaviour is transformed into macro-level

outcomes, both intended and unintended. The following sections will deal with some aspects of the behavioural theory at micro level. Subsequently, the relation between macro and micro level, and the other way around, will be discussed.

2.3 Micro level: the behaviour of patients and providers

An important element in analysing macro-level phenomena is the behavioural theory at micro level. The point of departure is that people's acts are goal-oriented and rational in a restricted sense, i.e. against the background of their knowledge and ideas about goals and means to reach them (Boudon 1981). The extent to which people achieve their goals will be determined by the constraints imposed on them as well as by the resources at their disposal. In as far as constraints and resources are structurally or institutionally determined, they are the way to bridge the gap between macro and micro level (Wippler and Lindenberg 1987).

If we apply a theory of goal-oriented behaviour as an element of an explanation, we need to know the background against which people weigh up their alternatives - in other words, what their goals are. A systematic approach to this is given in social production function theory (Lindenberg 1996). The assumption here is that people have a limited number of ultimate goals, namely physical well-being and social approval. In which way, or via which intermediate or instrumental goals, people try to achieve these ultimate goals depends on social structural and institutional conditions.

The behaviour of health care providers

Health workers may be assumed to strive to achieve the same general goals of physical and social well-being as everyone else. An important instrumental goal specific to health workers is to promote their patients' or clients' health. The importance of this goal has been inculcated through a long period of socialization in medical school and internships and during post-graduate specialization. The patient's health is usually the first and foremost frame of reference that determines a physician's definition of a decision situation. This also underlines the mutual dependence of health workers' and patients' goals.

The fact that health workers also have other instrumental goals makes it understandable that they are not necessarily perfect agents for their patients (Mooney and Ryan 1993; Domenighetti et al., 1993). The actions they take to improve their patients' health have consequences for other goals: they take time, generate income, or lead to approving or disapproving reactions by colleagues. Structural conditions at the system level might influence the possibilities to achieve an optimal mix of income and leisure time. Fee-for-service payment makes it attractive to perform more services, because that increases income, as was hypothesized by Westert (1992). Physicians who work in a single-handed practice depend on their patients for social approval, while those in a group practice depend on their colleagues to achieve the same goal (Freidson 1970).

The behaviour of patients

Models of patients' behaviour have been elaborated mainly from a social-psychological point of view. A common model is the Health Belief Model (Janz and Becker 1984), which is based on attitude theory. A more sociologically oriented model is the so-called Andersen-Newman model (Andersen and Newman 1973). It is used to predict health care utilization on the grounds of three types of influence: predisposing variables, such as age and gender; enabling variables (or constraints), such as insurance status or availability of health services;

and need variables, such as the experience of symptoms of ill health. These models miss a theory of preference, such as social production function theory. They either take the goals of patients for granted (as in the Anderson-Newman model) or just ask people for their preferences (as in the Health Belief Model). In the area of health economics, the Grossman model (Grossman 1972; Van Doorslaer 1987) assumes that health care utilization is an instrumental goal, among other instrumental goals, to produce health. The basic idea is that people invest in maintaining their 'stock of health capital' by their life style, preventive actions, and use of health care. We assume that, apart from maintaining or regaining health, people also have other instrumental goals, such as reducing anxiety or uncertainty (Ben Sira 1986) or finding quick or slow solutions to their problems (e.g. depending on sickness benefits). However, a systematic elaboration of patients' instrumental goals, relating them to structural and institutional circumstances, is not available yet.

Patient-provider interaction

Utilization of health services, the meeting point of supply and demand, is constituted in the interaction between health care providers and patients, usually during the consultation. A typical feature of this interaction is its asymmetry. First of all, asymmetry exists in the importance of the consultation. For a particular patient, there is only one problem and that is his or hers, while for the health worker there are many patients with many problems (Gillon 1988). Secondly, there is asymmetry in information. Providers have information that patients do not have, and the former use that information to come to a diagnosis or to advise therapy. Finally, health care providers sometimes govern access to scarce resources, such as drugs that are only available on prescription or sickness certificates that entitle the patient to certain benefits (Stone 1979).

Given these asymmetries, one would hypothesize that the expectations of health workers and patients often diverge (Persoon 1975). Of course, both also have other instrumental goals in addition to regaining or maintaining health. In situations of diverging expectations, patients may choose among three modes of action:

- negotiate or confront the health worker: the alternative of the knowledgeable patient;
- find another health care provider: the option of 'doctor shopping' or turning of alternative medicine;
- act as if they accept the situation but neglect the advice: the option of non-compliance.

Both the diverging expectations and the options that will be chosen in such situations depend on constraints and resources.

2.4 From macro to micro level: constraints at different levels

The gap between macro and micro level is bridged by assumptions about structural and institutional constraints that influence the way people can realize their goals. These constraints operate at different levels. Basically, the organization of the phenomenon one studies determines what the relevant levels are and where they are located. In the case of health services research, three levels might be relevant: the level of the health care system; the level of the practice or organization providers work in and, on the patient side, his or her social context; and the level of the actual consultation between provider and patient. The upper half of figure 2.3 shows these levels.

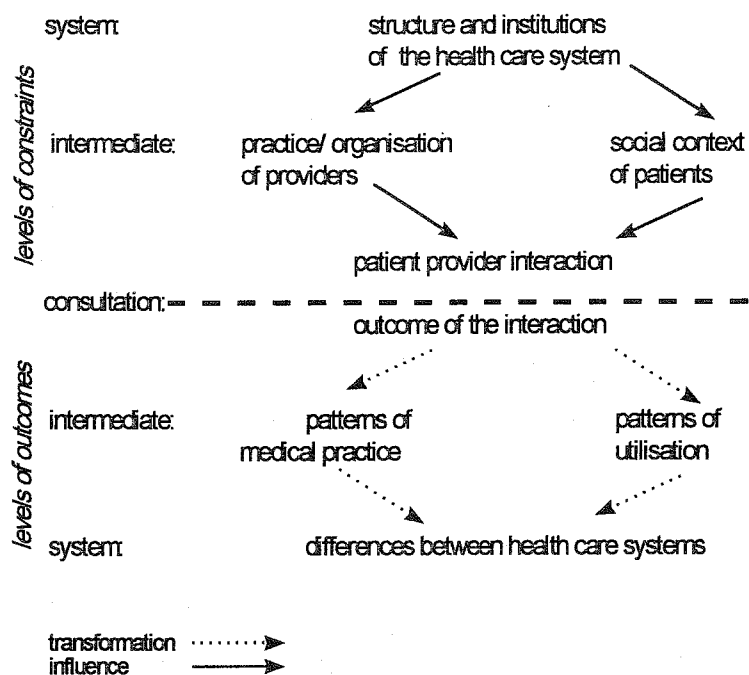


Figure 2.3 Levels of constraints and levels of outcomes

At the system level, both health care providers and patients are influenced by the structure and institutions of the health care system. The result of the interaction between patient and provider, in terms of the alternative modes of action distinguished above, is influenced at the system level by the extent to which consultations are embedded in an existing patient-provider relationship. This is particularly evident when patients are on the list of a specific health care provider. This casts a shadow on the quality of future interactions. Moreover, in some systems, the restrictions on changing one's doctor are more stringent than in others (Thomas et al., 1995). If providers are paid on a fee-for-service basis, patients and health workers are usually not tied to each other institutionally; if so, they are bound for a limited time only. In this case, one would expect patients to negotiate when expectations diverge. If providers are paid on a capitation basis, patients and providers are tied to each other. Usually, there are then administrative barriers to making a change in one's doctor. It is hypothesized that the reaction to diverging expectations in this situation will often be non-compliance. If providers are in salaried service, patients are usually tied to a group of providers, but not to an individual doctor. In this case, we would expect to find a higher incidence of doctor shopping.

The second, intermediate level at which constraints operate is at the level of the practice or organization of the provider and the social context of the patient. Doctors in single-handed practice are more dependent on their patients to gain social approval, while doctors who work in larger groups depend more on each other to gain this good (Freidson 1970). As a consequence, the former might be more willing to negotiate with their patients. On the patient side, the tendency to negotiate might be influenced by a person's ability to communicate one's goals to the health care provider which is probably related to their

educational level. In addition, negotiation may be motivated by the need to communicate one's goals, probably related to the patient's economic position (the costs of proposed treatment in terms of time or money) (Westert et al., 1991). Finally, constraints emerge at the level of the consultation. The more urgent a health care problem is, the less important the patient's other goals will be and the more patients will be inclined to follow professional advice. If the health problem is less urgent, the goals will coincide to a lesser extent. If, in such a case, the doctor's freedom of decision-making is reduced by professional guidelines or protocols, the patients might be more inclined to try doctor shopping to get a second opinion.

2.5 From micro level to macro level

Health services research does not usually try to explain the choices made by individual health care providers or patients. On the side of providers, the interest is mainly in patterns of medical practice; there is less interest in the choice of a therapy in an individual case. In the same way, on the patient side, interest is mainly in patterns of health care utilization. The behaviour of individual providers and patients, therefore, has to be transformed to higher levels (see the lower half of figure 2.3). Just as the above discussion distinguished different levels at which constraints operate, it also distinguishes different levels of results: from the results of the interaction of provider and patient in particular consultations, to intermediate-level results in terms of practice patterns and utilization patterns, to differences between health systems at the system level.

The transformation of micro level to macro level can take diverse forms. We distinguish five:

- aggregation; in this case, individual behaviour is transformed to a distribution through the application of a mathematical transformation. An example is the rate of Caesarian sections in a region. This is the sum of the individual decisions by gynecologists to perform a section, divided by the total number of births in certain time period.
- partial definition (or definition by convention); when the incidence of an individual effect reaches a certain level, a collective effect is supposed to exist by definition. An example is the existence of an epidemic. One might use the partial definition that if a certain percentage of the population at risk is infected, an epidemic is supposed to exist.
- the application of institutional rules; in this case the transformation is not made through a more or less arbitrary definition but is based on an institutional rule. An example is the process of creating consensus statements or protocols for medical treatment. In a process like this, implicitly or explicitly, a majority rule is used as a necessary step in transforming individual expert opinion into a consensus document.
- game theory and simulation; the analogy of a game can be used to predict the collective outcomes of joint individual actions. Game theory can be applied in analysing fee inflation, for instance. When formal mathematical solutions cannot be found, simulation can be used to transform individual effects to collective outcomes.

2.6 Conclusions

This chapter has discussed the relations between micro and macro levels by using examples from health services research. These examples provide the grounds for a heuristic approach. The approach used here is based on Coleman's general scheme of explaining macro-level

relations through micro-level mechanisms, Boudon's analytical scheme of processes of social change, and the analysis of unintended consequences of behaviour. One important element in this heuristic is a behavioural theory at micro level. The approach used here is based on goal-oriented behaviour and the idea of social production functions. That basis makes it possible to relate macro-level structures and institutions to behaviour.

This approach has proven to be fruitful in a number of theory-guided empirical studies of the spatial distribution of physicians (Groenewegen and Van der Zee 1983; Groenewegen 1985), health care providers' allocation of time (Calnan et al., 1992; Cancrinus-Matthijssse 1995), and practice patterns (Flierman 1991; Westert 1992; Uunk et al., 1992; Delnoij 1994; Delnoij and Spreeuwenberg, forthcoming).

The heuristic approach is being used in a number of current studies on patterns of medical practice and differences between health care systems. The aim of these studies is to gain insight in the spatial and dynamic relations of health care supply and hospital production in European countries.

Health services research is both applied and policy-oriented. The approach described in this chapter appears to be easily transferable to other applied fields, such as housing.

References

- Andersen, R. & J.F. Newman (1973), Societal and individual determinants of medical care utilization in the United States. *Milbank Memorial Fund Quarterly* 81, pp. 95-123.
- Ben Sira, Z. (1986), *Stress, disease and primary medical care*. Aldershot: Avebury.
- Boudon, R. (1981), *De logica van het sociale: een inleiding tot sociologisch denken*. Houten: Bohn Stafleu Van Loghum.
- Boudon, R. (1982), *The unintended consequences of social action*. London: Macmillan Press.
- Calnan, M., P.P. Groenewegen & J.B.F. Hutten (1992), Professional reimbursement and management of time in general practice: an international comparison. *Social Science and Medicine* 35, pp. 209-216.
- Cancrinus-Matthijssse, A.M. (1995), *Tussen hulpverlening en ondernemerschap: beroepsuitoefening en taakopvattingen van openbare apothekers in een aantal West-Europese landen*. Ph.D. Thesis, Universiteit van Amsterdam.
- Coleman, J.S. (1986), Social theory, social research and a theory of action. *American Journal of Sociology* 91, pp. 1309-1335.
- Coleman, J.S. (1990), *Foundations of social theory*. Cambridge, MA: Belknap Press of Harvard University Press.
- Delnoij, D.M.J. (1994), *Physician payment systems and cost control*. Utrecht: Nederlands Instituut voor Onderzoek van de Gezondheidszorg (NIVEL).
- Delnoij, D.M.J. & P.M.M. Spreeuwenberg (1997), Variation in GPs' referral rates to specialists in internal medicine. *European Journal of Public Health* (forthcoming).
- Domenighetti, G., A. Casabianca, F. Gutzwiller & S. Martinoli (1993), Revisiting the most informed consumer of surgical services: the physician-patient. *International Journal of Technology Assessment in Health Care* 9, pp. 505-513.
- Doorslaer, E.K.A. van (1987), *Health, knowledge and the demand for medical care: an econometric analysis*. Ph.D. Thesis, Rijksuniversiteit Limburg.
- Flierman, H.A. (1991), *Changing the payment system of general practitioners*. Utrecht: Nederlands Instituut voor Onderzoek van de Gezondheidszorg (NIVEL).
- Freidson, E. (1970), *Profession of medicine: a study in the sociology of applied knowledge*. New York: Harper & Row.
- Gillon, R. (1988), Ethics, economics and general practice. In: G. Mooney & A. McGuire (eds.), *Medical ethics and economics in health care*. Oxford: Oxford University Press pp. 114-134.
- Groenewegen, P.P. (1985), *Locatiekeuze en huisartsendichtheid; een verklaring van regionale verschillen en veranderingen*. Ph.D. Thesis, Rijksuniversiteit Utrecht.
- Groenewegen, P.P. (1994), The shadow of the future: institutional change in health care. *Health Affairs* 13, pp. 139-148.
- Groenewegen, P.P. & J. van der Zee (1983), Spreiding van huisartsen en tandartsen over Nederland; gelijke doelstellingen, verschillende regels. *Gezondheid en Samenleving* 4, pp. 99-109.

- Groenewegen, P.P., J.M. Bensing & J.M. Bosman (1994), Een inventarisatie van gezondheidszorgonderzoek in Nederland. In: Raad voor Gezondheidsonderzoek, Advies Gezondheidszorgonderzoek. Den Haag: RGO.
- Grossman, M. (1972), On the concept of health capital and the demand for health. *Journal of Political Economy* 80, pp. 223-255.
- Janz, N.K. & M.H. Becker (1984), The health belief model: a decade later. *Health Education Quarterly* 1, pp. 1-47.
- Joseph, A. & D. Phillips (1984), Accessibility and utilization. New York: Harper & Row.
- Lindenberg, S. (1996), Continuities in the theory of social production functions. In: H. Ganzeboom & S. Lindenberg (eds.), *Verklarende sociologie: opstellen voor Reinhard Wippler*. Amsterdam: Thesis Publishers, pp. 169-184.
- Mooney, G. & M. Ryan (1993), Agency in health care: getting beyond first principles. *Journal of Health Economics* 12, pp. 125-135.
- Persoon, J.M.G. (1975), *Veranderingen in de patiënt-huisartsrelatie*. Nijmegen: Dekker & Van de Vegt.
- Popper, K.R. (1963), Prediction and prophecy in the social sciences. In: *Conjectures and refutations*. London: Routledge & Kegan Paul.
- Schuller, R. (1995), *Parallele modernisering in de verloskunde: verklaring van de ontstane verschillen in baringscultuur van de Westerse wereld gedurende de twintigste eeuw*. Utrecht: Faculteit Ruimtelijke Wetenschappen (scriptie).
- Smith, D. (1979), *Where the grass is greener; living in an unequal world*. Harmondsworth: Penguin.
- Stone, DA. (1979), Diagnosis and the dole: the function of illness in American distributive policies. *Journal of Health Policy, Politics and Law* 4, pp. 507-521.
- Thomas, K., J. Nicholl & P. Coleman (1995), Assessing the outcome of making it easier for patients to change general practitioner: practice characteristics associated with patient movements. *British Journal of General Practice* 45, pp. 581-586.
- Ultee, W., W. Arts & H. Flap (1992), *Sociologie: vragen, uitspraken, bevindingen*. Groningen: Wolters-Noordhoff.
- Uunk, W.J.G., P.P. Groenewegen & J. Dekker (1992), Verwijzingen van huisartsen naar fysiotherapeuten: een verklaring en analyse van verschillen tussen huisartsen. *Mens en Maatschappij* 67, pp. 389-411.
- Westert, G.P. (1992), *Variation in use of hospital care*. Assen: Van Gorcum.
- Westert, G.P., P.P. Groenewegen & S.M. Lindenberg (1991), De invloed van ziekenhuispatiënten op den duur van de hospitalisatie. *Tijdschrift voor Sociale Gezondheidszorg* 69, pp. 184-194.
- White, K.L., J. Frenk, C. Ordonez, J.M. Paganini & B. Sarfield (1992), *Health services research: An anthology*. Washington, DC: PAHO.
- Wippler, R. (1981), Erklärung unbeabsichtigter Handlungsfolgen: Ziel oder Meilenstein soziologischer Theoriebildung. In: J. Matthes, Hrsg., *Lebenswelt und soziale Probleme*. Frankfurt a. M.: Campus, pp. 246-261.
- Wippler, R. & S. Lindenberg (1987), Collective phenomena and rational choice. In: J. Alexander et al. (eds.), *The micro-macro link*. Berkeley: University of California Press, pp. 135-152.