HOSPITAL ADMISSIONS IN THE DUTCH AND BELGIAN HEALTH CARE SYSTEMS

An analysis of regional variation

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PREFACE

The idea of conducting this study of regional variations in hospital admission rates originated some years ago in the reading of Xavier Leroy's book 'Offre et consommation de soins en medicine générale; analyse regionale, méchanismes du marché indicateurs de besoins' (Supply and utilization of primary health care; regional analyses, market mechanisms and indicators of need). As an appendix to this book a wealth of regional data on the Belgian health care system was published.
We have added some statistical data to this and we have gathered comparable data on the Netherlands, which was an extremely tedious job.
What started as a minor project - a relatively peripheral activity and closing entry after our main research-activities - has resulted in this rather voluminous report. In concluding this study we would like to thank the people who have contributed to it in some way or the other.
First of all we are in dept to Dr. X. Leroy (Service d'études Socio-économiques de la Santé, Université Catholique de Louvain) who published the regional data for Belgium. For supplementary data we thank the Nationaal Instituut voor de Statistiek (National Institute of Statistics, Brussels) and for data on the Netherlands the Centraal Bureau voor de Statistiek (Central Bureau of Statistics, Voorburg) and the Geneeskundige Hoofdinspectie van de Volksgezondheid (Chief Inspector of Public Health, Leidschendam). We thank Mrs. M. Boschman (Netherlands Institute for primary care - NIVEL) for her assistance throughout the project.
Valuable comments on an earlier draft of this report were made by our colleagues from the Netherlands Institute for Primary Care (NIVEL), by Mrs. M. van Dormaël (Groupe d'Etude pour une Réforme de la Médicine, Brussels), F.P. Duisters (Central Bureau of Statistics), Mrs. M. Foets (Erasmus University, Department of Health Services Administration), X. Leroy (Catholique University of Louvain, Centre for socio-economic studies of health), J. Peschar (State University at Groningen, Department of Sociology) and B.H. Posthuma (Aegon insurance company, Haren).
All remaining errors are ours.

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CONTENTS

1. INTRODUCTION

The analysis of health care systems is one of the more complicated types of health services research. On the one hand it is problematic to compare systems as a whole - one has to be sure that both in the criteria (often expressed as the proportion that health care expenditures form in the gross or nett national product) and in the object of comparison (the health care systems) all relevant elements have been included.

This implies a painstaking and careful scrutiny of the composing criteria and the definition of parameters used in the comparison. Even in cases where systems are sufficiently comparable, differences in performance are not so easily interpretable. Health care systems differ in many respects that change in time at an unequal rate; all changes cumulating in a fluctuating proportion of the G.N.P.
It is on the other hand equally risky to draw a conclusion about the health care system as a whole from the comparison of one single feature. Differences in one respect might be compensated in other parts of the system.

Nevertheless it is tempting to compare health care systems partially or totally. Although the rate of growth of the health care sector varies considerably between countries[1], the continuing upward trend and the apparent difficulties in containing the costs increases the tendency to look over the wall and to point out the better functioning parts of the neighbouring system.
When we limit ourselves to the Dutch and Belgian situation we see an unmistakable increase in mutual interest. In Belgium the idea of modifying the dominant fee-for-service system and the creation of a barrier for specialist medical care is being considered. In Holland there is a growing concern about the supposed negative effects of the capitation-fee system on the diligence of general practitioners.
So a neighbour's health care system might serve as a mirror and reveal that the ways problems are solved in a particular system are not unique at all.

Why comparing the Dutch and Belgian Health Care System
There always is a mix of theoretical and practical reasons for such decisions. To start with a pragmatic reason: the comparison of health care systems is hampered by the implications of the terms and definitions used. Even the most simple things are in need of constant explanation. Geographical (and also very important linguistic) proximity can ease these problems. Another pragmatic argument is the existence of an inter-

esting and reliable set of data collected at the **Service d'études socio-économiques de la Santé** (Center for socio-economic studies of health directed by prof. Denise Deliège-Rott of the Catholic University of Louvain). Without the work of Xavier Leroy, this study would never have been completed (Leroy, 1978, 1981[a], 1981[b]). Beside the availability of a unique data set for the Belgian health care system (an important condition), the striking differences in many respects between the two geographically neighbouring systems formed the main theoretical reason for undertaking the study. A comparison of Great Britain and Belgium would yield even more contrasts and be theoretically more fruitful. But then, on both sides of the comparison data collection would be necessary and that was not possible in a pilot study like this, partly as a result of the absence - as a consequence of the system - of disaggregated British data. The fact that data needed for comparison are a product of the systems themselves played a trick on us during our study as will be shown in the following chapters.

Why hospital admissions

At first we prefer a partial analysis to an analysis of the complete system because we want to base our comparison as far as possible on assumptions about the behaviour of **demanders** and **providers** of health care. In that respect hospital admissions are not our first choice because a lot of decisions have been made before the admission. The availability and comparability of data and the certainty that hospital admissions play a key role in the dynamics of the health care system made us take this decission.

For this first exercise we used data from 1974.

The contents of this study

This report consists of five chapters and the introduction. In the first chapter we give some guidelines for the analysis of health care systems. In this chapter we mainly refer to the work of the Canadian economist Robert Evans. This framework is followed by description of the relevant aspects of the two health care systems. In the third chapter we try to elaborate on a set of hypotheses about the behaviour of consumers and providers of health care, which will predict regional differences in hospital admissions. In our analysis we must separate the processes that are common to both health care systems and the unique features and processes in each of them. Before we can test our hypotheses in chapter 6, we will give a precise description of the data used in this study. Some of the differences found might be due to differences in data collection and definition. After presenting and commenting on the results we will conclude our report with (among other things) suggestions for further research.

Recently data on the Belgian health care system were published for the situation in 1979 (Leroy, 1983). This made it possible to replicate our analyses. This replication is added as appendix III.

2. GUIDELINES FOR THE ANALYSIS OF HEALTH CARE SYSTEMS: THE TYPOLOGY OF ROBERT EVANS

In order to separate what is relevant from the (wealth of) trivial details while comparing health care systems, one needs a framework for analysis. In most cases this framework is entirely implicit.
Some common elements are discernable however. Blanpain, Delesie and Nys (Blanpain e.a. 1978) described the legislative role of the state in 5 European countries. In the introductory chapter they divided the countries into groups with direct and indirect governmental influence at a centralized or decentralized level. Other important factors are : the ownership of hospitals (state owned or owned by voluntary associations or profit based) and the remuneration of physicians (salaried, fee-for-service, capitation fee). The regulative role of the government in the health insurance market is their main focus of interest (Blanpain e.a.; 6 and 14-29).
When Foets and Nuyens (1980) described the Belgian health care system in their monograph "Focus op de Belgische Gezondheidszorg", they divided their book in three parts: actors, means and patterns of care. Actors are: the government (local and central), the organized professions, health insurance funds, the organized voluntary organizations for the provision of institutional care and the pharmaceutical industry. Means consists of financial means, revenues and expenditures and manpower. Patterns of care is divided in four chapters: preventive health care; ambulatory care; in-patient care (mainly hospitals); psychiatric institutions.
Both studies stress the importance of the role of the state (cf. for the Dutch health care Juffermans, 1982) in financing and regulating the provision (and consumption) of health care. So the state, whether or not indirectly regulating the financing of health care, the collective versus private insuring agency, the providers and consumers of health care and their organizations are the major actors on the stage of health care. The extent to which the actors control each other or the way they are connected is another important feature of health care systems.
Finance, revenues and expenses on a macro (the share of health care expenditures in the gross national product) and a micro level (family expenditures on health care as a source of income for providers of care) are the main topic of interest for students in this field. The better an author succeeds in connecting these elements sensibly the more comprehensive and instructive his contribution may be. An example of such an instructive paper is the essay the Canadian economist Robert Evans contributed to the reader: Health, Economics, and Health Economics (Van der Gaag & Perlman,1981), about 'Incomplete vertical integration: The dis-

tinctive structure of the health care market' (Evans, 1981). Evans' central thesis is, that the utilization of health services can only be understood as a function of the relations between five classes of transactors:

- consumers
- first line providers contacted directly by consumers
- second line providers whose output is either used by consumers under the direction of first line providers or is supplied as intermediate product to first line or other second line providers
- government and
- suppliers of insurance or purchasers of risk associated with health care use (Evans, 1981: 330-331).

These five transactors can be related in different ways (this is what Evans called vertical integration) in patterns of action varying from those which are completely independent of each other to patterns where one of the transactors dominates the scene. In the **fully professional model** all transactors are influenced or controlled directly by the first line providers who as a group have been granted self government by the formal regulating authorities. Control of insurance by providers, existed and to a certain extent still exists in Holland in a modified way in the form of health insurance funds, originated by the local branches of the Dutch Medical Association. This is a key feature in the fully professional model. In other models the emphasis lies upon the role of the government (in the **fully socialized model** the government controls both consumers and providers) or the role of the insurers (in the latter example competitive insurers - voluntary associations of consumers - directly control supply and utilization).
In Health Maintenance Organizations (HMOs) consumers control providers directly but not completely (usually professional ethics prevent complete subordination to non-professionals). Consumers choice models presuppose competition[1], a relative abundance of providers and direct (preferably local) control of procedures and expenditures.
In each system (except the ideal type where no linkage exists between the 5 transactors and consumers deal directly with all types of providers[2] the control of second line providers is complicated and in most cases unsatisfactory. In each health care system the bulk of expenditures takes place in the second line of the system (hospital, manufacturers of drugs, equipment making); the entrance is through first line providers. Sometimes the central or local government exerts control by assessing the hospital budgets. Most of the decisions of hospitals regarding investments are subject to government consent.

Evans notices that the widest range of variation across jurisdictions seems to be in the patterns of government and insurance integration with the rest of the health care system (Evans, 1981: 338). Sometimes the government only takes over the least profitable elements of insurance (the insurance for the poor and elderly, as with the Medicare and Medicaid systems in the USA).
This leads, according to Evans, to insufficient control because of the degree of freedom left to the providers of care. Only total take-over will yield the desired results: the containment of health care costs without denying the principle of equal access for consumers as Evans shows by comparing the relatively stable health care expenditures in Canada with the steeply rising figures for the USA. Evans' typology is a useful framework for comparing health care systems because it helps to separate relevant from trivial details. In the next chapter we will try to describe the Dutch and Belgian health care systems in terms of the actors and control relations as formulated by Evans.

3. SOME RELEVANT FEATURES OF THE DUTCH AND BELGIAN HEALTH CARE SYSTEM

In this chapter we will present some general characteristics of the Belgian and Dutch health care systems. In the chapters which follow we will identify those characteristics that possibly influence the number of hospital admissions and we will present a description of regional variation in terms of a number of characteristics. In this general presentation we follow the scheme of Evans, as introduced in the preceding chapter. The chapter is divided in four paragraphs: consumers, first and second line providers, the insurance system and regulation in the field of health care.

3.1. Consumers

Unless the physical well-being of people is affected strongly by the way the health care system is organized (and although this is in fact the system's purpose, in relatively affluent societies no positive connection has been found between generally accepted indicators of health care and quality and quantity of care), the health status of the population can be considered as an independent factor for the explanation of the use of health care facilities. Of course this independency is not total: illness is both a biological and social phenomenon and thus sensitive to differences in the socio-economic and legal situation of a country[1].
Direct measures of the health status of a population - let alone comparable measures for two populations - are very difficult to find. We will therefore restrict ourselves to more indirect measures, such as the demographic composition, mortality and health threatening life habits. We cannot of course take hospital admissions as an indicator of health status.

Life expectancy

Table 3.1. shows life expectancy figures for both countries.

Life expectancy is (1980) and was (1974) slightly better in the Netherlands than in Belgium. The well known (and still increasing) differences between men and women are shown clearly in this table.

Mortality

Both infant mortality rates and (age-)standardized general mortality rates are important indicators of the general health status of a population.[1] In table 3.2 both rates are presented.
The trend shown in the former table shows up in this one. The Dutch figures point to a better health status than the Belgian figures. More

Table 3.1. Life expectancy figures for Belgium and The Netherlands (1974/1980).

Life Expectancy	Belgium				The Netherlands				Index (Belgium = 100)			
	M		F		M		F		M		F	
	1974	1980	1974	1980	1974	1980	1974	1980	1974	1980	1974	1980
0 years	68.8	70.0	75.1	76.8	71.0	71.7	76.4	79.2	103	102	102	103
10 years	60.3	61.3	66.5	67.9	63.5	63.7	67.6	70.0	105	104	102	103
20 years	50.7	51.6	56.8	58.1	52.9	53.9	57.8	60.2	104	104	102	104
50 years	23.2	24.1	28.3	29.6	24.9	25.6	29.2	31.3	107	106	103	106
65 years	12.3	13.0	15.8	16.9	13.7	14.0	16.4	18.4	111	108	104	109
80 years	5.5	5.7	6.5	7.1	6.2	6.5	6.8	8.1	113	114	105	114

Table 3.2. Infant mortality and (age)-standardized mortality rates in Belgium and The Netherlands (1974/1980).

Infant mortality per 1000 life births					Index Belgium 1974 = 100			
	Belgium[a]		The Netherlands[b]		Belg.		Neth.	
	M	F	M	F	M	F	M	F
1974	19.6	15.7	12.6	9.2	100	80	64	47
1980	13.9	10.9	9.7	7.4	71	56	49	38

Crude and age-adjusted death rates per 1000 population*	Crude death rates		Standardized rates		Index Belg. 1970 X = 100	
	Belg.[c]	Neth.[c]	Belg.[c]	Neth.[c]	Belg.	Neth.
1970	12.30	8.41	10.87	8.99	100	83
1980	11.45	8.12	9.49	7.69	87	71

Sources: [a] Statistisch Jaarboek van België - 1975, 1981 (Statistical Yearbook Belgium);
[b] Statistical Yearbook of the Netherlands, 1975, 1981;
[c] Foets & Van der Zee, 1985.

* Because of the tedious task of computing age standardized death rates for two countries at several dates, this table has been copied from Foets & Van der Zee (1985). These authors present standardized death rates for 1950, 1960, 1970 and 1980. We took the figures for 1970 and 1980.

detailed information over a longer period is given by Foets and Van der Zee (1985), but this limited picture shows clear differences.

Demographic composition

Another indicator of the demand for health care is the age/sex distribution of the population. The higher proportion of the elderly, the more health care, generally speaking, is needed. Demographic changes are slow but thorough. The continuing ageing process of both populations is shown in table 3.3 which also shows the considerable differences in the age distribution of both countries.

The decline in the birth rate occurred in Belgium after the first World War, while the Dutch continued to have a birth rate of over 20 per 1000 until the end of the 1960's. The two populations basically differ in this respect.

Table 3.3. Age/sex distribution of the Dutch and Belgian Population (1974/1980).

	Belgium				The Netherlands				Index Belgium 1974 = 100			
	Male		Female		Male		Female		Males		Female	
	1974	1980	1974	1980	1974	1980	1974	1980	1974	1980	1974	1980
0-14 years	23.4	23.2	21.4	19.4	26.3	23.3	24.9	21.9	112	110	116	113
15-45 years	42.9	44.6	39.8	41.8	45.3	47.6	42.4	44.5	106	107	107	109
46-64 years	22.2	22.5	22.6	22.7	19.2	19.5	20.4	20.2	86	87	90	89
65-74 years	7.7	7.6	9.9	9.8	6.0	6.1	7.6	7.8				
75 years	3.7 11.4	4.1 11.7	6.3 16.2	7.1 16.9	3.2 9.2	3.4 9.5	4.7 12.3	5.5 13.3	80	81	76	82
Total	100%	100%	100%	100%	100%	100%	100%	100%				

Sources: [a] Statistisch Jaarboek voor België 1975-1981.
[b] Statistical Yearbook of the Netherlands, 1975-1981.

Life habits

Data about health threatening habits are not widely available for both countries. For the Netherlands they are part of the routinely published statistics, but for Belgium these data are not available, as far as we know.

Data about food and drinking habits can be gathered in two ways. The first (and most widely used) indicator consists of production and consumption statistics, e.g. the amount of alcohol produced and imported in a country minus the exportation divided by the (relevant) number of consumers, usually the number of inhabitants of a country. More detailed (but always less reliable) information is gathered from survey research.

For smoking habits the number of non-smokers (and the changes in this number over time) is as important as the average number of cigarettes smoked.
For the sake of comparability we will only present the figures we found in the WHO publication Health Services in Europe (WHO, 1981, table 9: 240-241). The data in this table stem from the years around 1974, so for the purpose of our analysis, this will do. Time series of some indicators (alcohol, smoking) are shown in Foets and Van der Zee (1985).

Table 3.4. Food, alcohol and tobacco consumption in Belgium and the Netherlands.

	Belgium	The Netherlands	Index B = 100
alcohol (in ltrs per capita/year) (1972)	9.3	6.4	69
tobacco (in lbs/adult/year) (1973)	8.5	9.8	115
energy (kJ/person/day) (1973-74)	15.2*	13.9	91
protein (g/person/day) (1973-74)	99*	86	87
fat (g/person/day) (1973-74)	174*	153	87

* Including the Grand Dutchy of Luxembourg.
Source: WHO (1981).

With the exception of smoking, which is higher in the Netherlands, the figures show higher rates for Belgium. For life style habits the picture is not as clear as for the other indicators of health status; the higher smoking rates for the Netherlands could balance the higher alcohol rates for Belgium.

Conclusion
For most indicators of health status (age-adjusted death rates, life expectancy, infant mortality) the Belgian figures are worse than the Dutch. The population of Belgium is older than the Dutch too. So both countries differ with respect to the need for health care. We cannot quantify this at the moment; we will have to take this difference into account in the analysis of differences in health care utilization.

3.2. Providers of care

In Evans' scheme the distinction between first line providers and second line providers is an important analytical tool. It should be noted that his definition of first and second line providers differs from common parlance. The concept of first line care is usually defined as ambulatory, generalist and directly accessible care. Evan's restricts his definition to this last aspect. First line providers are therefore those health care providers who can be directly consulted by the consumers, while all providers who can only be consulted after a referral by another health care provider are considered as second line providers.
There are considerable differences in this respect between Belgium and the Netherlands. Table 3.5 shows the distribution of the most important first and second liners in both health care systems.

Table 3.5. First and second line providers in the Belgian and the Dutch health care system.

		The Netherlands	
		first line	second line
Belgium	first line	general practitioner dentist	ambulatory specialist medical care
	second line	midwife[3], home care	in-patient specialist medical care, supporting medical specialists (radiology etc.), hospital services, long term medical care, dispensing chemists (Rx), physiotherapy.

The most important difference concerns the accessibility of medical specialists. In Belgium all ambulatory specialist medical care is directly accessible, in the Netherlands, as a rule, referral by a general practitioner is required. Hospital services, the services of supporting medical specialists (such as radiologists and pathologists) are in both countries only accessible indirectly. In the case of home care provided by district nurses the situation is the other way around.
The consequences of direct or indirect access to health care providers

for the analysis of regional variation in hospital admissions will be dealt with in chapter 4.

Quantity of supply

It is not only the distribution of the profession into the categories of first and second line providers, but also the relative number of professionals which are characteristic features of a health care system. In both countries however, the production of reliable figures has been hampered by the incompleteness of the official statistics. Generally a medical specialist is quite well defined but the general practitioners are usually defined more or less negatively as non-retired, non-specialist or otherwise active physicians (See Leroy's criticism of the Belgian statistics, Leroy 1978: 36). The figures for both countries can be read in table 3.6 (see page 13).

Generally speaking there are more physicians in Belgium than in Holland. This applies both to general practitioners and to medical specialists.
Although the absolute number of hospital beds (beds in general and university hospitals) is higher in the Netherlands, the relative number is lower than in Belgium. There is a striking difference in the number of geriatric beds: in the Netherlands in 1974 4.8 times as many as in Belgium calculated per 10.000 inhabitants and 6.2 times as many if calculated per 10.000 inhabitants of 65 and older (see Nuyens, 1980: 25 and Foets & Nuyens, 1980: 295-296 and 320-329). Another striking difference is the relative number of pharmacies). Belgium used to have one of the highest rates in the world for this profession and Holland one of the lowest.
The number of long-term beds and the higher number of physicians certainly will affect the number of hospital admissions; the difference in the pharmaceutical density is less relevant in this respect.

3.3. Insurance and regulation

The Dutch system[4] of insurance against the cost of illness and disability was inspired by the original German scheme founded by Bismarck in the last decade of the nineteenth century, while the Belgian system has been influenced greatly by the French.

The Netherlands

Compulsory insurance for all employees with an income below a certain level; voluntary insurance for independents under a certain in come level; private insurance for all above the income level and benefits in kind without (until very recently) out of pocket contributions from the insured are the main characteristics of the Dutch system. The General Act on

Table 3.6. Numbers of health care providers and hospital beds in Belgium and the Netherlands (1974, 1980).

	Belgium				The Netherlands			
	Number		Number per 10.000 inhabitants		Number		Number per 10.000 inhabitants	
	1974	1980	1974	1980	1974	1980	1974	1980
General practitioners	5.972*	7.638*	6.12	7.77	4.683	5.301	3.44	3.76
Common specialists	2.100**	2.502**	2.15	2.54	1.815	2.467	1.33	1.75
Other specialists	3.826	4.430	3.92	4.50	3.667	4.891	2.70	3.47
Supporting specialists	1.365	1.617	1.40	1.64	1.036	1.581	0.76	1.12
All specialists	7.291	8.549	7.47	8.67	6.518	8.939	4.79	6.34
Pharmacies***	5.322	5.506	5.42	5.58	875	1.002	0.64	0.71
Dentists	2.724	3.943	2.78	4.00	3.889	5.346	2.88	3.79
Acute medical & surgical beds	49.290	53.477	50.5	54.3	64.358	67.358	47.7	48.0
Longterm hospital beds	5.701	11.072	5.8	11.2	37.477	46.434	27.6	33.0
Idem per 10.000 inhabitants over 65 years			42.4	78.5			262.1	287.5

* As far as they provide ambulatory care (plm. 3% has a hospital connection).
** Ambulatory and hospital care, internal medicine, pediatrics and gynaecology).
*** Figures for 1975 and 1980.
Sources: Leroy, 1978; Foets & Nuyens, 1980; Het Medisch en paramedisch aanbod in België, 1984; Nederlands Huisartsen Instituut, 1982; Geneeskundige Hoofdinspectie, 1974 and 1980; Centraal Bureau voor de Statistiek, 1960 and 1980; Ministerie van Volksgezondheid en Milieuhygiëne, 1977; Nationaal Ziekenhuis Instituut, 1980.

Exceptional Medical Expenses (Algemene Wet Bijzondere Ziektekosten) has covered exceptional financial risks since 1967, e.g. a stay of more than one year in a hospital. This act applies to all inhabitants of the Netherlands without restriction. Premiums are paid largely by employers, the fund deficit (Dfl 1.5 billion in 1980) is subsidized by the State. All admissions to extended care facilities or institutions for mentally and physically handicapped and mentally retarded are covered by the Act from the first day and all admissions to general and mental hospitals are covered from the 366th day (Blanpain, 1977: 139). This, combined with a rather lavish insurance system for loss of income because of illness and disability, has removed the threat that 'illness' forms for the economic circumstances of the individual. The cost of all this is Dfl. 20.35 billion for costs of illness in 1976 and Dfl. 20.3 billion for loss of income because of illness and disability.[5] This amounts to 6.7% and 6.5% of the G.N.P. respectively.

The regulation of public health insurance restricts the choice by consumers of a certain type of insurance. The type of insurance may influence the utilization of health care facilities. Under the public insurance scheme - nearly 70% of the population - there are (or better: until recently there were) no financial transactions between consumers and providers; all services are in kind. Privately insured patients - 30% of the population - have to pay for the services and get a reimbursement according to their insurance conditions.

Of course this has also consequences for the remuneration of health care providers. A general practitioner generally practices his profession as an independent entrepreneur and gets a fixed amount of money (a fee) for each patient on his list plus a contribution in the general costs of his surgery for the first 1800 patients and a contribution for the old age pension of the practitioner for the first 2000 patients[6], for each publicly insured patient on his list. There is no differentiation in this amount. There is no higher fee for elderly patients (as in Great Britain). For the private patients on his list he gets a fee for each service. In rural areas the structure of a physician's income is different because he is dispensing drugs and doing deliveries. Since the capitation fee increased considerably in the late nineteen sixties, the bulk of a general practitioner's income is constituted by this capitation fee paid by the health insurance (IJsbrandy, 1980). Because of a decreasing number of consultations with private patients (probably a consequence of changing economic circumstances) the National Association of General Practitioners recently formally applied for the abolition of 'private patients' and pleaded for a comprehensive public insurance system in primary care with a capitation fee for each person.
Generally the medical specialists practice in close partnership the hospitals, with the exception of opthalmologists and independent psychiatrists.
Medical specialists are paid on a fee for service basis for publicly insured patients (in this case the health insurance funds pay the fees) as well as privately insured patients. We will postpone a discussion of the fees for medical specialists to the next chapter, because they directly influence the incentives to treat a patient in the hospital or on an ambulatory basis.

The health insurance funds, as administrators of the public health insurance scheme, in general are not directly involved in the ownership or running of health care facilities, although some trade union based health insurance funds own pharmacies and dental clinics as a relic of the past (before the Health Insurance Funds Act was accepted by parliament in

1966).

There are considerable differences between the Netherlands and Belgium in the way health care facilities are planned and restricted (see Nys, 1981 and Nys and De Leede, 1985). These regulations however only influence hospital admissions indirectly, for instance in terms of the number of available hospital beds.

Belgium

The main features of the Belgian health insurance system are:

1. Almost complete coverage by one of the two public insurance schemes;
   a) a general scheme; for all wage-earners and their dependants and pensioners, covering all medical costs (apart from co-payment, several prosthetic appliances are not covered);
   b) a special scheme for non-wage-earners, mostly self-employed people (about one sixth of the population), covering only substantial medical costs such as hospital admissions. This can be supplemented with a voluntary insurance covering the minor risks.

2. There is a system of fee for service and co-payment for ambulatory care. For specialist, in-patient care, fees usually are paid directly to the provider while the money is reimbursed by the local branch of the six national health insurance funds. The bills for costs of hospital admissions are paid directly[7] by the health insurance funds. The co-payment is charged directly to the patient. The co-payment as a proportion of the negotiated fee depends on the insurance category. Widows, orphans, the handicapped and pensioners until recently received full reimbursement where their income did not exceed a certain level (BF 165.000 in 1976).[8]

3. Socially active public insurance corporations. Unlike the situation in the Netherlands, Belgian health insurance funds are integrated forwards (to use Evans' terms) into the provision of care.
   They own out-patient clinics[9], pharmacies, institutions for social work and even hospitals (10% of the acute beds in 1976, Foets & Nuyens, 1980: 84).

For the consumers the subsection of the insurance system to which they belong is an important determinant of their behaviour. It determines whether they have to pay part of the fees themselves or whether they have to pay ambulatory care without reimbursement (independents). So the consumers's preference for the type of insurance is, as in the Netherlands, practically absent. On the other hand preference for the providers of ca-

re can be expressed fully. It might be attractive financially however to obtain services from the institution owned by the health insurance fund, because deductions are provided in the co-payment rate (ristourno) or there is no co-payment at all, but third party payment.

The introduction of the comprehensive insurance system in 1963 when non-wage-earners were brought into the compulsory system, caused violent and large scale reactions afterwards from the physicians who organized themselves in syndicates that still dominate the negotiating circuits in Belgium. After the doctor's strike in 1964 parties agreed to a complicated contract where local groups of physicians in each district (arrondissement) were to make clear (by either objecting to the results of the negotiations that had been forwarded to each physician or by giving no reaction) whether they accepted the agreement between syndicates and health insurance funds. Where over 60% accept, the whole region is supposed to agree officially although those who refuse are not obliged to charge the negotiated fees (which only apply for a part of the day however). So physicians formally have quite considerable opportunities to charge higher fees.[10]

The existence of insurance-owned out-patient clinics and of a fierce competition caused by a relative abundance of physicians, limits excesses to a certain extent.

A rather interesting feature is that for the same item of service in most cases the fee differs with the qualification of the provider. The 'medical mutual benefit committee' establishes lists of services that can be provided by only one sort of qualified provider and items of services that may be provided by differently qualified physicians or paramedical personnel.

Where an employer-employee relationship exists between differently qualified providers (e.g. between physiotherapists (paramedical) and revalidation physicians), there are the possibilities of abuse.

Compared to the Netherlands the second line providers are less dependent on the hospital. Medical specialists often practice in private surgeries and in independent out-patient clinics unconnected to a hospital. In the Netherlands out-patient clinics are almost allways part of the hospital; in Belgium both spheres are delineated more precisely.

4. A GENERAL MODEL FOR THE EXPLANATION OF REGIONAL VARIATIONS IN THE NUMBER OF HOSPITAL ADMISSIONS AND THE INFLUENCE OF DIFFERENCES IN THE HEALTH CARE SYSTEM.

The results of statistical analyses of regional variation in the number of hospital admissions in different industrialized countries point to a number of variables that influence hospital admissions irrespective of the differences between health care systems. Examples of these variables are the urbanization of a region and the number of hospital beds (compare e.g. Rothberg,1980).
In addition to this there are variables that reflect the differences between health care systems. Examples of these are the number of publicly insured patients in health care systems with a mixed insurance system and the number of referrals to specialists in health care systems with a clear division between first and second line providers.

In this chapter we will outline a general model for the explanation of regional variation in the number of hospital admissions in Belgium and the Netherlands - the pattern that both countries have in common - and, with the differences between both systems in mind, we will predict deviations from this general pattern.

Regional differences in the number of hospital admissions per 1000 inhabitants not only reflect differences in the health status of the population, but are also a result of the decisions of providers and consumers of health care (differences in health status are, of course, in a lot of cases also related to decisions made by people, but the decisions we refer to here are e.g. the decision as to whether or not to seek professional help). Explanations of regional differences in the number of hospital admissions must take these decisions into account. It is, however, difficult to start at the level of individual decisions and to predict step by step the consequences for the number of hospital admissions. In most cases different consequences are **a priori** equally plausible, because there is no information on the behavioural parameters of the different decision makers and because of the fact that decisions are dependent one upon the other and form feedback systems that are difficult to conceptualize. This does not release us from the obligation to state our predictions as clearly as possible and to describe the line of reasoning which connects individual behaviour and the outcomes. However, as long as we cannnot test hypotheses at a lower level of aggregation and as long as we have no clear picture of the dependencies and feedback mechanism, it is not possible to state our predictions as the only possible logical deductions.

The general model

The number of hospital admissions in Belgium is higher than in the Netherlands: 118 admissions per 1000 inhabitants in Belgium and 104 in the Netherlands. The regional variation in both countries is substantial and the distribution of the number of hospital admissions per region partly overlaps. How much of these differences can be explained in **one general** model? Does the fact that the mean age of the population in most regions in Belgium is higher than in the Netherlands partly explain these differences? Another example: do differences in the number of hospital beds explain part of the differences? In general older people are more often admitted to hospitals than younger people and the more hospital beds there are, the more people are admitted. These two examples point to the two groups of variables that are distinguished by health economists when they try to explain hospital admissions: the demand for the 'good' hospital care and the supply of hospital care.

The demand side

There is no direct demand for 'hospital' admissions, but for health or health care. The demand for hospital admission is mediated by the opinion of a doctor who decides whether or not a patient will be hospitalized. To formulate a general model we will therefore try to identify a few parameters of the propensity to seek medical care, which are the same for the Netherlands and Belgium. We can distinguish two groups of parameters: those concerning the health status of the population and those concerning cultural or attitudinal differences in the propensity to seek professional help given a complaint of some kind.

Measurement of the health status of a population is a frequently discussed, but seldomly adequately solved problem in health services research. Even when it would be possible to construct a satisfactory index of the health status of the population of a single country (e.g. based on self reported morbidity, self reported health or expert opinions), it is very difficult to compare data on different countries. An exception is data on mortality; whatever the health care system and the administrative procedures are, people do die and deaths are reasonably well recorded by age, sex and place of residence of the deceased. It is therefore possible to construct age and sex standardized mortality ratio's for regions in different countries, at least it is possible for Belgium and the Netherlands.

These standardized mortality ratio's come closest to an indicator of differences in health status, even though the probability of a preceding hospital admission varies with the cause of death. The cause of death is also recorded in the Netherlands and in Belgium, but the validity of

these recordings is frequently questioned, even in analyses of a single country.
In conclusion : the most direct (and available) indicator for regional differences in health status is the standardized mortality ratio. Apart from this there are more indirect indicators of the health status of populations, notably the age and sex distributions.
Older people are in general less healthy than younger people and although women have a higher life expectancy than men, they make more use of the health care facilities. This higher use of health care facilities by women relates at least in part to the reproductive functions. Variations of the number of women in the reproductive age is strongly correlated to the age distribution in general.
More important are variations in the number of births (which also reflects cultural differences and therefore in part coincides with a urban-rural distinction). The fact that in the Netherland a considerable number of deliveries still take place at home, will be taken up in the section on the influence of differences between both health care systems. Here childbirth will be conceived as one of the reasons why women often have more contact with the health care system than man. The number of hospital admissions for women of all ages is 23% higher than the number for men in Belgium. In the Netherlands the difference is 12%. The number of admissions of elderly people (60 years and older) is 55% higher than the number for all ages. In the Netherlands the difference is 64% (Leroy, 1978, appendix table 35 and LISZ-jaarboek, 1975).[1]

The second group of parameters on the demand side concerns cultural or attitudinal differences in the propensity to seek medical care. Indicators for these differences are the degree of urbanization of a region and the socio-economic composition of a region. The socio-economic composition is of course not only a parameter indicating cultural differences in the propensity to seek medical care, at an individual level it also forms the dividing line in most public health insurance schemes. For that reason socio-economic composition (and more specifically income) will be treated more fully in the section on the influence of the differences between the health care systems in the Netherlands and Belgium.

Altough it can be argued that people in rural areas are healthier than people in more urbanized areas, they also have a lower propensity to seek medical care for their complaints. Of course there are also less health care facilities in rural areas (and on the supply side the distance to a hospital is an important determinant of utilization), but aside from this there remains an influence based on cultural differences. People from lower socio-economic strata are in general less healthy than people from

higher strata. People from higher strata, however, presumably because of a higher level of education, more easily express themselves and might therefore be less restricted to seek the help of a professional.

The relations on the demand side of the general model can be summarized in a few propositions about regional differences in the number of hospital admissions per 1000 of the population:
- the higher the number of elderly people in a region, the higher the number of hospital admissions;
- the higher the standardized mortality ratio in a region, the higher the number of hospital admissions;
- the more urbanized a region is, the higher the number of hospital admissions.

The supply side

The number of hospital admissions, is of course influenced by the availability of hospital facilities and of alternative treatment facilities such as nursing homes for the elderly and ambulatory care clinics. The availability of hospital facilities can be indicated by the number of hospital beds and the number of hospital based physicians, whereas the availability of alternatives to hospital care could be indicated by the number of beds in nursing homes[2] and the number of ambulatory care physicians.
In a general model for the explanation of variance in hospital admissions these can be used as parameters on the supply side.

The capacity of hospitals is not fully indicated by the number of hospital beds. Other important parameters are the degree of occupation of the available beds and the mean stay in the hospital. There is a logical relation between the mean stay and the number of admissions: given a certain number of beds available, the higher the mean stay, the lower the number of admissions. At a regional level this is an important relation. One well known effect is that there is a lower number of hospital admissions in regions with an aging population, caused by the fact that the mean stay in the hospital is generally longer for older people.

There are (to our knowledge) no a priori reasons to suppose that the difference in the mean stay in hospitals between the Netherlands and Belgium (the mean stay is higher in the Netherlands) is caused by differences in the health care system.

One of the interesting by-products of analysing regional variation in the number of hospital admissions in Belgium and the Netherlands in a single

model, is that it is possible to have a better look at the linearity of the relationships. An example is the relation between the number of hospital beds per 1000 inhabitants per region and the number of hospital admissions. The number of hospital beds varies within rather narrow boundaries in the Netherlands when compared with Belgium. Within these boundaries the relationship is linear, but one might ask the question as to whether there is some kind of natural upper limit to the number of hospital admissions in regions with a higher number of beds. The range of the number of hospital beds is considerably expanded by using regional data in the Netherlands **and** in Belgium.
The average number of acute hospital beds is somewhat higher in the Netherlands, but the regional variation is higher in Belgium.

The relations on the supply-side can be summarized in a few propositions (hypotheses on the influence of the relative numbers of hospital based and ambulatory care physicians will be postponed to the next section because of the differences in accessability of specialists in both countries):
- given an average length of stay in hospitals, the higher the number of hospital beds in a region, the higher the number of hospital admissions;
- the more alternatives to hospital care there are in a region, the lower the number of hospital admissions.

The influence of differences in the health care systems
In chapter 3 the most important differences between the health care systems in the Netherlands and Belgium were identified. What are the consequences of these differences for the number of hospital admissions in both countries? That is the question we address in this section.
At first sight the parallel accessibility of specialists and general practitioners could result in a higher number of hospital admissions in Belgium, because people have easier access to specialists than they do in the Netherlands and therefore have an increased chance of being admitted to a hospital. But on the other hand, specialists in the Netherlands nearly all work in hospitals, while many specialists in Belgium work for at least part of their time in private surgeries or in ambulatory care clinics set up by the health insurance funds. This could lead one to expect a lower number of hospital admissions in Belgium (at least in regions where a greater number of specialists work in private surgeries or ambulatory care clinics).
The system of remuneration in the Netherlands, with a capitation fee for general practitioners and a fee for service for medical specialists could lead to a higher number of hospital admissions.

The insurance system in Belgium has some consumption restricting features. However, hospital admissions cannot be expected to be greatly affected, because there is co-payment for ambulatory care and specialist services but not for nursing fees (at least in 1974).

These rather intuitive hypotheses on the influence of differences in the health care systems of Belgium and the Netherlands can be further analysed by looking at the behaviour of providers and consumers of care and at the incentive structure that governs their behaviour. As we said in the beginning of this chapter, it is difficult to deduce precise predictions at a highly aggregated level starting at the micro level.

However, this reasoning gives insight in the possible mechanisms by which the incentive structure steers the behaviour of providers and consumers and lead to outcomes at the level of hospital admissions. Further analysis of hypotheses on possible mechanisms must of course be conducted at lower levels of aggregation.

To explain differences in the number of hospital admissions one has to take into account the behaviour of providers and consumers of medical care. The decision to have a patient admitted to a hospital lies with the physician. Patients decide whether or not to visit a physician when they have complaints about their health, and in the case of Belgium whether to visit a general practitioner or a specialist. The relevant alternatives for a physician when consulted by a patient, are:
- to treat the patient outside the hospital
- to treat the patient in the hospital
- to refer the patient to another physician who again has to choose between ambulatory treatment or in hospital treatment.

The choice between these alternatives is determined by the incentive structure of the health care systems in the Netherlands and Belgium. We assume (following economists as e.g. Zweifel,1981) that the utility of physicians is derived from the amount of income, free time and the quality of care delivered (an 'ethical variable' as Zweifel calls this last utility argument).
Our task then is to identify those aspects of the regulations and institutions that govern the behaviour of the actors in the health care system and through this possibly influence the number of hospital admissions. We will start with the Netherlands.

The Netherlands

The access to specialist medical care has been mentioned as one of the important characteristics which are assumed to influence the number of

hospital admissions. In the Netherlands patients cannot go to a medical specialist directly. Strictly speaking this applies only to the publicly insured part of the population. However, although private patients can directly consult a medical specialist, most private insurance companies ask for a referral from a general practitioner before restituting specialists fees. As the the general practitioner has a pivotal position we will start with an analysis of his behaviour.
The behavioural alternatives of general practitioners can be limited to treating patients themselves or to referring a patient to a medical specialist. Formally a hospital admission is preceded by such a referral, although actual practice can be different in acute cases. In the Netherlands it is not possible[3] for general practitioners to treat their patients inside the hospital (although there are some forms of shared responsibility (cf. De Melker,1973), but this is not common practice).
The choice between these alternatives has no consequences for the income of general practitioners. As has been pointed out, in chapter 3 general practitioners in the Netherlands get a yearly capitation fee for their publicly insured patients, irrespective of the number of services they render to these patients. Although referring a patient or treating him himself does not have consequences for the income of general practitioners, it has consequences for the amount of free time. When free time is defined as total available time minus the time spent in patient care, it will be clear that referring patients results in more free time without loss of income (the model could be made more complicated by taking into account the alternative of referring publicly insured patients, but treating private patients himself, cf. Heesters, 1983).

General practitioners however, cannot refer an unlimited number of patients. There are certain complaints for which there is consensus within the profession that they should be handled by general practitioners themselves, and there are groups of complaints for which it is clear that a patient should be referred. With other complaints general practitioners have a margin of freedom.

Apart from ideas about what is current practice in the profession and considerations of quality in patient care, there is no disincentive to referring patients to medical specialists. The recent diffusion of peer review practices and monitoring of the behaviour of doctors could create more institutionalized limits to the discretionary power of health care providers (Stone, 1980, chapter 7 and 8).
Once a patient has been referred to a specialist the latter has the choice between treating the patient in an out-patient clinic or in the hospital. In the Netherlands, nearly all medical specialists are connec-

ted with a hospital (there are some exceptions in the fields of opthalmology, psychiatry and gynaecology) and out-patient clinics are also connected with the hospital. What is the consequence of the choice between these alternatives?

Specialists are remunerated on fee for service basis. The income of specialists therefore depends on the number of services they can charge to the health insurance funds (as far as the publicly insured patients are concerned; private patients pay the specialist directly and obtain reimbursement from their private insurance company). The fee surgical specialists can charge for a service does not differ according to whether the service is rendered in an out-patient clinic or in the hospital. The rules for the fees of other specialists favour short hospital admission (Van Tits, e.a., 1981 p: 38).

Just as a general practitioner cannot refer every patient nor treat every patient himself regardless of the complaints of the patient, most specialists cannot provide all their services in the out-patient clinic. Some cases cannot be treated outside the hospital while in other cases there is a greater margin of freedom (the margin of freedom for a number of diagnoses has been quantified by Van Tits e.a., 1981).Apart from this, older patients are generally hospitalized sooner than younger patients. This could in part be caused by the kind of morbidity older patients present (diagnoses with a smaller margin of freedom for the medical specialist to choose out-patient treatment) and partly by the greater risk of complications.

The hospital has its own interest in the choices medical specialists make. All in all the shift from in-patient treatment to out-patient treatment is financially unfavourable for the hospital. The reason is that hospital tariffs are based on patient-days or occupied beds and that the costs of operating the auxiliary departments (such as physical therapy) are calculated in the price of a patient-day (Van Tits, e.a., 1981: 39).
In conclusion we can say that the choice between in-patient and out-patient treatment either has no consequences for the earnings of medical specialists (as in the case of surgical specialists) or favours in-patient treatment (for other medical specialists).

The behaviour of medical specialists could be influenced by the interests the hospital has in in-patient treatment (in cases where there is a certain margin of freedom).
The health care system in the Netherlands does not give much incentive for keeping patients out of the hospital. What is the situation in Bel-

gium? We already know that the number of hospital admissions is higher in Belgium than in the Netherlands. Can this be attributed (partly at least) to a lack of incentive to keep patients out of the hospital?

Belgium

In the case of the Netherlands the simplifying assumption could be made that the preferences of consumers do not directly influence the number of hospital admissions. However,in analysing the incentive structure in the Belgian health care system one has to take into account the behaviour of the consumers. They have the choice between consultation with a medical specialist or with their general practitioner. By going directly to the medical specialist one might argue, people run a greater risk of being admitted to a hospital.[4]

The first thing we examine here is the question what kind of people prefer to consult a medical specialist. Secondly whether there are any balancing processes which keep down the number of admissions where people can consult a medical specialist directly.

It is generally found in surveys of the Belgian health care system that people from higher socio-economic strata consult medical specialists more often without interference of a general practitioner (Foets & Nuyens, 1980: 272; Nuyens, 1979, part 1H). This can be explained by taking into account the costs and benefits of visiting a medical specialist or a general practitioner.

Costs and benefits connected with the choice are in the level of co-payment, the level of out-of-pocket expenses and the expected health returns. Whether health care expenses will be reimbursed by the health insurance funds depends on the kind of items of service and the 'regime' of the health insurance.The self employed insured under the 'regime independent' are entitled to a smaller range of services.[5] The level of co-payment depends on the income situation of the patient. Certain groups do not have to pay any co-payment at all: widows, orphans, handicapped and retired persons (co-payment rules have been changed in 1982).

The amount of money charged by a physician is not necessarily equal to the amount on which the reimbursement by the health insurance funds is based. Doctors have a certain margin in establishing their fees. The contracts with the health insurance funds give them this freedom, partly because the contracts are only for a part of the day and partly because the contracts are not necessarily subscribed to by every individual doctor.

Whether physicians fees exceed the amount on which the restitution is based and how much they exceed this, depends presumably on the amount of competition between physicians and on the prosperity of the population. In general, medical specialists can be assumed to exceed the amount on

which reimbursement is based, more than general practitioners.

Medical specialists although there are a lot of them, do not form one homogeneous group with the same supply of services. Therefore competition is probably less severe. The charging of higher fees is however restrained by the establishment of outpatient clinics for ambulatory care with different medical specialists by the health insurance funds. In these clinics only agreed fees are charged (or maybe even less is charged in cases where health insurance funds cover the co-payment themselves to attract members to their own out-patient clinics).
The fees that can be charged by medical specialists are higher for the same items of service than the fees of general practitioners. This means that even with complete reimbursement the out-of-pocket expenses are higher.
The costs of consulting a medical specialist are therefore generally higher than those of consulting a general practitioner. The benefits of consulting a medical specialist directly depend on the expected health returns and the kind of complaints a patient has. Because of the image of medical specialists as more prestigious and technically more competent than general practitioners, one may assume that people expect higher health returns from visiting a medical specialist.
The kind of complaints a patient has may also influence the choice between a medical specialist and a general practitioner. When the complaints are clear and the consumer knows to which specialist field of competence his complaints belong, he will choose a medical specialist. If in a case like this he still consults with a general practitioner he also runs the risk that his g.p. (after several consultations) will decide on a referral. The patient will then have to pay (the co-payment) for the fees of the general practitioner **and** for the fees of the medical specialist. Had he gone to the medical specialist directly, he would only have had to pay for the fees of the medical specialist.
For people who do not have to pay any co-payment or for those who only pay a small amount of co-payment, it does not matter whether a general practitioner tries to treat the complaints first and then decides to refer the patient to a medical specialist. This financial mechanism together with the fact that people from higher social strata have more knowledge about which specialist to consult and the fact that the social distance between them and medical specialists is smaller, explains why people from higher social strata more often directly visit a medical specialist. This could have consequences for one of the parameters of the general model of regional variations in the number of hospital admissions we have formulated above: the socio-economic composition of the population. However, data on hospital admissions show a different picture: the number

of hospital admissions is higher for people from lower social strata. In comparing admission rates for people with different socio-economic backgrounds, one has to take into account other differences such as the fact that older people are disproportionally represented in the lower income classes (Vis, 1981: 18-21).

When we look at the behavioural alternatives of physicians in Belgium and the incentives for treating patients outside the hospital or in the hospital, it is clear that general practitioners as distinct from the situation in the Netherlands have no interest in referring their patients to medical specialists. The fee for service system combined with direct access of patients to specialist care induces general practitioners to treat patients as long as possible themselves. Of course the tendency to keep patients under their own treatment is constrained by considerations of quality of care and by the possibility that the patient himself will decide to seek specialist care. The impact of the latter restriction can be very important. Although in Belgium general practitioners have an interest in keeping patients under their care, as distinct from the Dutch g.p. who can refuse a referral, the patient can always decide to turn to specialist care.

Medical specialists in Belgium have the opportunity of working in a hospital, working in an ambulatory care clinic connected to a hospital, working in an ambulatory multispecialty clinic not connected to a hospital (and in a number of cases owned by the health insurance funds) or working in a private surgery.
When Belgian medical specialists treat patients in a hospital, they have to pay part of the fee to the hospital to cover the use of the premises and hospital equipment as well as the administrative services of the hospital (e.g. collecting the fees). The percentage of the fees that has to be paid to a hospital varies with the specialism and the dependence on hospital equipment. Roemer & Roemer (1981: 151) give the example of pathology and radiology with about 60% of the fees going to the hospital and of surgery with 10 to 30% of the fees going to the hospital. There are no uniform rules in this field; there are therefore substantial differences between hospitals. When medical specialists treat their patients in a hospital connected ambulatory care clinic they usually have to pay a fee to the hospital.
Of course medical specialists in Dutch hospitals also have to contribute to the operating costs of the hospital but in the Netherlands most medical specialists do not have the choice of working outside the hospital or in ambulatory care clinics connected to the hospital. They therefore do not have the opportunity to optimize the proportion of their work in the

hospital. This procedure could form an incentive for medical specialists in Belgium to treat patients in private surgeries or clinics.

The hospitals themselves have an interest in in-patient care. They are financed (as far as operating costs are concerned; the situation is different for investments, these are in part financed by the government) through the price per patient-day which is in part paid by the health insurance funds and in part by the state. So far there is no big difference with the Dutch system. It encourages the hospital management to stimulate in-patient treatment by medical specialists. The ownership situation of the hospitals however, differs from that in the Netherlands. The Christian and Socialist health insurance funds own (or manage) a number of hospitals (around 50 in 1976). They stimulate the use of these hospitals by their members through reductions in the price, for example by not charging the co-payment for in-patient care of the medical specialist (these reductions are called 'ristourno'). On the level of the general policy of the health insurance funds as owners of hospitals the strategy will be to reduce costs by keeping down the number of hospital admissions, but at the local or regional level the competition with other hospitals will induce a strategy of keeping the member patients out of other (i.e. those not owned by the health insurance funds) hospitals by making the stay in a health insurance funds owned hospital more attractive.

Conclusion

To find out what mechanisms could bring about the difference in the number of hospital admissions between Belgium and the Netherlands, we have analysed the behaviours of the actors in the health care system and the incentives that influence their behaviour. An analysis of the behavioural alternatives of the providers of care (general practitioners and medical specialists) points out that there are more incentives to keep patients out of the hospital in Belgium.

The behaviour of the consumers of care is relatively unimportant in the Dutch case, because consumers cannot consult with medical specialists in hospitals without being referred by a general practitioner. In Belgium the behaviour of the consumers of care is more important because they are free to choose to visit a medical specialist or a general practitioner. In choosing to visit a medical specialist, the chance of being admitted to a hospital is possibly higher. It is, however, difficult to evaluate the influence that this could have on the rate of hospital admissions. Hospitals in the Netherlands as well as in Belgium have an interest in in-patient treatment because of the system of financing by patient-day. The influence of the ownership of hospitals by health insurance funds in Belgium is however difficult to estimate.

5. THE CHOICE OF THE REGIONS, THE SOURCES OF THE DATA AND THE FREQUENCY DISTRIBUTION OF VARIABLES

5.1. The region (unit of analysis)

For the analysis of hospital admissions a nodal type of region is the most suitable. If one intends to use other statistical information besides hospital admissions a general type of region is preferable to a more specific one (e.g. hospital regions).
The Dutch Central Bureau of Statistics offers a geographical division consisting of 80 or 42 regions. The 80 fold division is more interesting for analytical purposes because it consists of municipalities (the lowest independent administrative unit) but does not necessarily follow the administrative boundaries of the 11 Dutch provinces, in case a city attracts commuters from other provinces.
The 42 unit division (so-called COROP-region) does follow the provincial boundaries and is therefore less empirical.

For Belgium we had no choice. Our analysis is based on the data published by Leroy for arrondissements (an administrative level between municipality and province). There are 43 arrondissements in Belgium and apart from their difference in administrative sense, they are quite well comparable with the Dutch COROP-regions.

One area (the recently reclaimed Southern IJsselmeerpolders - COROP-region no.40) has been left out of the analysis because of the extremely deviant demographic composition (15.3% 0-5 yrs and 1.8% over 65 yrs in 1976) and the complete absence of medical specialists and hospitals.[1] The population was added to COROP-region no.10 (Zwolle and environs). For the analysis we have 85 regions at our disposal for both countries together. In appendix one a map with a key is shown.

5.2. The dependent variables

In this section we will describe the sources and the operationalization of the dependent variables: the number of hospital admissions and the average length of stay per admission. After the description of the sources we will show the frequency distribution and the geographic differences on a number of maps.

5.2.1. Hospital admissions

The Netherlands

For the Netherlands we related the number of admissions to general, teaching and special hospitals among the inhabitants of a specific munici-

pality to the number of inhabitants as of january 1st 1974. The number of hospital admissions per municipality is published annually the Chief Medical Inspector of Public Health in a publication called 'Overzicht van de gegevens van ziekenhuizen in Nederland over het jaar 1974' (Survey of the data on hospitals in the Netherlands in the year 1974 - Ministry of Public Health and Environmental Protection, 1977, table 6.3.). Admissions in psychiatric institutions are no part of the numbers published. The number of admissions and the number of inhabitants per municipality have been aggregated for the 42 COROP-regions.

For Belgium we found the admission rates for 1974 in Leroy's second book (Leroy, 1981, table 39, p. 359). In this publication hospital admission rates (per 1000 inhabitants) for the 43 districts are shown for various age and sex groups (0-14, 15-59, over 60 years). The published rates differ from the same rates in his first book (Leroy, 1978, p. A35). The reason is that the data provided by the Ministry of Public Health and the Family for his first book were incomplete. The rates also differ from the figures published by the Ministry of Public Health and the Family in 1975 (Ministerie van Volksgezondheid en van het Gezin, Brussel, kerncijfers betreffende hospitalisatiegraad tijdens het jaar 1975, tabel 1 bis, p. 26 a.f.).
Leroy states (Leroy, 1981, p. 134) that there is a .75 correlation between his rates of 1974 and the rates published by the Ministry of Public Health and the Family for 1975, which is surprisingly low for a correlation between two relatively related phenomena in 2 years.The source of this difference is not clear.
In the admission rates for Belgium the admission in mental hospitals are included, where they are not in the Dutch admission rates. We could correct the Belgian figures because the Ministry of Public Health and the Family published the psychiatric admission rates separately.
Because of the significant fluctuations we decided to take the admission rates for 1974 from Leroy's second book, and as a second attempt the average of the 1974 rates and the rates for 1975, published by the Ministry of Public Health and the Family and corrected for the number of admissions to psychiatric institutions.

The distribution of the hospital admission rates for both countries is shown in table 5.1 and on the first map we see the distribution displayed geographically.

Table 5.1. Hospital admission rates (°/oo) for 85 districts in Belgium and the Netherlands (1974).

	Belgium I	Belgium II (corr.)	The Netherlands	Total I	Total II
< 95.0	1	1	8	9	9
95.0-106.4	5	7	16	21	23
106.5-119.5	16	18	16	32	34
119.6-133.0	11	11	2	13	13
> 133.0	10	6	0	10	6
$\bar{x}$	121.32	117.64	104.04	112.84	110.92
sd	15.633	14.469	11.400	16.180	14.660

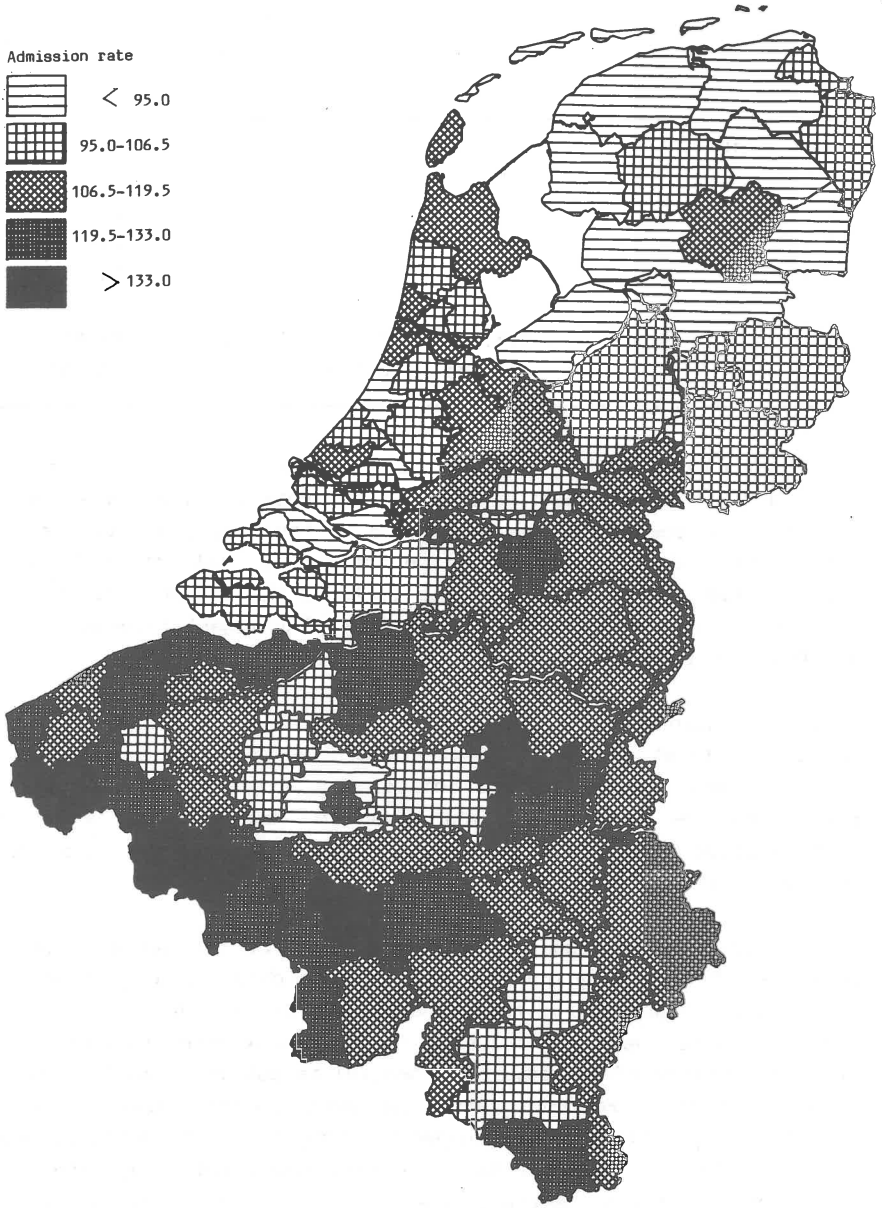
The Dutch admission rate (104°/oo) and the corrected Belgian rate (117.6) approach each other closer than the Dutch rate and the uncorrected rate (121.3). The lowest figures are found in the northern provinces of the Netherlands and the highest ones in the mining district in French-speaking Belgium. The south-eastern districts of the Netherlands show a similar pattern as the adjacent Belgian parts. The lowest figures for Belgium are found in the 'commuter belt' around Brussels.

5.2.2. The mean stay per admission

In Leroy's first and second book (data from 1974) there are no figures presented about 'mean stay per admission'. In his third publication however, they are present. We just coded the mean stay per admission for each district form table 73 (Leroy, 1982). This concerns data from 1976 instead of 1974.

The figures on the number of hospital days for the Nerherlands are not given per municipality nor per district. So direct coding or aggregation is, unlike the procedures for the admission rates, not possible. The number of hospital days per district can be approximated indirectly because the total number of bed-days per hospital is published in the same publications as the admission rates per municipality (Ministry of Public Health, 1977, table 23). We grouped all hospitals per district, aggregated the number of hospital days for most hospitals (long-term hospitals like rehabilitation centres, where no mean stay per admission was published, were left out) and divided the sum by the number of admis-

Map 5.1. Geographical distribution of hospital admission rates in Belgium and the Netherlands, 1974



sions. This is in fact not an ideal procedure. The number of admissions is the total number of inhabitants of the region admitted to **any** hospital (in- or outside the district) and the number of hospital days is the total number of days produced by the hospitals **belonging** to the region. As the size of the district is considerable, the misestimates are limited, but do exist. The distribution is shown in tabel 5.2 and map 5.2.

The mean stay per hospital admission usually is related negatively to the admission-rate. The longer the average stay the lower the chance of a new admission. The lower figures for Belgium are compatible with this rule: notwithstanding the fact that the Belgian figures are from 1976 instead of 1974 and there is a general downward trend in mean stay per admission.

Table 5.2. Mean stay per admission for 85 districts in the Netherlands and Belgium.

	Belgium	The Netherlands	Total
< 12.60	11	2	13
12.60-14.19	15	10	25
14.20-15.79	8	15	23
15.80-17.39	6	11	17
> 17.40	3	4	7
$\bar{x}$	13.95	15.20	14.57
sd	2.108	1.697	2.006

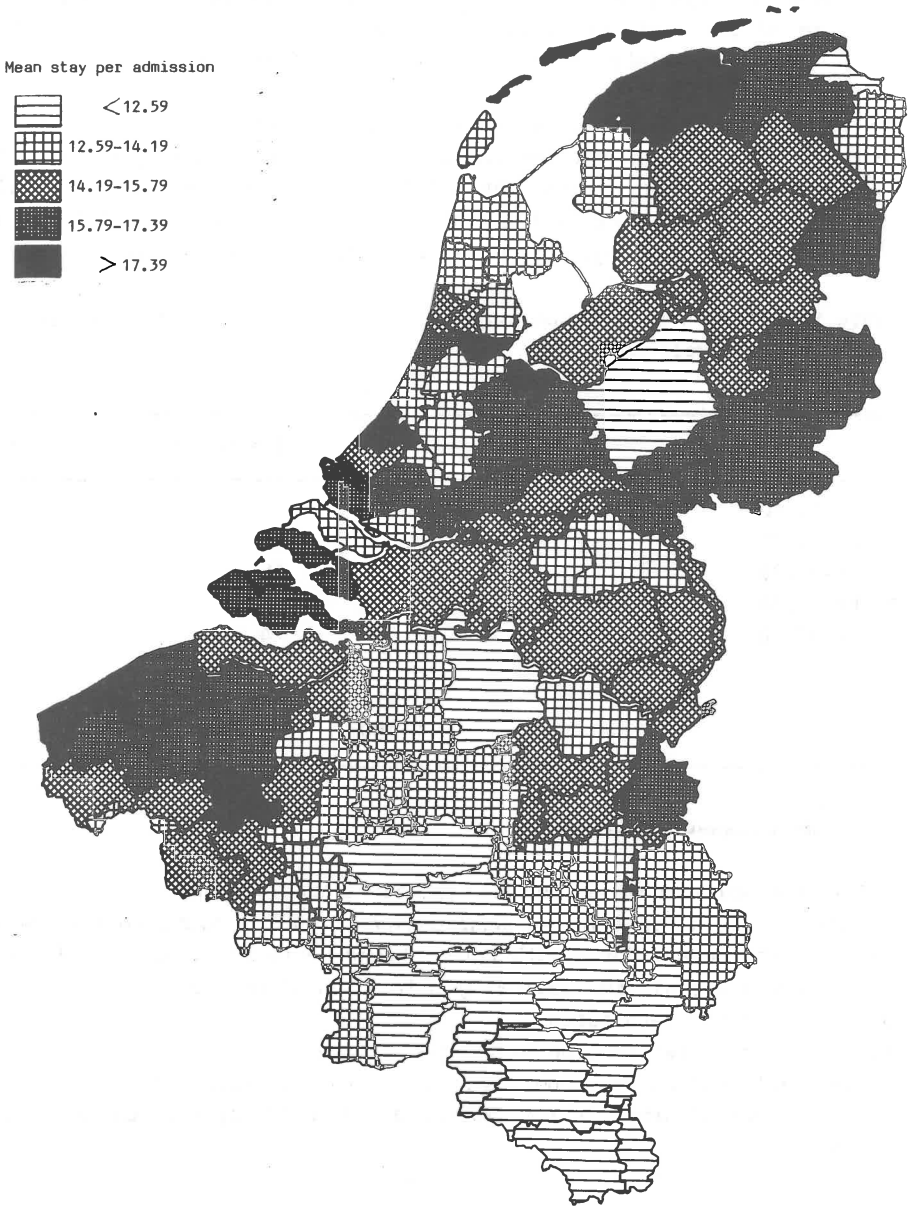
5.3. The independent variables

5.3.1. Variables representing the demand for health care

In this analysis the level of aggregation is rather high, so the indicators of 'the demand for health care' should be fairly rough. We chose (or had at our disposal) the following indication of demand:

a. age-adjusted death rates
b. the age/sex distribution of the population
c. the distribution of income as an indicator of social class
d. the degree of urbanization, measured indirectly by the population density.

Map 5.2. The mean stay per hospital admission for 85 districts in Belgium and the Netherlands (data for 1976 and 1974 respectively)



5.3.1.1. Age adjusted death rates

Within narrow cultural and socio-economic boundaries death rates can be considered as indicators of the health status of a population, provided that differences in the age distribution between populations have been duly eliminated.

As the age distribution of the Belgian population differs significantly from the Dutch, we constructed a standard population by averaging the proportional division of age/sex categories in both populations.

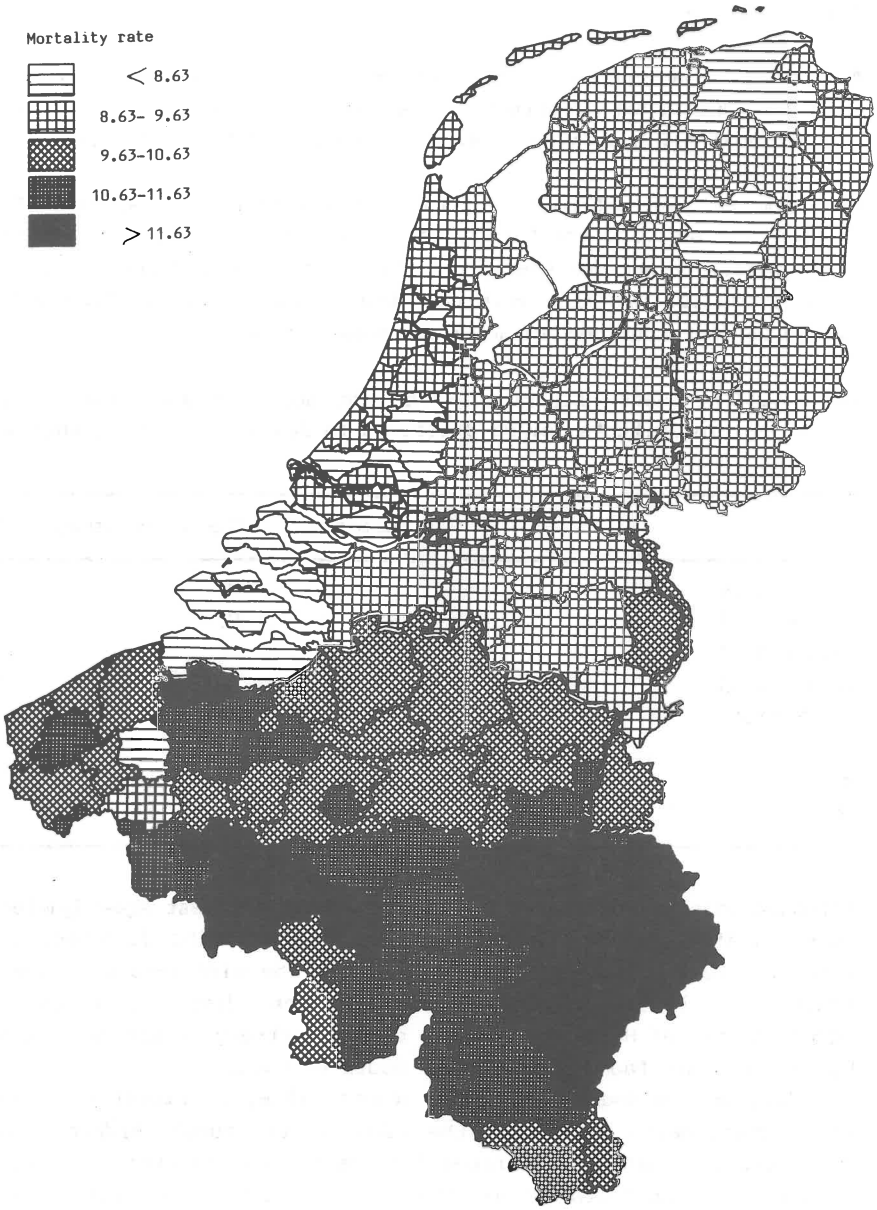
From the Belgium National Institute of Statistics (department of demographic studies) and the Dutch Central Bureau of Statistics we received on request, the age/sex specific mortality rates per district (1974). The death rates per district were computed on the basis of these data. The frequency distributions and maps are shown below.

Table 5.3. Frequency distribution of age adjusted death rates per 1000 inhabitants for 85 districts in Belgium and the Netherlands.

	Belgium	The Netherlands	Total
< 8.64	1	8	9
8.65- 9.63	1	32	33
9.64-10.63	18	2	20
10.64-11.63	12	-	12
> 11.64	11	-	11
$\bar{x}$	10.84	8.98	9.92
sd	.927	.507	1.195

Although Belgium contains the district with the lowest age-adjusted death rate (Tielt, 7.64°/oo)[2] both countries show striking differences according to this indicator of 'health status'. The districts with the lowest death rates in the Netherlands are the rural districts of Zeeland the 'green heart' of Holland and parts of the northern provinces. The highest Dutch rates are found in North and South Limburg.
For Belgium the industrial areas around Liège, Charleroi and Mons have the highest death rates, but the rates in the rural 'Ardennes' are not much lower. In general the rates for the French speaking part are higher than the Flemish death rates; with the exception of the district of Eeklo in the province of East Flanders.

Map 5.3. Age adjusted death rates for 85 districts in Belgium and the Netherlands (1974).



5.3.1.2. Age distribution

a) The proportion of people over 65

For the Netherlands distribution-tables of the population according to age and sex as well as according to marital status are published yearly for each municipality. These data can be aggregated easily to each higher level, provided that they derive from the lowest aggregation level: the municipality.

For Belgium statistics per district are not published yearly. The National Institute of Statistics produces files for census linked purposes. The nearest year (to 1974) for which data were available was 1977. Data were copied manually at the National Institute for Statistics.

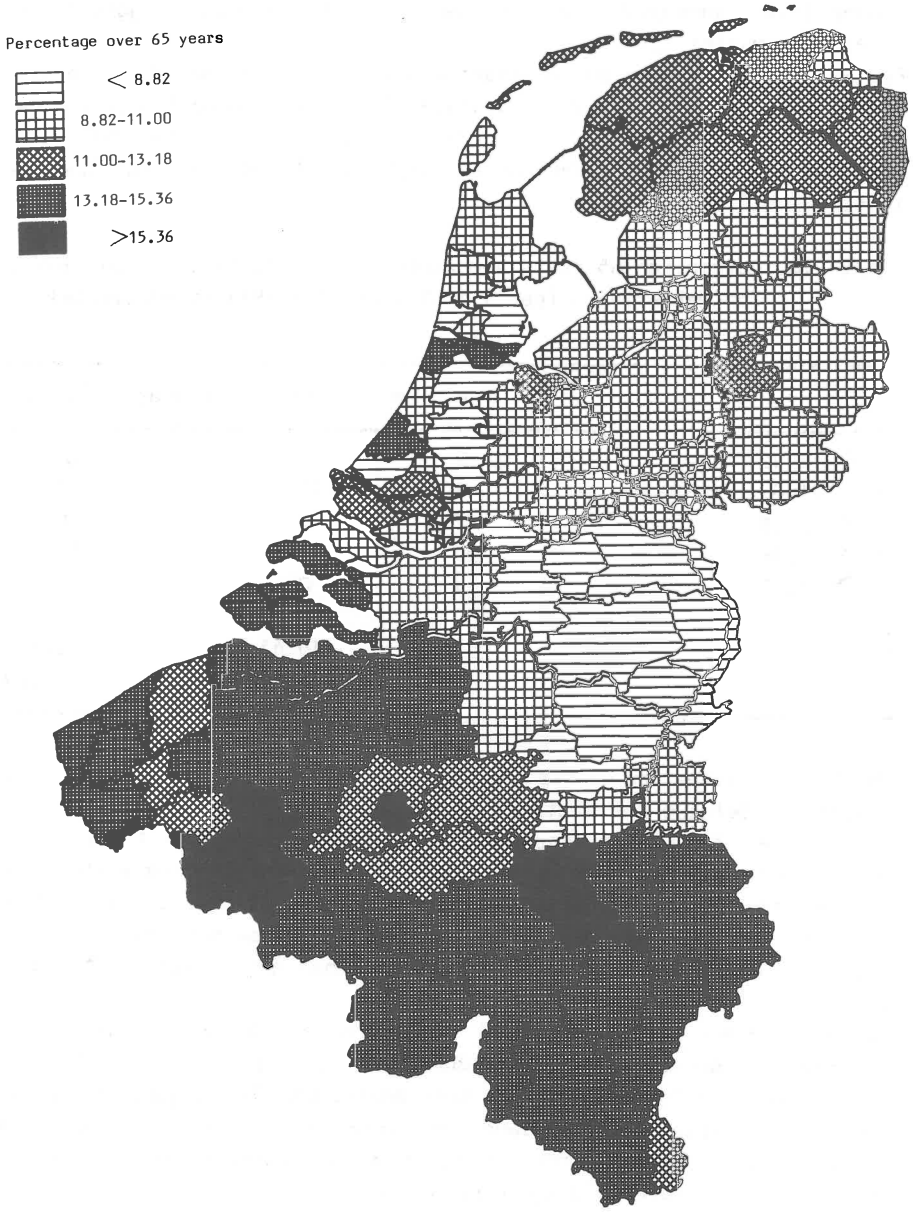
Table 5.4. Percentage 65 years and older for 85 districts in Belgium & The Netherlands (per 1.1.1977 and 1.1.1974 respectively).

	Belgium	The Netherlands	Total
< 8.82	2	10	12
8.83-11.00	2	18	20
11.01-13.18	7	9	16
13.19-15.36	25	5	30
> 15.37	7	0	7
$\bar{x}$	13.97	10.43	12.22
sd	2.198	2.179	2.809

The two countries do differ clearly in demographic composition, although for Belgium the district of Turnhout and the whole province of Limburg show a more or less similar age distribution as their Dutch counterparts on the other side of the border. The regions with large populations of the elderly in Belgium are:the area around Liège (district of Huy and Waremme) and the province of Hainaut (districts of Tournai, Ath and Mouscroun). Brussels also has a relatively old population.

For Holland one finds the lowest proportion of old-age pensioners in the Southern provinces (Noord Brabant and Limburg) and around Amsterdam. Relatively 'old' districts are: Amsterdam, The Hague, the rural areas of the province of Zeeland and the northern provinces as well as the relatively wealthy areas of Het Gooi and Kennemerland (of old a refuge for well-to-do old age pensioners).

Map 5.4. Geographical distribution of the proportion of 65 years of age and older for 85 districts in Belgium and the Netherlands as per 1.1.1977 and 1.1.1974 respectively.



b) The proportion of 0-4 years olds.
The sources of this indicator are the same as in the former paragraph. We only have to show the distributions.

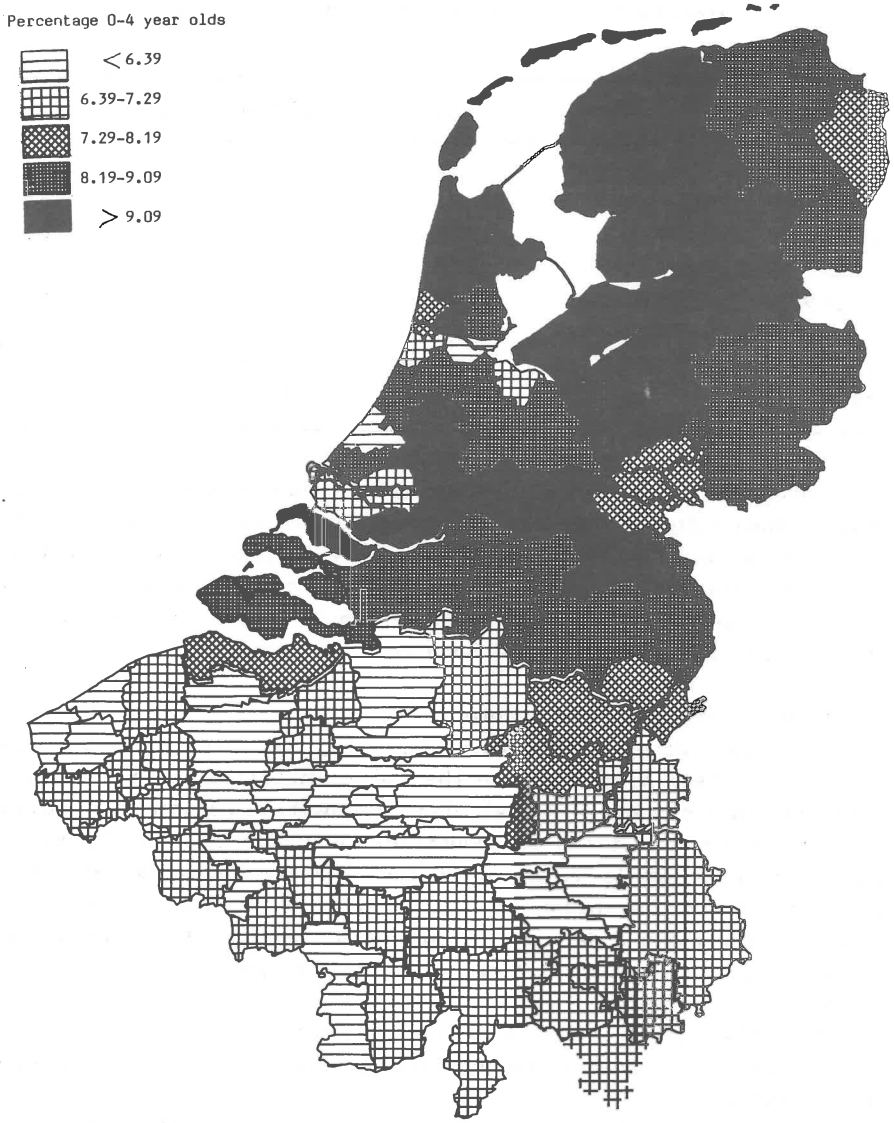
Table 5.5. Percentage 0-4 years old for 85 districts in Belgium & The Netherlands (per 1.1.1977 & 1.1.1974 respectively).

	Belgium	The Netherlands	Total
< 6.40	18	2	20
6.40-7.29	25	4	29
7.30-8.19	2	5	7
8.20-9.09	0	17	17
> 9.10	0	14	14
-			
x	6.52	8.63	7.56
sd	.449	1.124	1.357

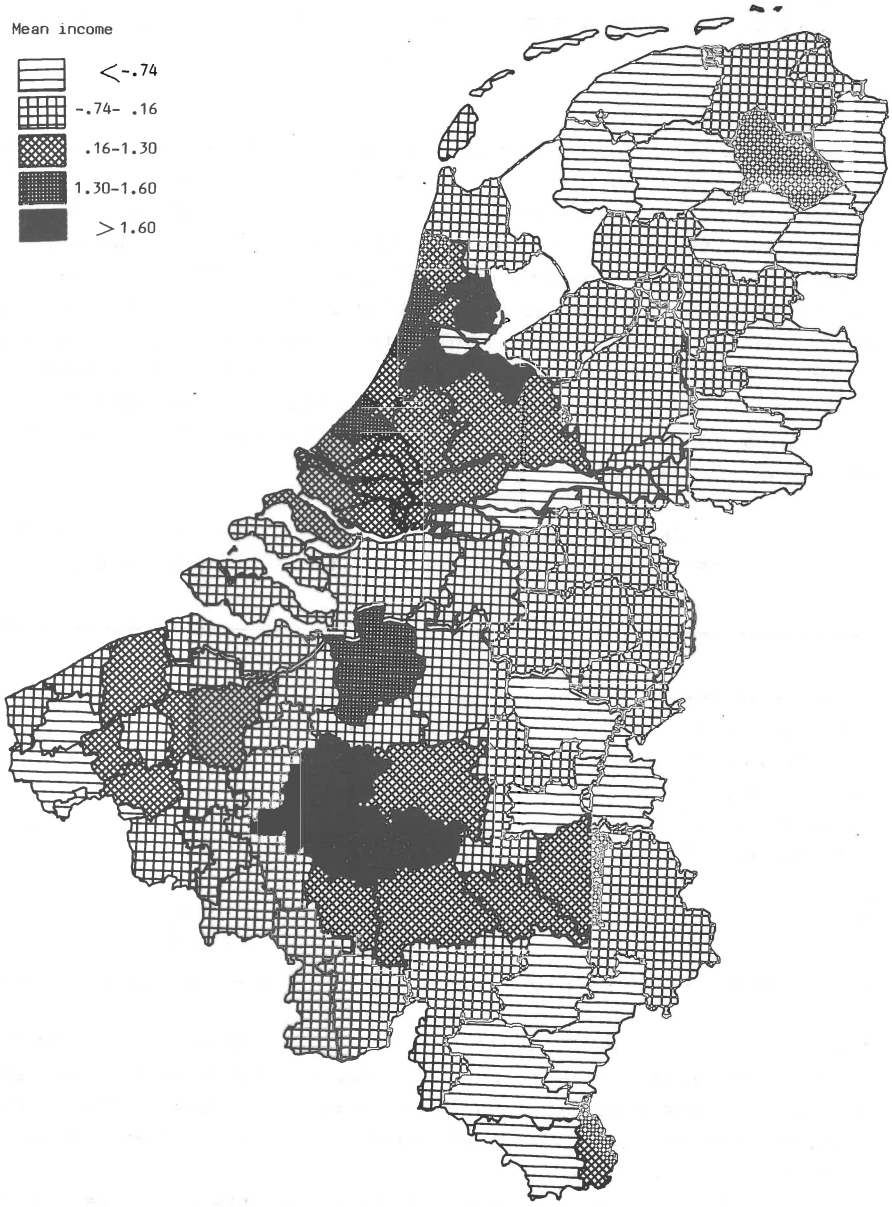
The demographic differences between both countries are here even more marked than with the proportion of over 65. The description is roughly the same as in the former section though both proportions do not always vary inversely. South Limburg (NL) has both a low number of inhabitants over 65 and 0-4 years, while the Dutch province of Friesland has rather high proportions of both age categories.

5.3.1.3. The distribution of income
These indicators cannot be compared directly, but some comparable index can be constructed. As we only use the income distribution as a rough indicator for differences in social class composition between the regions, and as we do not expect the two countries to differ essentially in this area, we chose a simple solution. We took the average income per region (per person liable to income tax), standardized it to a normal distribution and took the standardized deviation of the mean (the Z-score) as a measure for socio-economic differences between regions.
Sources for both countries were:
- the Netherlands: the publication of regional income distribution for 1974 (Regionale Inkomensverdeling 1974) published by the Central Bureau of Statistics.
- Belgium: here we obtained data from the National Institute of Statistics - Financial Statistics no.10,1976 (incomes from 1976). Figures for each district were published.

Map 5.5. Geographical distribution of the percentage of 0-4 year olds in Belgium and the Netherlands (1977 and 1974 respectively).



Map 5.6. Geographical distribution of income in Belgium and the Netherlands, standard scores (1976 and 1974 respectively).



As the standardized scores were computed per country and the frequency distribution was transformed into a normal distribution, it is no use showing the frequency distribution of the transformed scores.
The geographical distribution is shown on map 5.6. High income areas are the environment of Amsterdam in the Netherlands and Brussels and environs in Belgium.

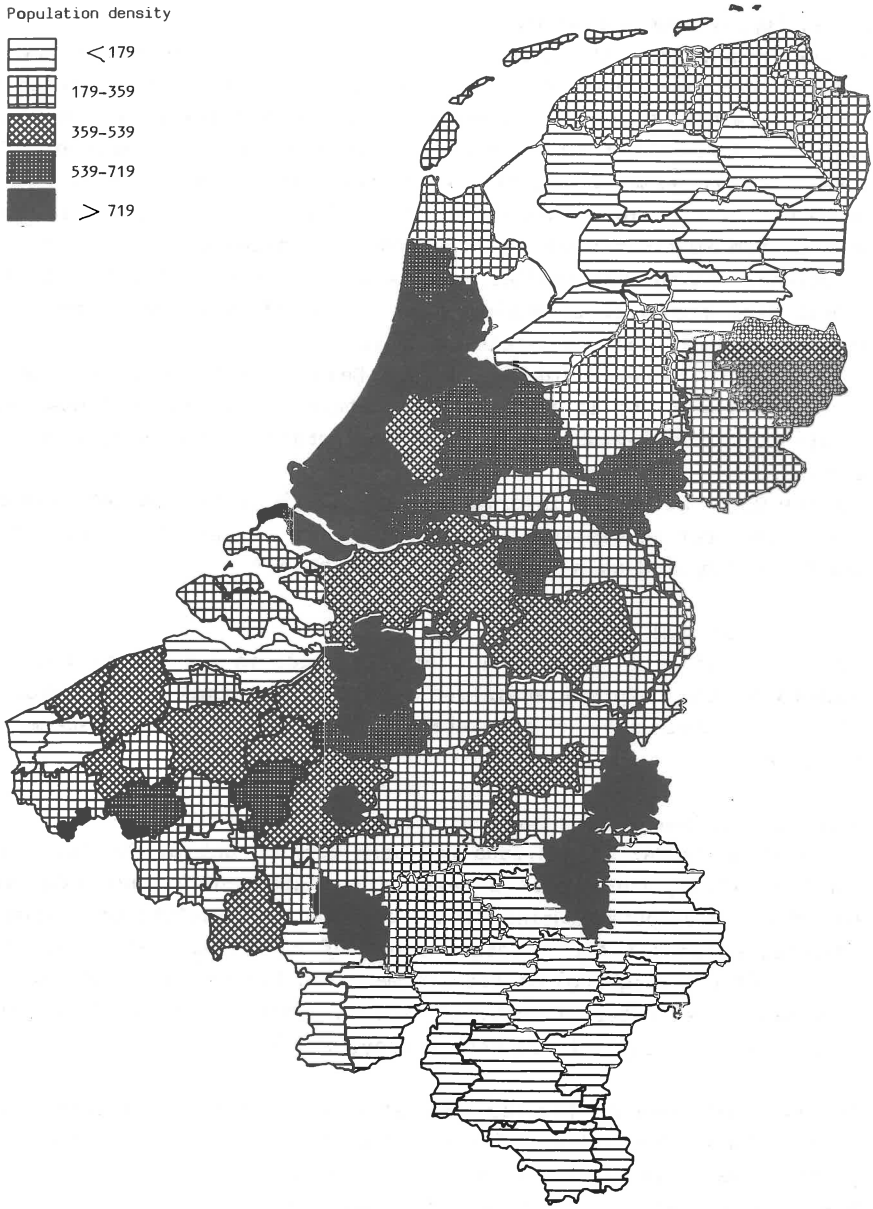
5.3.1.4. Urbanization
It is not so easy to characterize regions of a nodal type (the unit of analysis in this study) according to the degree of urbanization. Nodal regions, by definition, have an urbanized core and surroundings of more or less suburbanized countryside. At first we thought we had found a solution by taking a supposedly comparable variable: the proportion of the population in municipalities of less than 10.000 inhabitants. The size of municipalities however varied (before the large scale 'fusion' took place in Belgium that reduced the number of municipalities considerably) too much between the countries in 1974. So we chose the population density of the region as a proxy for urbanization. The distribution is shown in table 5.6. and map 5.7.

Table 5.6. Population density (number of inhabitants per km^2) in 85 Belgian and Dutch districts (1977 and 1974 respectively).

	Belgium	The Netherlands	Total
$<$ 180 inh/km^2	14	7	21
180-359 inh/km^2	12	13	25
360-539 inh/km^2	9	5	14
540-719 inh/km^2	3	5	8
$>$ 720 inh/km^2	5	12	17
$\bar{x}$	470	724	595sd
	978.4	872.9	931.0

Population density is not distributed normally, especially in the Netherlands where there are more or less rural districts on the one hand and metropolitan areas on the other hand. In Belgium the differences are more gradual. The population is distributed (or rather spreads itself) more evenly over the country.
In Belgium the metropolitan areas of Brussels, Antwerp, Liège and Charleroi have the most dense populations, while the rural areas of the Arden-

Map 5.7. Population density (number of inhabitants per km^2) for 85 districts in Belgium and the Netherlands (data for 1977 and 1974 respectively).



nes have been populated most sparsely. In Holland the difference between the 'Randstad'(belt town) Holland and the rest of the country (with exception of South Limburg) is clear.

5.3.2. Supply side variables

On the supply side the important variables are the number of hospital beds and the density of physicians in different categories: specialists, general practitioners, common specialists. In an analysis of hospital admissions, data on the organization, administration and management of hospitals as businesses are possibly important as far as there is variation between countries or regional variation. Data of this kind are however scarce. Van Montfort's dissertation about hospital costs- and production functions, showed that smaller hospitals (less than 200 beds) could not profit from economies of scale, which (among other things) showed itself in a prolonged (average) length of stay.

As a rule we gathered information for Belgium from the various writings of Xavier Leroy. It is in this field where he contributed most to the construction of reliable and valid indicators on the supply of health services.

For the Dutch situation information was usually harder to get. Numbers of specialists per specialty, for instance, were not available for 1974 and had to be computed on a rather arbitrary base.[3]

5.3.2.1. Hospital beds

The number of acute medical and surgical beds is one of the main determinants of the hospital admission rate of a community. Most studies on admission rates show a moderate to strong covariation between these variables.

Sources: the sources for both countries were the following:

- The Netherlands: in previous research carried out by Posthuma and Van der Zee (1977), the number of available acute medical and surgical beds for 1974 was computed (using data about the municipality of residence of admitted patients) for a large number of municipalities. These figures could (after reweighing) be transformed into figures per district.
- Belgium: the number of hospital beds was copied directly from table 4.3 (p. 366) in Leroy's third book (Leroy, 1981).

For two districts no figures were shown because the districts contained no hospitals. The values of the districts that admitted most of their patients were distributed to these districts.

Distributions are shown in table 5.7 and in map 5.8.

Table 5.7. The number of acute medical & surgical hospital beds per 1000 pop. for 85 districts in Belgium & The Netherlands (1974).

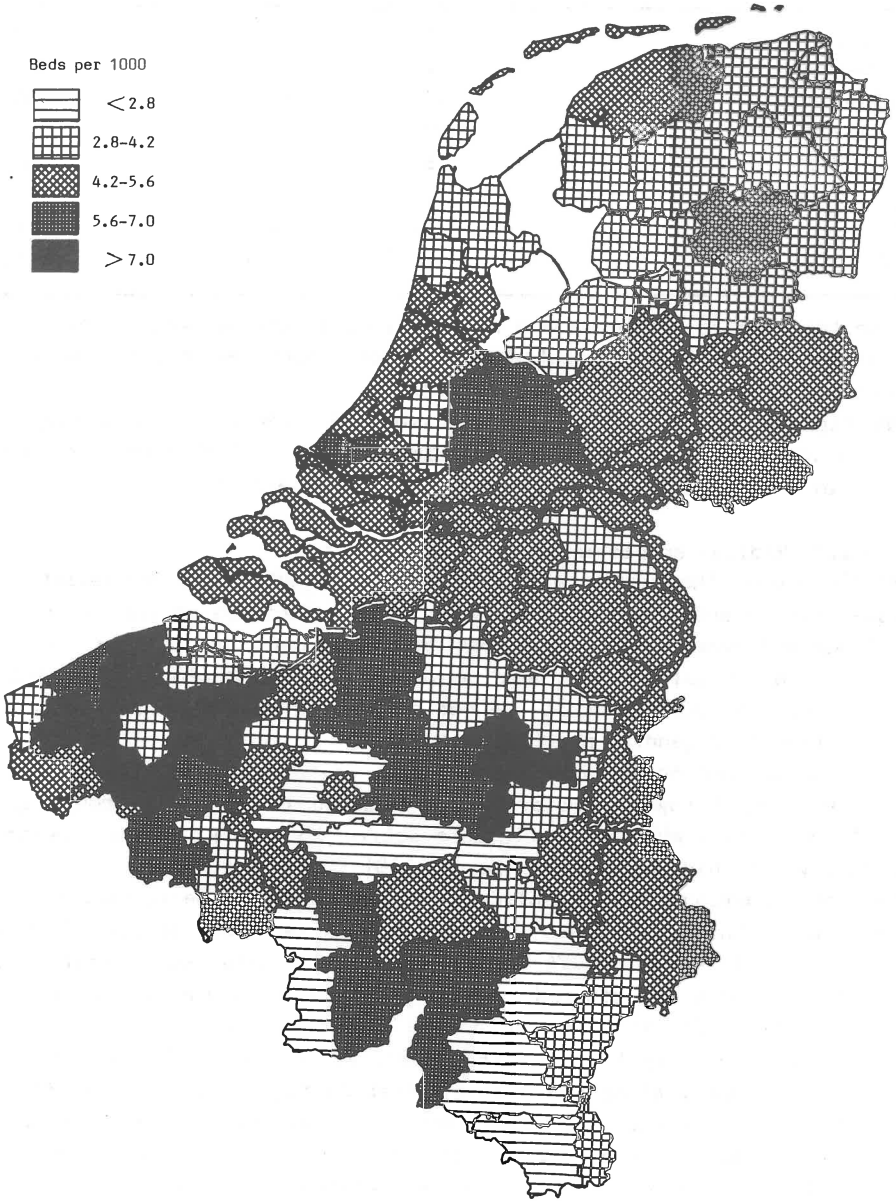
	Belgium	The Netherlands	Total
< 2.80	7	0	7
2.81-4.20	11	13	24
4.21-5.60	10	26	36
5.61-7.00	9	3	12
> 7.01	6	0	6
$\bar{x}$	4.80	4.58	4.69
sd	.94	.15	1.42

Hospital beds do not provide a clear dividing line between the two countries. There is enough variation within both countries to allow us to expect a statistically unbiased relationship.
The highest rates are found in provinces of Flanders (East and West) and the district of Hasselt in Belgian Limburg. The distribution of hospital beds in Belgium is less uniform than in the Netherlands.

5.3.2.2. Medical specialists

Merely adding the common indicator for the quantity of specialist care would not be sufficient in this analysis,for although in the Netherlands all medical specialists are second line providers, in Belgium they are directly accessible. Furthermore pediatricians, gynaecologists and internists perform functions that are not so clearly distinguishable from the activities of a general practitioner.
The sources for both countries differed considerably in accessibility. For Belgium, Leroy's work proved a valuable guide to information, we could copy the number of specialists actively working in their specialty directly from his second book (Leroy, 1981, table 2.4: 340).
For the Netherlands some complicated tricks had to be performed. At first we learned the total number of specialists per municipality from the Chief Medical Officer (1974). Unfortunately no data were available per specialty. These we gathered by coding a complete address-book edited by the National Information System of the Health Insurance Funds, by transforming each municipality into CBS-municipality codes and also coding the specialty number. After the coding operation figures were aggregated via municipalities to district level. The two totals however, did not match. The total number of specialists with a health insurance fund contract was generally lower than the total number provided by the Chief Medical Officer.

Map 5.8. The number of acute medical and surgical hospital beds per 1000 inhabitants for 85 districts in Belgium and the Netherlands (1974)



This might have been due to the fact that some salaried (but fully qualified) assistants in academic hospitals did not have personal contracts with the health insurance funds[4], so we took the arbitrary decision of correcting the figures per specialty by multiplying them with the proportional difference between the total number per district provided by the Chief Medical Officer and the product of the operation of coding the list of contracters. In tables 5.8 and 5.9 the total number of medical specialists and the relative number of so-called 'popular specialists' (internists, pediatricians and gynaecologists) is shown (the number of inhabitants per specialist). The geographical distribution is displayed in maps 5.9 and 5.10.

Table 5.8. Number of inhabitants per med. specialist (all specialists) for 85 districts in Belgium and The Netherlands (1974).

	Belgium	The Netherlands	Total
< 1700	20	10	30
1700-2499	20	6	26
2500-3299	3	13	5
3300-4099	0	5	16
> 4100	0	8	5
			8
$\bar{x}$	1766.1	2906.0	2329.3
sd	495.20	1286.26	1127.56

The areas with the lowest density of medical specialists (the largest number of inhabitants per specialist) are found in the Netherlands. The density of specialists is higher in the Walloon part of Belgium, with the exception of the most rural (Ardennes) region. In Holland the areas around university hospitals are populated most densely with medical specialists.

Common specialists

In table 5.9 the frequency distribution of the number of inhabitants per 'common specialist' is shown. (For the regional dispersion, see map 5.10)

The black areas are found predominantly in the Netherlands. The variation within the Netherlands is larger than in Belgium. The direct and stable link of Dutch medical specialists with the hospitals (independently established specialists are an exception, only ophthalmologists and psy-

Map 5.9. The number of inhabitants per medical specialist for 85 districts in Belgium and the Netherlands (1974).

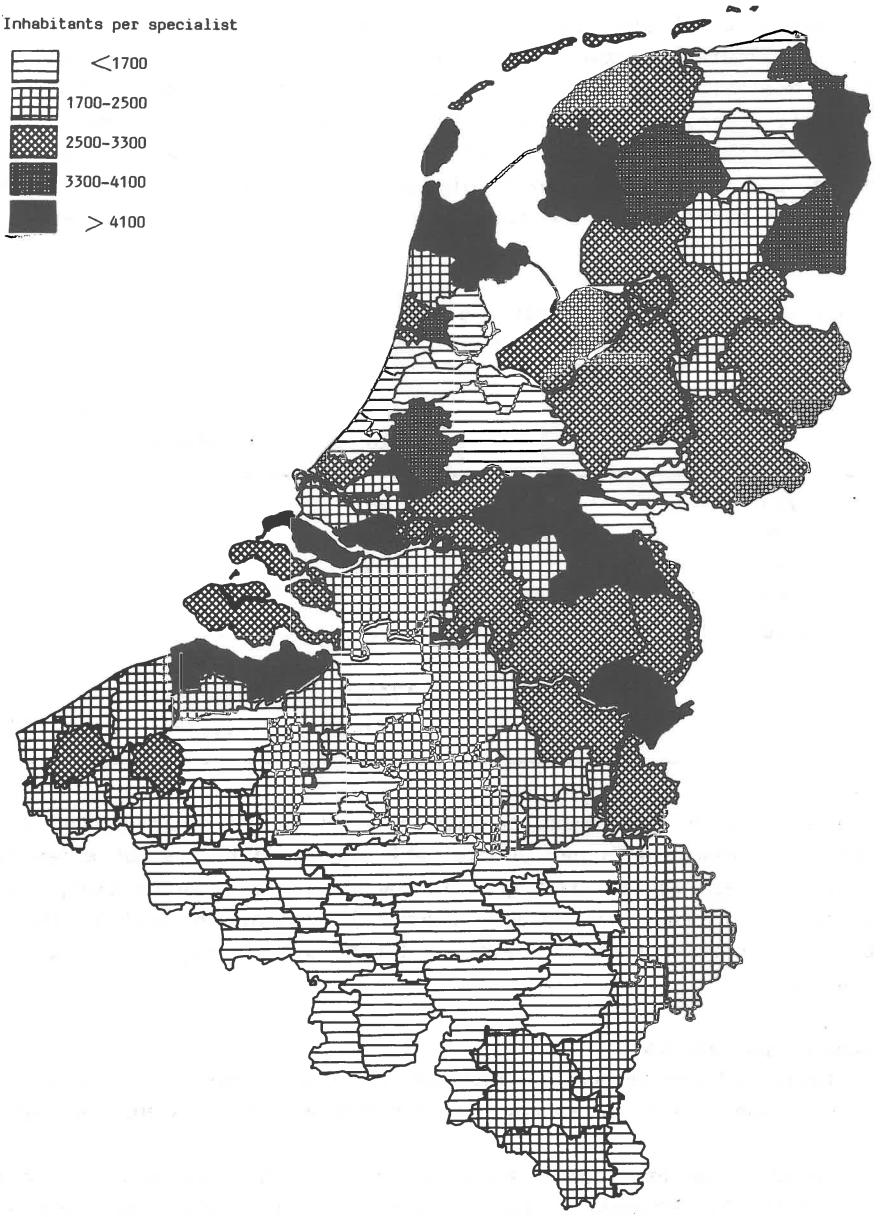


Table 5.9. Number of inhabitants per **common medical specialist** (pediatricians, gynaecologists, internists) for 85 districts in Belgium and The Netherlands (1974).

	Belgium	The Netherlands	Total
< 4000	8	4	12
4001-5999	26	6	32
6000-7999	7	7	14
8000-9999	2	19	21
>10000	0	6	6
$\bar{x}$	5052.3	8365.8	6689.6
sd	1410.87	3382.32	3058.8

chiatrists have this type of practice might be the source of this unevenness.

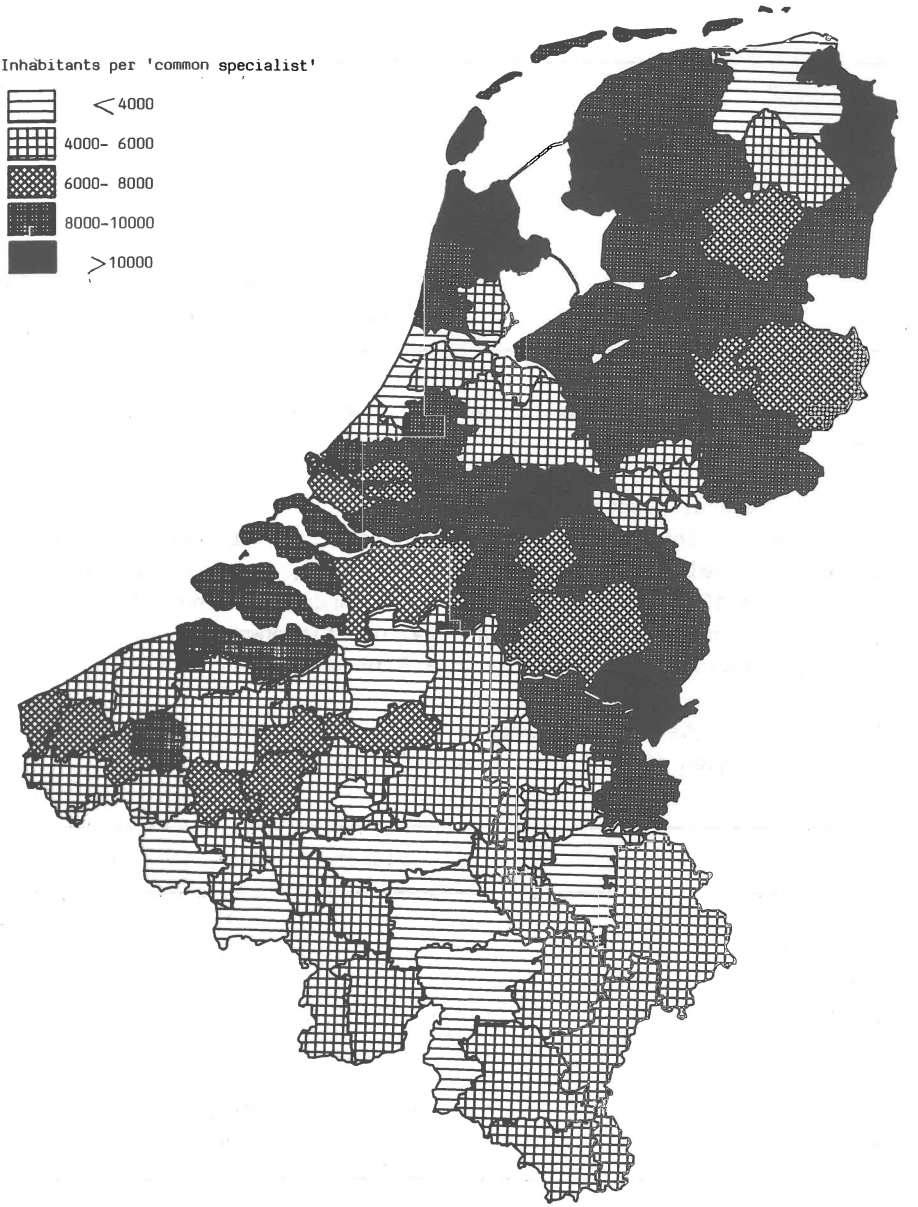
5.3.2.3. General practitioners

The number of inhabitants per general practitioner was more easily obtained. For Belgium the source was, as usual, Leroy's 'fichier' (Leroy, 1981, table 19: 335) and for the Netherlands data could be provided by our own data base of all Dutch general practitioners.
The distributions are shown in table 5.10 and in map 5.11.

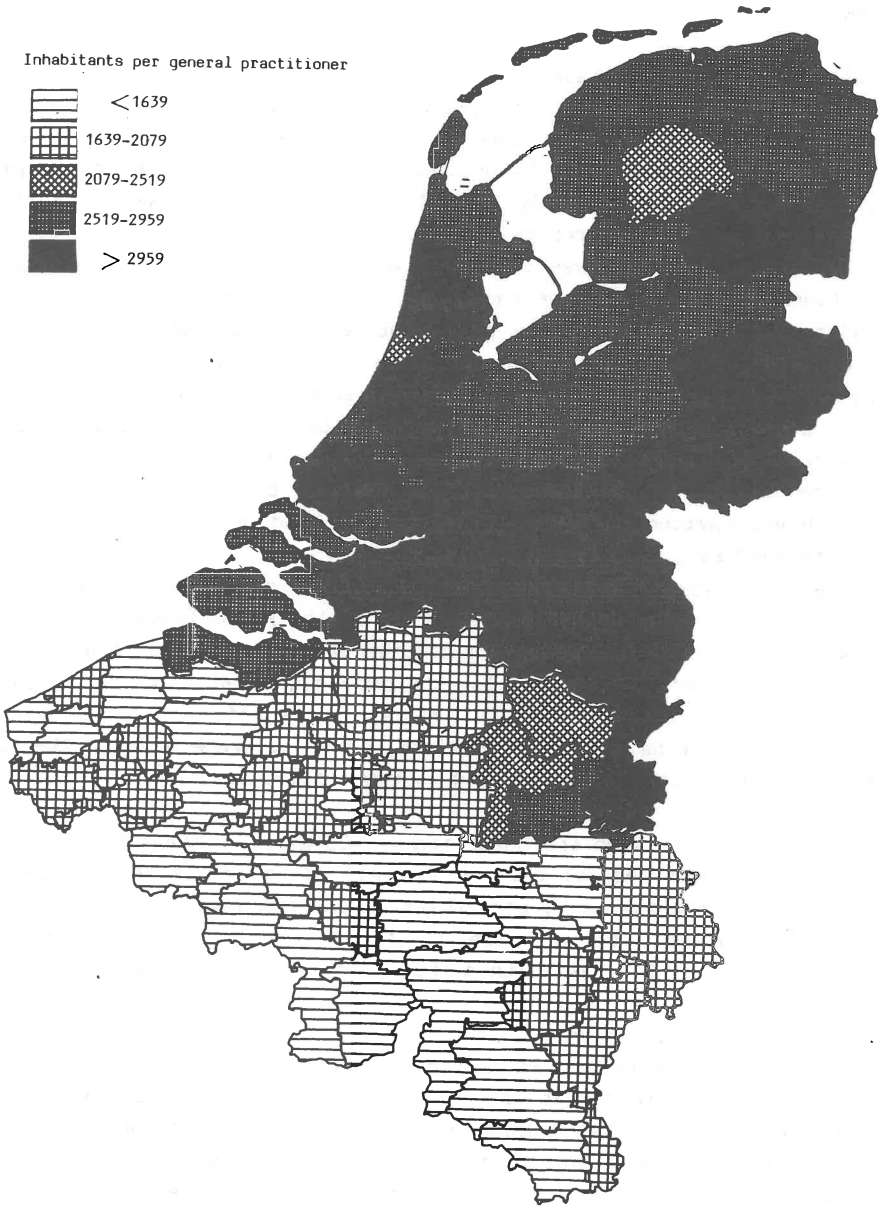
Table 5.10. Number of inhabitants per general practitioners, for 85 Belgian and Dutch districts (1974).

	Belgium	The Netherlands	Total
< 1640	21	0	21
1640-2079	19	0	19
2080-2519	2	2	4
2520-2959	1	16	17
> 2960	0	24	24
$\bar{x}$	1686.0	2979.9	2325.3
sd	315.46	269.12	713.13

Map 5.10. The number of inhabitants per common medical specialist (internist, pediatrician, gynaecologist)for 85 districts in Belgium and the Netherlands (1974).



Map 5.11. The number of inhabitants per general practitioner for 85 districts in Belgium and the Netherlands (1974).



The density of general practitioners shows practically no overlap between both countries. They are quite distinct in this field. In Belgium the g.p. density is relatively low in the province of Limburg while in the Netherlands the southern and eastern parts show the lowest density figures.

5.3.2.4. Size of hospitals

Economies of scale seem to negatively influence the average length of stay per hospital. This has been shown by Van Montfort (1981), so we decided (for a change in fact, as these sorts of models are rather primitive with their crude supply indicators) to extend our set of variables with an indicator that represents the size of hospitals in the region.
For Belgium the source was the publication of 'Eerste en voornaamste statistische uitkomsten van de enquête in de verzorgingsinstellingen' (First and main statistical results of the survey of institutions of care) by the Belgian Ministry of Public Health and the Family (Ministerie van Volksgezondheid en van het Gezin z.j., situatie op 1 januari 1975).
For the Netherlands figures have been distilled from table 3 of the 'Overzicht van de gegevens van ziekenhuizen over het jaar 1974' (Survey of the data on hospitals for the year 1974) by the Ministry of Public Health and Environmental Protection (Geneeskundige Hoofdinspectie van de Volksgezondheid, 1977).
There is one problem in the comparison of both countries. There is a difference of scale between the countries. In the Netherlands hospitals with fewer than 100 beds are rare. In Belgium it is a common sort of size.
If 'economies of scale'[5] do play the role suggested above in the production of hospital admissions and bed-days, this effect would be the same for both countries, so we decided to add the **average size of the hospitals** in the 85 regions to the independent variables.

The difference between the countries is striking. As Nuyens (1983) points out, residential medical care is a small sized affair in Belgium. This might affect the mean stay per admission and the admission rate accordingly. The lowest hospital size is found in the Ardennes, while the southern part of the Netherlands shows the largest average hospital size.

5.3.4. System related variables

Some of the independent variables cannot be classified as 'demand' or 'supply' side factors, but are to be considered as derived directly from the legal and financial regulations that govern transactions between suppliers and consumers of health care. These characteristics cannot be compared because they differ intrinsically. Examples of this type of variable are:

Map 5.12. The average size of general hospitals for 85 districts in Belgium and the Netherlands.

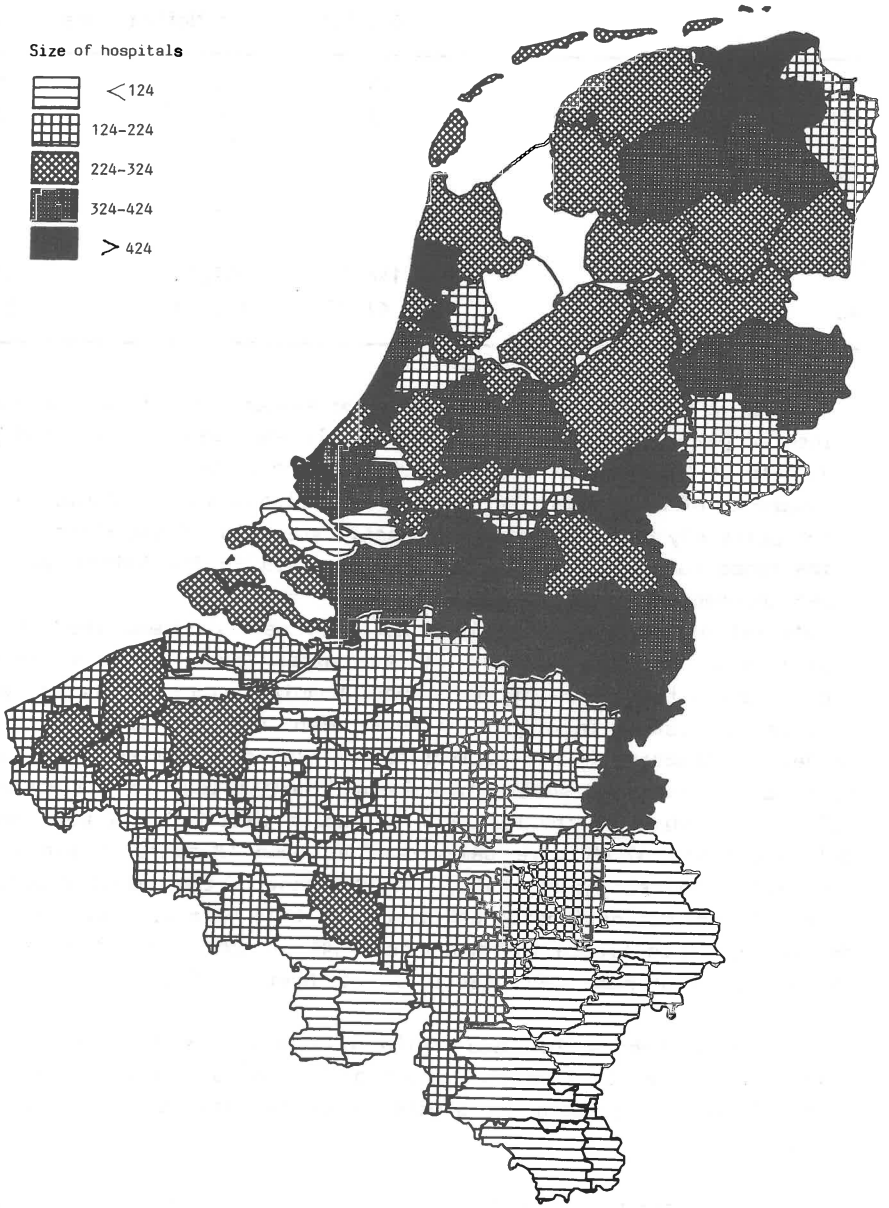


Table 5.11. The average number of hospital beds for 85 districts in Belgium and The netherlands.

	Belgium	The Netherlands	Total
< 125	15	1	16
125-224	23	6	29
225-324	5	15	20
325-424	0	11	11
> 425	0	9	9
$\bar{x}$	146.7	332.0	238.3
sd	61.88	111.31	131.50

- all variables related to the **insurance system** (privately and publicly insured patients in the Netherlands, self employed and salaried participants of the Belgian health insurance fund systems).
- **ownership of hospitals.** Both in the Netherlands and in Belgium publicly and privately owned hospitals coexist. Ownership of hospitals by health insurance fund organizations is not possible in the Netherlands but a not uncommon practice in Belgium.
- **cultural differences.** This is a not very well circumscribed area that is touched on only slightly in this macro level analysis. Among the differences that certainly influences hospital admission rates, are the different customs in respect of confinement and delivery.

In Belgium practically all deliveries are clinical deliveries. Deliveries at home are rare and so are 'ambulatory' deliveries. In the Netherlands (1974), according to the Ministry of Public Health 52.4% were hospital deliveries and 47.6% were deliveries at home (Ministerie van Volksgezondheid en Milieuhygiëne, 1981). In 1974 most of the hospital deliveries were full admissions (Boerma estimates for this year 6.7% as 'ambulatory' deliveries. This figure increased to 29.4% in 1983 while the percentage of deliveries at home decreased to 34.5%, Boerma 1983: 19-21).

So different habits in this field influence the hospital admission rates. We decided to take the number of births[6] as a variable explaining part of the differences in admission rates between both health care systems.

In this paragraph we shall show the distribution of the following variables:

- the relative number of publicly insured patients (The Netherlands)
- the relative number of persons insured under the 'regime générale' (salaried employees) in Belgium
- the relative number of widows, orphans, disabled and old age pensioners for both 'régimes' (Belgium)
- the percentage of health insurance fund owned hospital beds (Belgium)
- the number of births per 1000 population (both countries).

5.3.4.1. Insurance variables

The first variable we will discuss is the proportion of publicly insured persons in the Netherlands. As has been pointed out in section 3.3. health care to publicly insured persons is being delivered in kind. There is an argument going on in the Dutch health care policy circles as to whether the (established) higher consumption rates for publicly insured persons are due to the relatively barrier-free insurance system or have other causes like differences in health status between these (in wealth differing) groups.

The same sort of debate about the influence of the insurance system on the consumption of health services took place in Belgium along comparable lines.
This time the two groups consisted of the 'active' (i.c. employed) part of the population on the one hand and the 'nonactive' (the widows, orphans, handicapped and old age pensioners) part on the other hand.

The co-payment system ('ticket modérateur' - remgeld) did not apply to the latter group in 1974 provided their income did not exceed a certain ceiling (in 1976 BF 165.000 + 32.000 per person in charge, Leroy, 1981: 26). This dispute is described in chapter 2 of Leroy's second book (Leroy, 1981: 24-28).
The general idea in Belgium and the Netherlands is that the absence of direct co-payment induces consumption of health services. The establishment of an 'insurance effect' is not easy because of the connection of insurance and health status influencing factor (certainly in Belgium where old age pensioners and handicapped persons are part of the 'non-actives').
There is however a certain consensus (for instance worded by Philipsen, 1983) that the insurance system does have aspects which affect consumption, so the proportion of publicly insured patients is introduced to account for insurance related differences between Dutch districts and the proportion of non-actives for the Belgian situation. Recent results of the Rand Corporation experimental design (Newhouse e.a. 1981; Van der Ven, 1983) confirm the above mentioned influence.

The distribution of the proportion of publicly insured patients is shown in table 5.12.

Table 5.12. The proportion of publicly insured patients in 42 Dutch districts (1974).

Percentage					$\bar{x}$	sd
<60	60-64	65-69	70-74	>74		
3	9	12	14	4	68.04	5.261

Source: Landelijk Informatie Systeem Ziekenfondsen (National Information System of the Health Insurance Funds) - figures for 1974.

In table 5.13 the distribution of the proportion of non-actives is shown.

Table 5.13. The proportion of 'non-actives' (widows, orphans, handicapped and old age pensioners) in 43 Belgian districts (1974).

Percentage					$\bar{x}$	sd
<20	20-22	23-25	26-20	>30		
5	16	12	6	4	23.24	4.053

Source: X. Leroy, 1981 - table 1-18: 317-334.

There is another distinction in the Belgian public insurance system. All salaried persons and their dependants are liable to the 'régime générale'. This regime also applies to some other groups (students, domestic servants). Self employed persons (and strangely enough, members of monastic orders) are liable to the 'régime indépendent' (see Heesters and Kesenne, 1985). The latter group is only insured for 'heavy risks' like hospital admission and in-patient care. In a lot of cases additional insurance for 'small risks' is obtained on a voluntary basis.

The distribution of this 'régime indépendent' is shown in table 5.14.

Map 5.13 The proportion of publicly insured patients in 42 Dutch districts.

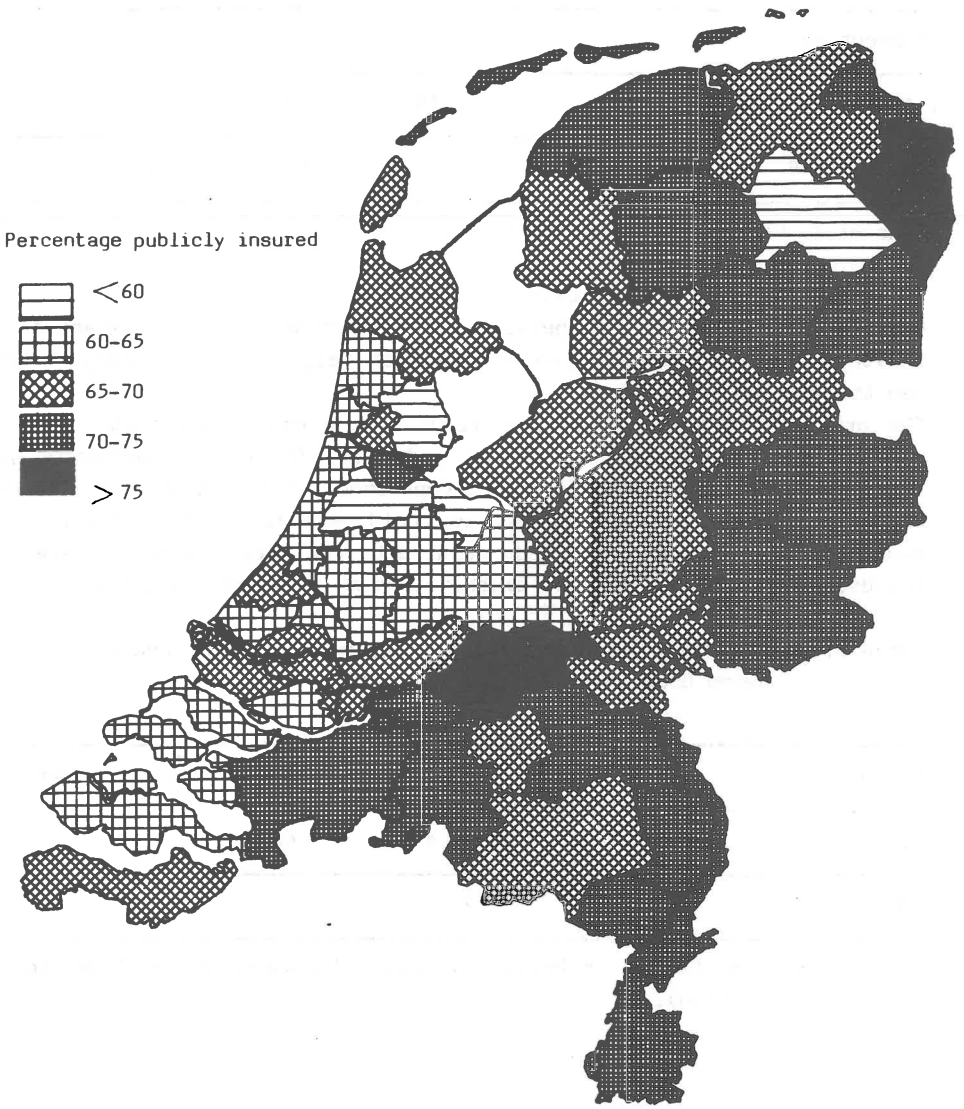


Table 5.14. Distribution of the proportion of the population liable to the 'régime indépendent' for 43 Belgian districts (1974).

Percentage					$\bar{x}$	sd
<15	16-21	22-27	28-33	>34		
10	18	8	5	2	20.77	7.219

Source: X. Leroy, 1981 - table 16: 332.

5.3.4.2. Ownership of hospitals

A characteristic difference between Holland and Belgium is the fact that health insurance funds can own hospitals in Belgium, whereas they cannot own them in the Netherlands.

The grip of the health insurance funds on the distribution of hospital services varies between the Belgian districts. Thanks to additional information provided by the scientific department of the National League of Christian Health Insurance Funds, we could establish the proportion of health insurance fund owned beds related to the total number of beds in the districts (for 1974). This distribution is shown in table 5.15.

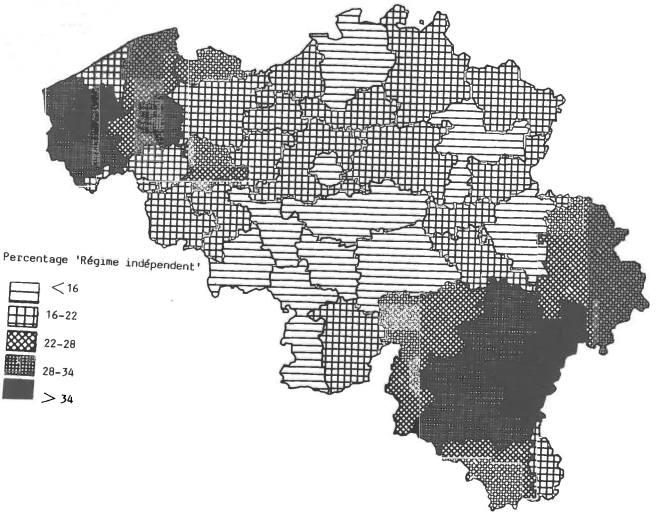
Table 5.15. The distribution of the proportion of health insurance funds owned beds in 43 Belgian districts.

Percentage					$\bar{x}$	sd
0	1-15	16-30	31-45	>46		
23	9	4	2	5	12.95	22.910

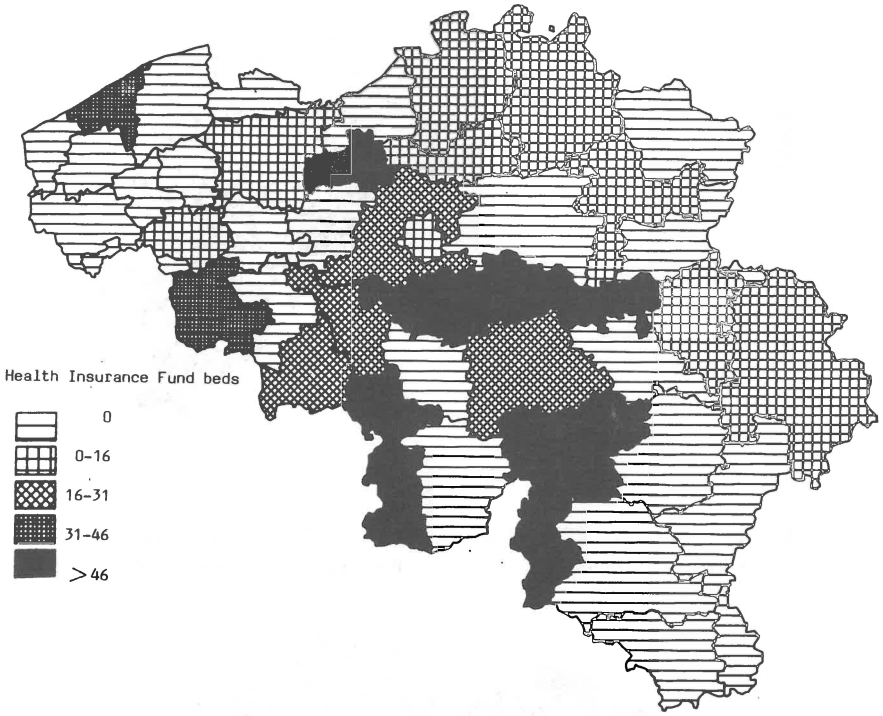
Source: National League of Christian Health Insurance Funds (additional information).

Map 5.14 The proportion of 'non actives' (widows, orphans,handicapped and old age pensioners) in 43 Belgian districts (1974).

Map 5.15 Distribution of the proportion of the population liable to the 'régime indépendent' for 43 Belgian districts (1974)



Map 5.16 The distribution of the proportion of Health Insurance Funds owned beds in 43 Belgian districts.



5.3.4.3. The number of births

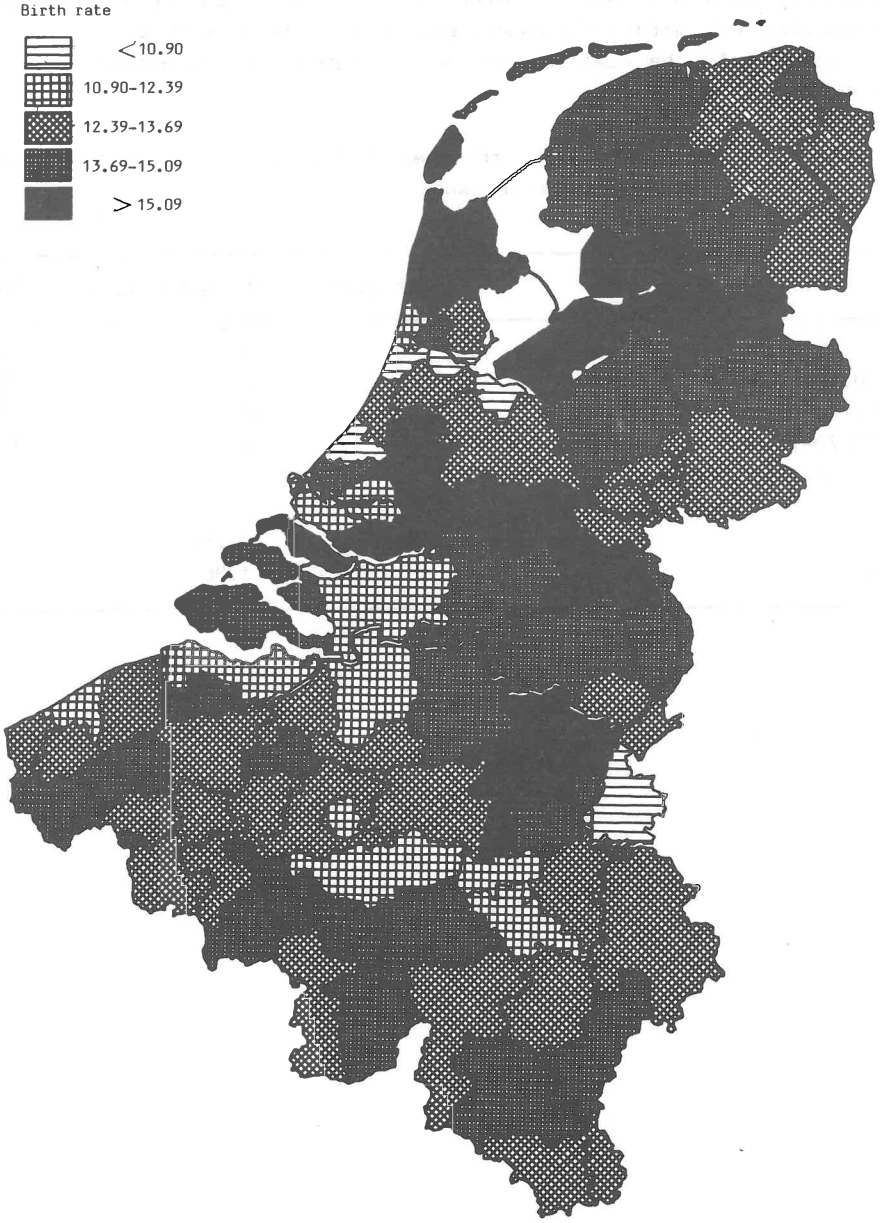
This is a rather heterogeneous section. As has been explained before, difference in custom regarding the place and manner of deliveries, probably form a source of difference in admission rates between the countries and, within the countries, between the districts.

In table 5.16 the distribution of the number of (live)births per 1000 population is shown.

Table 5.16. Number of live births per 1000 pop. in 85 districts in Belgium and The Netherlands.

	Belgium	The Netherlands	Total
< 10.90	0	5	5
10.90-12.39	6	4	10
12.40-13.69	20	10	30
13.70-15.09	15	16	31
> 15.10	2	7	9
$\bar{x}$	13.51	13.54	13.52
sd	.933	1.861	1.458

Map 5.17 Number of live births per 1000 pop. in 85 districts in Belgium and the Netherlands.



6. ANALYSIS OF REGIONAL VARIATIONS IN THE NUMBER OF HOSPITAL ADMISSIONS

The 4th chapter of this report contains a theoretical analysis of the regional variations in hospital admissions in the Netherlands and Belgium. The line of reasoning in that chapter was that a number of differences between regions that influence differences in hospital admissions are general in the sense that they will have the same kind of influence in western industrialized countries, regardless of the differences in health care system. There are also a number of variables which can be conceived of as indicators of the differences between health care systems. When we transpose this line of reasoning to the analysis of the data, an obvious strategy would be:

a. to use regression analysis to estimate an equation for the number of hospital admissions in one analysis of the 42 regions in the Netherlands and the 43 regions of Belgium. The independent variables in this regression analysis are the general indicators of demand and supply as indicated in chapter 4.
b. with this regression equation an estimation is made of the number of hospital admissions in each region. The differences between the estimated and the observed values (the residuals) are used as the dependent variable in an analysis of regional variation for each country.
c. as independent variables in this analysis we use the variables that indicate the differences between the health care systems of Belgium and the Netherlands.

6.1. Estimation of the parameters of the general model

In the general model the number of hospital admissions per 1000 of the population is supposed to be a function of the percentage of children under five years of age, the percentage of people over 65 years, the standardized mortality rate, the mean income of the population, the population density, the number of hospital beds per 1000 inhabitants, the mean stay for hospital care and the mean size of the hospitals. The variable mean income of the population is obviously correlated with differences between systems. Eligibility for public insurance in the Netherlands is dependant on income. In Belgium the level of co-payment is related to income (via marital status, age and handicaps). As far as the demand side is concerned the number of children under five years of age is strongly correlated with the birth rate which is an indicator of differences between the health care systems, because of the great difference in the number of home deliveries between both countries. On the supply side variables indicating the number of physicians (in different specialties) are excluded, because of difference in the accessibility of medical special-

ists between the Netherlands and Belgium.
We will start with the intercorrelations between the variables of the general model. These correlations are given for the total number of 85 regions and for the 42 regions of the Netherlands as well as for the 43 regions of Belgium. We have added a dummy variable which equals one when a region is in Belgium. A correlation of this dummy variable and one of the other variables indicates a generally higher or lower level of this variable in Belgium. (See table 6.1.).

Table 6.1. Correlations between the variables in the general model for both countries together and for each country (r * 100).

	H	B	T	H	B	T	H	B	T	H	B	T	H	B	T
Percentage 65+	-11	06	29												
Percentage 0-4 years	-32	34	-41	-55	-56	-74									
Mortality	18	08	42	-15	39	59	-16	-06	-65						
Income	17	-13	-00	-08	01	-02	-19	-32	-13	-26	-06	-08			
Population density	13	15	06	38	17	11	-71	09	-18	-03	-05	-13	38	55	47
Beds	54	35	36	04	-08	02	-50	08	-14	01	-25	-07	39	08	14
Size of hospitals	02	26	-27	-19	-18	-55	-17	-08	50	18	-19	-57	-01	34	08
Mean stay	09	06	-08	55	11	02	-60	-31	-01	01	-40	-40	01	-04	-02
Dummy Belgium = 1	-	-	47	-	-	63	-	-	-78	-	-	78	-	-	(00)
	hosp. adm.			perc. 65+			perc. 0-4 years			mortality			income		

Population density												
Beds	44	14	18									
Size of hospitals	07	19	17	09	65	17						
Mean stay	41	02	21	58	38	35	11	40	36			
Dummy Belgium = 1	-	-	14	-	-	08	-	-	-72	-	-	-31
	pop. density			beds			size of hosp.			mean stay		

First we are concerned with the correlations for all regions. The number of hospital admissions is positively correlated with the percentage of elderly people, the standardized mortality ratio and the number of hospital beds while negatively correlated with the percentage of children under five years of age and the mean size of the hospitals.
Furthermore there is a number of relatively strong correlations between the independent variables. In part these correlations reflect the differences in the distributions between the two countries (see also the correlations with the dummy variable Belgium = 1). This concerns the intercorrelations between the percentage of elderly people, the percentage of children aged 0-4 years, the standardized death rate and the mean size of

hospitals. We will not discuss these correlations.
The remaining relatively strong correlations between the independent variables are: a negative correlation between the standardized death rate and the mean stay in hospitals,furthermore positive correlations between the mean stay and the size of hospitals and the number of hospital beds and between the mean income of the population and the population density. When the correlations are broken down by country, there are some striking differences which may influence the interpretation of regression equations. The percentage of elderly people has a positive correlation with the number of hospital admissions for all regions, but a weak negative correlation for the regions in the Netherlands and no correlation for Belgium. This apparent anomaly is caused by the fact that the distribution of the percentage of elderly people is composed of two clearly distinguishable distributions for both countries; to a lesser extent the same is true for the distribution of the number of hospital admissions. The overall correlation is caused by a higher level of the percentage of elderly people and the number of hospital admissions in Belgium.
The overall correlation of the number of hospital admissions and the standardized mortality rate is of a greater magnitude than the separate correlations for the Netherlands and Belgium. This is likewise caused by the generally higher level of mortality in Belgium. The overall negative correlation between the number of hospital admissions and the percentage of young children turns into a positive correlation in Belgium (probably caused by the admissions associated with the delivery) and a negative correlation in the Netherlands. This overall negative correlation can of course be attributed to the higher percentage of young children and the lower level of hospital admissions in the Netherlands.
The correlations with income differ in sign when broken down by country. The line of reasoning that one of the countries has a generally higher level of income, would not do in this case, because relative income differences are used (standard scores). Generally, it is found that the number of hospital admissions is lower in wealthier areas. The positive correlation in the case of the Netherlands may be attributed to the correlation between the mean income of the population and the number of hospital beds. The overall correlation between the size of hospitals and the number of admissions is negative, while there is no correlation in the Netherlands and a positive one in Belgium. This is caused by the difference in size of the hospitals between the Netherlands and Belgium.
As far as the intercorrelations of the independent variables are concerned, the correlation of standardized mortality with the percentage of elderly people and with the mean size of the hospitals shows the same pattern.
In conclusion: the frequency distribution of a number of variables is

clearly composed of two separate distributions.As a consequence there are differences in the magnitude and size of the overall correlations and the correlations for the individual countries.

This is an important conclusion for the remainder of our analysis. It means that the parameters of the general model as estimated in a regression analysis over all regions rather reflect the differences between the Netherlands and Belgium than the structural relations between the variables in the model. Therefore, for some variables a linear approximation of the relationship with the number of hospital admissions over all regions is clearly inappropriate. Nevertheless, we will give the analysis over all regions to show how misleading such an analysis can be. However, to evaluate the validity of the general model we will examine the equations for both countries separately. The independent variables must have the same kind of influence in each country. For reasons of multicollinearity some variables had to be deleted from the equations. The proportion of the population over 65 and the proportion of the population of 0-4 years old covariate with the overall demographic structure. The proportion of 0-4 years of age has been deleted. More or less the same goes for the intercorrelations of the size of hospitals with the proportion of available beds per 1000 pop.
In Belgium these variables covariate (in the Netherlands they do not). For the separate analyses per country two equations are estimated, one including and one excluding the size of hospitals. The results are presented in table 6.2. (see page 67).

Two things are striking. Mortality rates only reflect the overall difference between Holland and Belgium both in age adjusted death rates and in hospital admissions (so per country differences disappear) although the sign of the coefficient is positive. Secondly the proportion of explained variance is considerably larger for the Netherlands (.29) than for Belgium (.10).

The mean stay per admission influences admission rates negatively in Holland while no influence is found in Belgium. The income distribution has a negative influence on the Belgian admission rates - more admissions in the **poorer** areas. The number of hospital beds per 1000 population influences admission rates for both countries in the same direction, regardless of the differences everywhere else in the health care systems.
As we indicated earlier on, the range of values of the number of hospital beds is greater in Belgium than in the Netherlands. This gives us the opportunity to have a look at the linearity of the relationship over a greater span of values. Figure 6.1. (see page 68) gives the scattergram

Table 6.2. Regression of the variables of the general model on the number of hospital admissions for all regions and for Belgium and The Netherlands.

	All regions		Belgium				The Netherlands			
			(1)		(2)		(1)		(2)	
	B	T	B	T	B	T	B	T	B	T
Perc. 65^+	-.20	-.27	.26	.22	-.11	-.09	.87	.90	.88	.90
Mean stay	-.36	-.86	-.74	-.56	-.25	-.20	-3.14	-3.06	-3.15	-.216
Mortality	4.73	2.80	1.94	.66	2.57	.89	3.92	1.25	3.92	1.25
Income	-1.09	-.69	-5.59	-2.01	-4.45	-1.74	-.81	-.44	-.81	-.43
Pop. density $x10^{-2}$	.18	1.00	.43	1.59	.41	1.55	-.11	-.52	-.11	-.27
Beds	4.33	4.17	2.01	1.30	2.97	2.40	15.11	4.28	15.11	4.28
Size of hosp. $x\ 10^{-1}$	-.16	-1.08	.55	1.03	-	-	-.003	-.02	-	-
Constant	54.09	2.53	83.56	2.27	78.93	2.15	39.26	1.44	39.23	1.22
$\bar{R}^2$	.29		.10		.10		.29		.31	
N	85		43		43		42		42	

and regression lines for the Netherlands and Belgium separately and for all of the observations. It is clear that the slope of the regression line is steeper for the Netherlands. In Belgium the slope is less steep, but there are no interpretable deviations from linearity at the tails of the distribution.

These results indicate the way for the rest of the analysis. For both countries we compute the residual admission rates that remain after the influence of the number of hospital beds has been eliminated. Therefore we estimate the number of hospital admissions with 'hospital beds' as the only independent variable with the following equations.

Belgium: hospital admissions = 104.732 + 2.690 x beds (r^2 = .12)

The Netherlands: hospital admissions = 61.090 + 9.384 x beds(r^2 =.29)

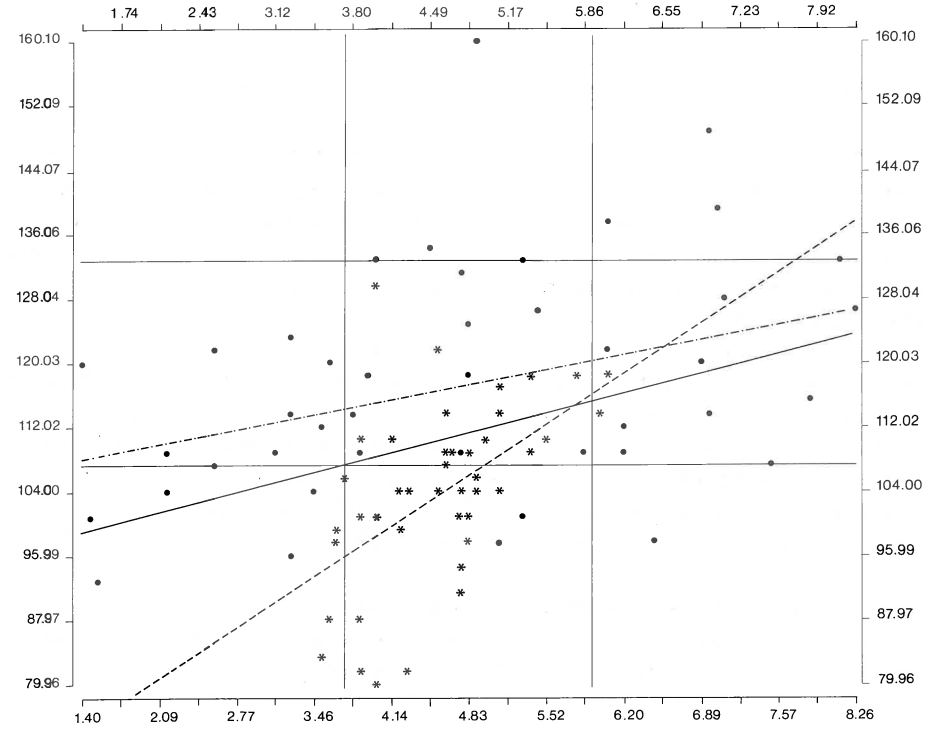
6.2. Statistical explanation of the residuals

The remaining group of variables can be divided into variables that can be found in both countries, but that are supposed to influence admission rates in a different way and variables that are unique in each country. Examples are:

a. birth rate (in Belgium supposed to be related positively with admissions, because practically all births include full admission)

b. the ratio between the number of 'common specialists', the number of general practitioners and the number of 'other specialists' in a district. In Holland no difference will be predicted for the ratio between the number of 'common specialists' (pediatricians, gynaecolo-

Figure 6.1. Scattergram and regression lines of the number of hospital admissions and the number oe hospital beds per 1000 of the population for the Netherlands and Belgium in 1974.



. Belgium
* The Netherlands
------- Belgium
-.-.-.- The Netherlands
——— all observations

gists and internists) and the total number. In Belgium the relative number of 'common specialists' whether or not combined with the number of general practitioners will influence hospital admissions negatively, as we predicted; in other words, the more common specialists there are in a region, the less the number of hospital admissions will be.

On the other hand some variables are 'unique' for a specific health care system. For the Netherlands this is the proportion of publicly insured patients and for Belgium the proportion of 'non active people' (more admissions predicted), the proportion of 'independents' (less admissions) and the proportion of health insurance fund owned hospital beds (difficult prediction - we are sticking to a negative relation for the time being). For the sake of comparability we shall have to estimate the results stepwise. Firstly we include the variables that can be found in both countries, but where different results are predicted (see table 6.3 on following page).
Then, in a second step, for each country the variables are included that showed a significant correlation in the first equation (see tables 6.4 and 6.5). The same procedure, now in 3 stages, will be repeated for the unique variables (see tables 6.6 and 6.7).

A common feature of all equations is the difference in sign of the variables introduced. That sounds promising because these different signs had been predicted.
Generally speaking the 'birth rate' has a positive and significant correlation with the residual admission rates in Belgium and no significant relation (a negative sign, however) in the Netherlands.
The ratio general/specialist medical care shows a less interpretable result. When we look at equation two, the one with the theoretically most interesting solution (the number of general practitioners and common specialists divided by the number of other (i.e. hospital based) specialists), we find that in Belgium the more generalist medical professionals there are the lower the level of hospital admissions. The denominator of this ratio is probably responsible for this result, for there is a strong negative coefficient between the number of inhabitants per specialist (equation 5) and the residual admission rate, while generally speaking this relation is the other way around for the Netherlands.
The more specialists the more admissions, given a certain capacity of hospital beds, is an interpretable result. For Belgium things are more or less as has been predicted. Even the result that the relatively strong position of general medical professionals can direct the flow of patients from the hospitals. For the Netherlands the findings are inconclusive. We

Table 6.3. Regressions of the variables for which a different effect for each country is expected, on the difference between the actual and estimated number of hospital admissions (B-coefficient and T-statistics).

	B	N	B	N	B	N	B	N	B	N
Birth rate	4.08 (1.93)	-.74 (-.83)	4.34 (2.16)	-.75 (-.93)	5.52 (2.23)	-.37 (-.43)	5.54 (2.54)	-.99 (-1.10)	6.33 (2.99)	-.89 (-.97)
Ratio gen. pract./spec.	-13.14 (-1.90)	5.14 (1.43)	-	-	-	-	-	-	-	-
Ratio common spec. + g.p./ other spec.	-	-	-.915 (-2.87)	2.73 (2.35)	-	-	-	-	-	-
No. of inh. per gen. pract.	-	-	-	-	-.0086 (-1.17)	.0086 .78	-	-	-	-
No. of inh. per common spec.	-	-	-	-	-	-	-.0032 (-2.19)	.00093 (-2.19)	-	-
No. of inh. per spec.	-	-	-	-	-	-	-	-	-.012 (-3.01	.0021 (1.56)
Constant	-41.20 (-1.40)	5.00 (0.45)	-33.05 (-1.17)	2.11 (.20)	-.60.09 (-2.03)	-8.80 (-.48)	-58.94 (-2.09)	5.65 (.52)	-64.29 (-2.38)	6.01 (.54)
R^2	.11	.00	.20	.08	.07	0	.14	.04	.21	.01

expected **no** relation between the general practitioner + common specialist/other specialist ratio and the admission rates. We found a positive one; the stronger the basic medical care, the more admissions.
In tables 6.4 and 6.5 we see what happens to results of table 6.3 when we introduce the variables that had a significant coefficient with admission rates in our analysis of the general model. For Belgium this is the income of the population - for Holland the mean stay per admission.

Table 6.4. Regression of the variables for which a different effect for each country is expected plus the mean income of the population on the difference between the actual and estimated number of hospital admissions - Belgium.

	(1)	(2)	(3)	(4)	(5)
Birth rate	2.12 (.88)	2.44 (1.10)	5.20 (1.89)	4.29 (1.86)	4.88 (2.25)
Ratio General practitioners/Spec.	-19.80 (-2.47)	-	-	-	-
Ratio Common spec. + g.p./other spec.	-	-11.86 (-3.44)	-	-	-
No of inh. per General practitioners	-	-	-.0086 (-1.16)	-	-
No of inh. per common specialist	-	-	-	-0.0043 (-2.67)	-
No of inh. per specialist	-	-	-	-	-0.16 (-3.71)
Mean income in standard-scores	-4.02 (-1.58)	-4.08 (-1.80)	-.65 (-.28)	-3.66 (1.52)	-4.56 (2.02)
C	-7.78 (-.22)	.22 (.007)	-55.82 (-1.67)	-36.33 (-1.15)	-37.54 (-1.28)
R^2	.15	.24	.04	.16	.27

Belgium: The income of the population is related negatively with the birth rate (correlation coefficient - see appendix 2 - r= - .45). So in most cases the introduction of the average income reduces the original correlation between admissions and birth rate to below the level of significance. Only in equation 5 (birth rate - number of inhabitants per specialist, income) are all coefficients significant and the proportion of explained variance is largest. This equation appears the most elegant additional solution.

Table 6.5. Regression of the variables for which a different effect for each country is expected plus the mean stay in hospitals, on the difference between the actual and estimated number of hospital admissions - The Netherlands.

	(1)	(2)	(3)	(4)	(5)
Birth rate	-1.74 (-1.78)	-1.64 (-1.81)	-1.37 (-1.45)	1.82 (-1.88)	-1.83 (-1.85)
Ratio General practitioners/Spec.	4.41 (1.28)	-	-	-	-
Ratio Common spec. + g.p./other spec.	-	2.35 (2.06)	-	-	-
No of inh. per General practitioners	-	-	.0022 (.38)	-	-
No of inh. per common specialist	-	-	-	.00074 (1.53)	-
No of inh. per specialist	-	-	-	-	.0017 (1.36)
Mean stay in hospitals	-2.15 (-2.12)	-1.93 (-1.94)	-2.20 (-2.09)	-1.98 (-1.93)	-2.11 (-2.07)
C	51.91 (2.11)	44.19 (1.84)	45.54 (1.45)	48.43 (1.93)	51.81 (2.11)
R^2	.08	.14	.05	.10	.09

The Netherlands: The introduction of 'mean stay per admission does not improve the (already poor) results of the Dutch equations. The largest proportion of explained variance appears in the least interpretable equation (2), where the ratio of general practitioner + common specialists/other specialists is one of the independent variables. The sign of the mean stay is in the expected direction, but we already knew that.

Unique variables

For the Netherlands the proportion of publicly (or privately) insured patients is taken as a unique property of the health care system. For Belgium the proportion of 'non actives', the proportion of 'independents' and the proportion of hospital beds owned by the health insurance funds are included in this stage of the analysis.

We follow the same lines of reasoning as we did in the preceding section. Firstly we show the influence of the new variables and in following steps we introduce, per country, the variables that have shown a relation with the residual admission rates in one of the preceding analyses (tables 6.6. and 6.7.).

Table 6.6. Stepwise regression of residual admission rates with variables representing unique features of the health care system of the Netherlands (1974).

	1	2	3
	B-coefficients and T-values	B-coefficients and T-values	B-coefficients and T-values
Perc. of publ.ins.	.34 (1.20)	.22 (.68)	.28 (.86)
Inh. per spec. x 10^{-2}		.10 (.77)	.03 (.19)
Mean stay per admission			-1.35 (1.43)
Constant	-23.15 (4.40)	-17.96 (4.54)	.74 (1.03)
$\bar{R}^2$	.01	.00	.03
N	42	42	42

The Netherlands: the proportion of publicly insured persons in a district does not contribute to the explanation of residual hospital admission rates. Given the number of available hospital beds no traceable influence can be shown; certainly not when the number of inhabitants per specialist

Table 6.7. Stepwise regression of residual admission rates with variables representing unique features of the health care system of Belgium (1974).

	1	2	3
	B-coefficients and T-values	B-coefficients and T-values	B-coefficients and T-values
% non actives	1.66 (3.54)	1.71 (3.34)	1.46 (2.77)
% independents	-.10 (-1.24)	-.10 (-1.12)	-.08 (-.95)
% sick fund owned hosp. beds	-.33 (-1.26)	-.29 (-1.05)	-.56) (-1.74)
Birth rate		1.06 (1.04)	1.20 (1.19)
Ratio g.p. + common spec./other spec.		.02 (.62)	.02 (.63)
Mean income of pop. (x 1000 BF)			-.17 (-1.75)
Constant	-30.21 (-2.30)	-46.74 (-2.18)	-2.31 (-.06)
$\bar{R}^2$	.24	.24	.26
N	43	43	43

is introduced into the equation.

Belgium: the proportion of non actives influences residual admission rates to a large extent (cf the proportion of explained variance in the Dutch and Belgian situations).

Besides, the influence of the proportion of independents and the proportion of health insurance fund owned hospital beds is not significant (T-values of about 1.25), but certainly not negligible. In the final

analysis, the proportion of health insurance fund owned hospital beds shows a clear relation with the residual admission rates. This theoretically interesting subject (see Evans' contribution about 'vertical integration') is worth further analysis.
The influence of generalists/specialists ratio disappears, although there is no multicollinearity (the correlation of this ratio with the proportion of non actives is .29; the correlation between the proportion of non actives and the number of inhabitants per specialist however is .53; the higher the density of medical specialists the higher the proportion of non actives, the lower the proportion of independents (-.60) and the higher the average income of the population).

With so few degrees of freedom (only 43 regions take part in the analysis) multicollinearity problems cause reliability problems, that can be solved in further research on a lower aggregation level. We must conclude with the observation that the explanation of residual admission rates for Belgium is more successful than for the Netherlands (one should keep in mind that the explanatory power of the initial general model was higher in the Netherlands) and that more complex multivariate analysis is hampered by the lack of observations. Notwithstanding all this, the results of our analysis are not entirely trivial: they provide guidelines for further research on a lower aggregation level. With this statement our main line of analysis stops, there are some side issues that deserve further analysis, however.

The first is the mean stay in hospitals. So far we have used this as an independent variable in the statistical explanation of regional variation in the number of hospital admissions. In the next section we will give the results of the estimation of an equation for the mean stay in hospitals. The second topic is the influence of the density of general practitioners on the number of hospital admissions. This variable has not been incorporated in the hospital admissions equations because of the strong and persistent correlation between the density of general practitioners and the percentage of old age pensioners.

6.3. The mean stay in hospitals

The relation between the mean stay in hospitals and the number of hospital admissions is a case of a mutual influence rather than a causal relation. It has already been stated that in case of a higher number of admissions and a given number of available beds the mean stay has to be lower. For this reason the mean stay has been taken in the equation of the number of hospital admissions. It is however also possible to analyse the regional differences and the differences between countries in the

mean stay in hospitals, given the number of admissions. This analysis is more of an explorative nature than our analysis of the number of admissions which is the central theme of this report. Thus far we have not found indications that there are differences in the institutional arrangements in both health care systems which influence the mean stay in hospitals differentially.
An overview of research on the regional variation in the average length of stay has been given by Rothberg (1982). The evidence from research in the United States of America is not unequivocal. The relation between the socio-economic situation of regions and the average length of stay is in most cases negative: the average length of stay is lower in the wealthier areas, but in a few cases unclear or even positive. The evidence on its relation with the degree of urbanization is unclear. There is a relation between the age distribution and the mean stay in hospitals, but regional differences did not significantly diminish after being checked for the average age of the population. The number of beds in nursing homes is potentially an important variable in explaining regional differences in the average length of stay in hospitals. According to Rothberg (1982) the evidence that should prove a substitution effect, is subject to widely different interpretations. We have, however, no data on the regional variation in the number of nursing home beds in the Netherlands and Belgium.
In table 6.8. (see page 80) three regression equations are given: one for the 85 regions in both countries taken together and one for each country.

The coefficients in the equation for both countries are again influenced by the difference in the distributions of some of the variables between both countries, notably the demographic variables and the standardized death rate. In the equations for both countries there is at least one interesting coefficient; that of the mean income of the population. Other things being equal, the higher the mean income of the population is, the lower is the average length of stay. In the two equations for each country apart the coefficient of income does not reach the 5% significance level.
In the case of Belgium significant coefficients are found for the mortality rate (the higher the mortality rate is, the lower is the average length of stay - a relation for which we have no explanation at hand) and the number of hospital beds (the greater the number of hospital beds, the higher the mean stay in the hospital). The coefficient of the number of hospital admissions in Belgium does not differ from zero, although one would expect that a higher number of admissions would result in a lower average length of stay. Apart from this, the demographic structure and the population density of a region also do not influence the average

Table 6.8. Regression on the average length of stay in hospitals in 85 regions in the Netherlands and Belgium (1974).

	All regions		Belgium		The Netherlands	
	B	T	M	T	B	T
Perc. 65+	.15	1.85	.17	.91	.33	3.36
Birth rate	-.45	-3.23	-.61	-1.32	-.14	-1.05
Mortality rate	-.89	-4.52	-1.02	-2.92	.11	.29
Pop. density	.00003	.14	-.00004	-.12	-.0001	-.47
Mean income	-.40	-2.05	-.43	-1.05	-.33	-1.69
Hosp. beds	.46	3.47	.35	2.05	1.93	5.68
Admissions	.0072	-.51	.0054	.23	-.04	-2.29
C	26.28	9.85	28.58	6.60	8.12	1.50
$\bar{R}^2$	.41		.24		.63	

length of stay in Belgium.

In the equation for the Netherlands the percentage of old age pensioners has a significant and positive relation with the average length of stay, as has the number of hospital beds. The relation with the number of admissions is significant and negative. The coefficient of the average income of the population does not reach the five percent significance level, but the T-value is relatively high. In contrast to the equation for Belgium the age-adjusted death rate does not have a relation with the mean stay in hospitals. The coefficient of determination is .63 for the equation for the Netherlands (which is rather high) and only .24 for Belgium.

We have succeeded in estimating an equation which is rather easy to interpret for the case of the Netherlands. Interpretation is less easy for the case of Belgium; why is there a negative relation with the standardized mortality rate? why is there no relation with the number of admissions? In view of the explorative nature of this analysis of the regional variations in the average length of stay the results are not unsatisfying. A further and more theoretical analysis is however needed.

6.4. General practitioner density and the number of hospital admissions

In chapter 4 it was hypothesized that the density of general practitioners could influence the number of hospital admissions (at least in

the Netherlands). Nevertheless this variable was not incorporated in our equations for the number of hospital admissions. The reason for this is the strong correlation between one of the indicators of the demand of physician and hospital services, the percentage of people over 65 years of age, and the density of general practitioners. Pearson's R is .80 for the Netherlands and .69 for Belgium. It is therefore hardly possible to distinguish between a relation with one or the other variable with the number of admissions. This problem seems to appear irrespective of the health care system in question (see for a survey of the literature Groenewegen & Van Bennekom, 1981). We have tried to circumvent the problem by computing an age standardized admission rate. The rate is the actual number of admissions per 1000 of the population divided by the expected number of admissions given the age structure of the region. For Belgium this expected number is computed by applying the age specific admission rates for the whole country (Leroy, 1978, table 35) to the age distribution of each region. For the Netherlands the source of the standardization is CBS (1980), table 88 (p. 240). In table 6.9 three equations are estimated.

Table 6.9. Regression on the age standardized admission rate for 85 regions in the Netherlands and Belgium and for each country.

	All regions		Belgium		The Netherlands	
	B	T	B	T	B	T
Birth rate	.004	.39	.053	2.18	-.017	-1.41
Mortality rate	.044	2.41	.027	1.12	.035	1.09
Population density	.000	.31	.00001	.68	-.00003	-1.17
Mean income	-.001	-.08	-.03	-1.16	-.004	-.19
No. of inh. per g.p.	.0001	4.15	.0001	1.36	.00004	.58
No. of inh. per spec.	-.000	-.02	-.0001	-2.03	.00002	1.07
Hospital beds	.04	4.17	.25	2.46	.15	4.22
Mean stay	.004	.53	.026	2.44	-.034	2.43
C	-.016	-.05	-.47	-.91	.63	1.35
R^2		.27		.35		.40

Our interest goes to the coefficients of the variable number of inhabitants per general practitioner. For both countries taken together there is a positive and significant coefficient: the higher the number of inhabitants per general practitioner, the more the actual number of admissions exceeds the expected number, or formulated in another way the

higher the density of general practitioners the more the expected number of admissions exceeds the actual number. This result suggests that a higher number of general practitioners lowers the number of hospital admissions. However, the equations for each country apart shows this effect only for Belgium and not significantly. For the regions in Belgium there is a moderately strong correlation between the number of inhabitants per general practitioner and the birth rate ($r = .50$). When birth rate is not taken in the equation the coefficient of inhabitants per general practitioner reaches significance for the regions in Belgium. Considering the relatively high correlation and the small number of cases it is however impossible to attribute the effect to one or the other independent variable. The equation for Belgium shows significant coefficients for:

- the birth rate (positive: the higher the birth rate, the more the actual number of admissions exceeds the expected number)
- the number of inhabitants per specialist (negative: the higher the density of specialists, the more the actual number of admissions exceeds the expected number)
- the number of hospital beds (positive: the higher the number of hospital beds the more the actual number of admissions exceeds the expected number)
- the average length of stay (also positive and in connection with the equation for the average length of stay in the preceding sections this shows the strange 'behaviour' of this variable in the Belgian case)

The equation for the Netherlands only shows significant coefficients for the number of hospital beds and the average length of stay. The signs of the coefficients are in the 'right' direction.

In conclusion: the density of general practitioners and the number of hospital admissions do not show a relation in the case of the Netherlands. In the case of Belgium they do, but only when the birth rate is left out of the equation.

7. CONCLUSION AND DISCUSSION

The main line of reasoning in this report is that international comparison of health care systems is always hampered by the small number of units that are analysed. If one compares two countries at a global level, only a qualitative analysis can be made. The efforts it takes to gather data on a sufficient number of health care systems - say fifty - to allow for a quantitative analysis are practically prohibitive. In our view there are two possible solutions for this problem. One is to enlarge the number of observations by using time series for a small number of health care systems; the other is the use of regional data for a small number of systems.
The problem with the first solution is that it is very difficult to find time series data over a long span of time - even for one health care system. We have therefore chosen the second option. To our knowledge it is the first time that regional variations have been used in the international comparison of health care systems. Our analysis must be looked at as a preliminary excercise that shows promising prospects.

As the central theme we have chosen variations in the number of hospital admissions. The reason for that is a practical one; data on hospital admissions are available in most health care systems, at least in Belgium and the Netherlands. The strategy for the analysis runs as follows: there are a number of influences on regional variations in admission rates which are independent of the specific health care system under study. These are general in the limited sense that their influence will be the same in western industrialized countries. Besides this there are variables which either have a different influence in each system or are merely present in one or the other system.
To formulate predictions about the influence of these specific variables an analysis has been made of the incentive structure governing the behavior of relevant groups of actors: general practitioners, medical specialists and hospitals (as corporative actors).

We have devoted a lot of space to the description of the regional variation in the variables used to explain differences in admission rates. Generally speaking descriptions are of less importance in scientific research than explanations, but then again accurate descriptions are an indispensible first step.
We have started with a global description of the differences between the health care systems of the Netherlands and Belgium. It is reasonable to state the conclusion that the health status of the population in Belgium is lower than that in the Netherlands. Mortality (in general and

perinatal) is higher in Belgium, the age structure is older, life expectancy is lower and the consumption of alcohol and fat is higher. As far as the supply side is concerned, Belgium, in general, is more richly endowed than the Netherlands: Belgium has a much higher physician to population ratio, but the number of hospital beds is somewhat lower than in the Netherlands and the number of long term hospital beds is much lower.

The maps of the regional variation in the variables used in the analysis speak for themselves. It is important, however, that, in some cases, the distribution of the variables is quite distinct for both countries, e.g. in the case of standardized mortality and the number of inhabitants per physician.

As far as the statistical analysis of variation in admission rates is concerned possible items for discussion can be divided into methodological/technical and substantial categories. **Formally** speaking two conclusions can be drawn from the results.

The first conclusion is that the distinction between general and system specific components of a model for the explanation of regional variation in hospital admissions is only partially successful. The intercorrelation between 'general' and 'system specific' characteristics of the regions causes multicollinearity that blurs a clear interpretation of the results. Precise predictions (although we tried hard) are due to the high level of aggregation and the derived position of hospital admissions in a health care model, hard to obtain yet, so that the interpretations of 'confirmed' and refuted expectations is a bit arbitrary. The limited success (in terms of explained variance) of the 'general model' transfer the main emphasis in the analysis to the separate countries.

The number of districts per country (an odd 40) however, is rather small for a multivariate analysis. The original number of 85 regions suited this purpose better.

The second conclusion has to do with the more successful side of our results. Usually comparative research between two countries contains no more than two units, (sometimes two time series) but even that approach is scarce. Comparing regional variation allows for a thorough analysis of variance. A good example is the influence in age adjusted death rates on hospital admissions. Here the relation is merely due to variations between and not within the countries. In a causal model relations should be shown on both levels.

Substantially there are several items for discussion. At first it is strange that demand variables (at least the indicators we used) do not influence admission rates. Only the equation for the average length of stay per admission for the Netherlands shows a clear relation with the proportion of the elderly in the population. In Belgium the admission

rate is correlated with the birth rate, but this is rather a function of specific rules concerning (non-pathological) deliveries than a clear indication of a general demand for hospital admissions.
Secondly the influence of supply factors is clear. On the one hand, hospital beds are the only 'general' variable in a model which tries to explain differences between contrasting health care systems, but on the other hand they are not easy to interpret.
From table 6.3 we could proudly announce that general medicine (the combination of general practitioners and common specialists) could counterbalance the influence of hospital based medicine (in Belgium at least, the positive sign for the Netherlands could not be very well interpreted).
Introduction of some other variables (the proportion of non actives for instance) reduced the contribution of this supply side variable to zero. So we would rather be careful with conclusions. System related variables do seem to exert a clear influence in Belgium (birth rate, proportion of non actives, proportion of independents, proportion of health insurance funds owned hospitals), while in the Netherlands their influence is nil. This suggests further research on a lower aggregation level in Belgium. Comparative research should contain more units for statistical purposes, so perhaps a municipality based analysis would be carried out as a follow-up to the one described above.
The best conclusion is, that studying health care systems with the aim of producing empirically testable hypotheses is an instructive activity, in spite of the ambiguity of the results.

NOTES to chapter 1

1) National health and financial authorities do not seem to refer to **relative** rates as they complain without exception about the rising cost of health care systems. In Great Britain, (of old) a moderate and restricted spender, as well as in the Netherlands or in the U.S.A. where the steepest rise in health care cost occurred apprehensive authorities are prepared to fundamental changes in the system (see e.g. chapter 7 in Health Services in Europe, World Health Organization, Copenhagen 1981 or table I in Blanpain J., L.Delesie and H.Nys: National Health Insurance and Health Resources: The European Experience, Harvard University Press, Cambridge, Mass.1978)

NOTES to chapter 2

1) In the Dutch health care system the so-called mutual health insurance funds approach this consumers choice type of organization. Some like AZIVO fund (The Hague) still own their own pharmacies and out-patient clinics or dental surgeries. The loss of independence and competition with the abolition of the voluntary associations in 1941 and the equalizing of costs and benefits on a national level deprives the system of voluntary association of its base. In the Belgian health care the phenomenon of insurance owned hospitals is worth studying. They will have to find an optimum between reduction of cost for the insured and containing the marginal costs for running the hospital.

2) One could wonder whether in this model second line providers are non-existent by definition.

NOTES to chapter 3

1) In a country with a rather generous social security system in the disability and chronic illness sector (like The Netherlands) the system might provide a different definition of illness, when compared with a system where disability payments are marginal.

2) Infant mortality is also frequently considered as an indicator of the quality of health care.

3) There is a difference in legal status. In the Netherlands it is an independent profession with partial license to practise obstetrics (non pathological deliveries). In Belgium midwives have no independent license to provide obstetrical care; a midwife can assist in normal

deliveries.

4) For a good general introduction into the Dutch Health Insurance System see chapter 4 of Blanpain, Delesie & Nys, 1978, or Versluys, 1981 (part of the Belgian National Programme in the Social Sciences). The most recent and thorough description (in Dutch) is by Heesters and Kesenne (1985).

5) Sources tables 30, 31 and 32 section V Social Affairs, and table 24 of section O and Finance in the Statistical Yearbook 1976.

6) Recently (in 1983) the number of patients for whom the general costs of the surgery are paid is reduced to the first 1600.

7) Not promptly, in fact with considerably delay, but this is another problem.

8) For the so-called 'social diseases' (cancer, poliomyelitis, tbc, mental and congenital diseases) there is a separate arrangement that provides for the almost complete reimbursement of costs.

9) Whose creation has contained the inclination of physicians to charge more than the negotiated fees (legally possible under certain conditions) by increasing competition.

10) The lower boundary of the fees is formed by the reimbursed part of the negotiated fees.

NOTES to chapter 4

1) The figures for Belgium concern the whole population; those for the Netherlands only the publicly insured part of the population.

2) Data on the number of beds in nursing homes and the number of long term hospital beds per regio are not at our disposal. It should be clear from table 3.6. that this may be an important variable (compare also Groenewegen & Leroy, 1985).

3) This is possibly too strong an assertion. In 1974 there were still a few hospitals that admitted general practitioners to treat private patients (but it is not known how often this facility is used) and in most general hospitals general practitioners are admitted for ambulatory deliveries.

4) On an aggregate level the evidence for this assertion is inconclusive Leroy (1981) reports a correlation between the number of consultations with specialist and the admission rate per region of .02 for Belgium as a whole and correlations of .45 and -.49 for Wallony and Flanders respectively.

5) Although it is common practice to reinsure the greater risks with a private insurance company.

NOTES to chapter 5

1) The first and only hospital was opened in september 1981.

2) The age/sex adjusted death rates were computed on the basis of data for one year only. Because of relativily small numbers of deaths per age/sex category the resulting rates may be unstable, as is suggested by the fact that in a recomputation with 1979 data, the arrondissement of Tielt no longer figures as the region with the lowest standardized death rate (see appendix III).

3) For the promotion of health services research in the Netherlands further systematic collection of missing data in this field would be extremely useful.

4) The regions with or next to teaching hospital (Groningen, Assen, Nijmegen, Utrecht, Amstelveen, Amsterdam, Leiden, The Hague, Rotterdam) showed the largest differences (25-30%).

5) There is some doubt about the effect. Posthuma states that the method that has been used to eliminate the differences in 'case mix' between hospitals, causes some tautological effects.

6) In fact both live births and stillborn babies have to be considered. In this version of our report, we had no Belgian figures of stillbirths per district at our disposal. So we only added 'live births' to our data set.

REFERENCES:

BENSING, J.M. & P.F.M. VERHAAK, Konsultatieproject Eindhoven; verwijspatronen, Utrecht, NHI, 1980

BLANPAIN, J., L. DELESIE & H. NYS, National health insurance and health resources, Cambridge, Mass., Harvard University Press, 1978

BOERMA, W.G.W., Verloskunde in gezondheidscentra en groepspraktijken, Utrecht, Nederlands Huisartsen Instituut, 1983

CENTRAAL BUREAU VOOR DE STATISTIEK, Regionale Inkomensverdeling 1974, 's Gravenhage, Staatsuitgeverij

CENTRAAL BUREAU VOOR DE STATISTIEK, Statistical Yearbook of the Netherlands 1975, 1976 and 1981, 's Gravenhage, Staatsuitgeverij, 1976, 1977 and 1982

CENTRAAL BUREAU VOOR DE STATISTIEK, Compendium Gezondheidsstatistiek Nederland 1979, 's Gravenhage, Staatsuitgeverij, 1980

CENTRAAL BUREAU VOOR DE STATISTIEK, Statististisch Zakboek, 's Gravenhage, Staatsuitgeverij, 1976 and 1980

DELIEGE-ROTT, D., J. LIEVENS & CH. ZEEGERS-DOOREMAN, Medical doctors in the nine countries of the common market (systems of payment and levels of remuneration), Université Catholique de Louvain, Department of medical demography and health economics, Bruxelles, 1975

DELIEGE, D. & X. LEROY, l'exercice de la médecine, Editions Nauwelaerts, Bruxelles, 1976

ES, J.C. VAN & H.R. PIJLMAN, Het verwijzen van ziekenfondspatiënten in 122 Nederlandse huisartspraktijken, Huisarts en Wetenschap, 13 (1970) 433-39

EVANS, R.G., Incomplete vertical integration: the distinctive structure of the health-care industry, in: J. van der Gaag and M. Perlman (eds). Health, economics and health economics, Amsterdam, North Holland Publishing Company, 1981

FOETS, M.M. & Y. NUYENS, Focus op de Belgische gezondheidszorg, Sociologisch Onderzoeksinstituut, Katholieke Universiteit, Leuven, 1980

FOETS, M.M. & J. VAN DER ZEE, Gezondheidstoestand en hulpbehoefte, in Peeters R., F.C.J. Stevens & J. van der Zee (eds), Basisgegevens over de Nederlandse en Belgische gezondheidszorg, Van Loghum Slaterus, Deventer, 1985

GENEESKUNDIGE HOOFDINSPECTIE VAN DE VOLKSGEZONDHEID, Statistiek Geneeskundigen per 1-1-1974 and 1-1-1980, Leidschendam, 1974 and 1981

GRIFFITHS, A., Health economics and financing of health services, in World Health Organization, Health Services in Europe, vol. I, Copenhagen, 1981

GROENEWEGEN, P.P. & B.M.P. VAN BENNEKOM, De spreiding van huisartsen over Nederland, deel I, literatuuroverzicht en theoretische overwegingen, Utrecht, NHI, 1981

HEESTERS, J.P., De honorering van de Nederlandse huisarts als vrij-beroepsbeoefenaar en de relatie met de goodwill-problematiek, diss. Tilburg, 1983

HEESTERS, J.P. & J. KESENNE, De financiering van de Nederlandse en Belgische Gezondheidszorg in: Peeters, R., F.C.J. Stevens and J. van der Zee (eds), Basisgegevens over de Nederlandse en Belgische gezondheidszorg, Van Loghum Slaterus, Deventer, 1985

JUFFERMANS, P., Staat en gezondheidszorg in Nederland, Socialistische Uitgeverij Nijmegen (diss. Universiteit van Amsterdam), 1982

LEROY, X., Offre et Consommation de soins en médicine générale, analyse régionale, méchanismes du marché, indicateurs de besoins, deel 2 Nationaal Onderzoeksprogramma in de sociale wetenschappen, diensten van de eerste minister, 1978

LEROY, X., L'Accès aux soins médicaux. Analyse régionale de l'offre et de la consommation en 1976; evolution 1974-76, deel 4B Nationaal onderzoeksprogramma in de sociale wetenschappen, diensten van de eerste minister, Brussel, 1981

LEROY, X., L'Accès aux soins médicaux. Analyse régionale de l'offre et de la consommation, deel 4A Nationaal Onderzoeksprogramma in de sociale wetenschappen, diensten van de eerste minister, Brussel, 1981

MELKER, R. DE, Ziekenhuispatiënt-huisarts-huisgezin, een exploratief inventariserend onderzoek, Dekker en Van de Vegt, Nijmegen, 1973

MINISTERIE VAN VOLKSGEZONDHEID EN VAN HET GEZIN, Kerncijfers betreffende de hospitalisatiegraad tijdens het jaar 1975, Brussel, 1975

MINISTERIE VAN VOLKSGEZONDHEID EN VAN HET GEZIN, Eerste en voornaamste statistische uitkomsten van de enquête in de verzorgingsinstellingen, (toestand op 1-1-1975) zj.

MINISTERIE VAN VOLKSGEZONDHEID EN MILIEUHYGIENE, Statistische gegevens over verloskundige zorg. 1960-1979, Leidschendam, 1981

MINISTERIE VAN VOLKSGEZONDHEID EN MILIEUHYGIENE, Overzicht van de gegevens van ziekenhuizen, 1974, Staatsuitgeverij, 's Gravenhage, 1977

MONTFORT, A.P.W.P. VAN, Production functions for general hospitals; an econometric analysis, diss., Utrecht, NZI, 1980

NATIONAAL INSTITUUT VOOR DE STATISTIEK, Statistisch Jaarboek van België, 1975 and 1981, Brussel

NATIONAAL INSTITUUT VOOR DE STATISTIEK, Financiële Statistiek no. 10, 1976, Brussel

NATIONAAL ZIEKENHUIS INSTITUUT, Instellingen van intramurale gezondheidszorg per 1-1-1980, Utrecht, NZI, 1980

NEDERLANDS HUISARTSEN INSTITUUT, Cijfers uit de huisartsenregistratie, Utrecht, NHI, 1982

NUYENS, Y., Eerstelijnsgezondheidszorg; rapport V: Vraag in de gezondheidszorg, deel 4, De verklarende resultaten. Nationaal Onderzoeksprogramma in de Sociale Wetenschappen deel I H, Diensten van de Eerste Minister, Brussel, 1979

NUYENS, Y., Gezondheidszorg in België, Gezondheid & Samenleving, 1 (1980) 18-36

NUYENS, Y., Sociale Kaart van de gezondheidszorg in België, in: L. Huyse en J. Berting (eds), Als in een spiegel? Tijdschrift voor Sociologie, 4, 1983, 161-178

NIJS, H., De planmatige gezondheidszorg; wetgeving ter beheersing van het aanbod van gezondheidsvoorzieningen in België, Nederland en Frankrijk, De Tijdstroom, Lochem, 1981

PHILIPSEN, H., Medische Sociologie en gezondheidszorg in Nederland, in: L. Huyse en J. Berting (eds), Als in een spiegel? Tijdschrift voor Sociologie, 4, 1983, 207-214

POSTHUMA, B.H. & J. VAN DER ZEE, Tussen 1e en 2e echelon, deel I en II, Utrecht, Nederlands Huisartsen Instituut, 1977, 1978

ROEMER, M.I. & R.J. ROEMER, Health care systems and comparative manpower policies, Marcel Dekker, inc. New York & Basel, 1981

ROTHBERG, D.L., Regional variations in hospital use: introduction and overview in David L. Rothberg (ed.), Regional variations in hospital use; geographic and temporal patterns of care in the United States, Lexington Books, Lexington, Mass., 1982

STONE, D.A., The Limits of professional power; national health care in the Federal Republic of Germany, The University of Chicago Press. Chicago, 1980

TITS, M.H.L. VAN, W.J.F.I. NUYENS & B.H. HOEKSMA, Substitutie kliniek-polikliniek, IVG, Tilburg, 1981

VEN, W.P.M.M. VAN DER, Effects of cost-sharing in health care, in: Effective Health Care, 1 (1983)

VERSLUYS, L., Beleidsontwikkelingen inzake eerstelijnsgezondheidszorg: Nederland, Nationaal onderzoeksprogramma in de sociale wetenschappen in het Koninkrijk België, deel 1B, 1981

VIS, Th.A.M., Vergrijzing, Monografieën Volkstelling 1971, Staatsuitgeverij, 's Gravenhage, 1981

WORLD HEALTH ORGANIZATION, Health services in Europe, Copenhagen, 1981

ZWEIFEL, P., "Supplier-induced demand" in a model of physician behavior, in Van der Gaag, J. & M. Perlman, Health, Economics and Health economics. North-Holland Publishing Comp., Amsterdam, 1981

APPENDIX I: Map of the COROP-regions for the Netherlands and the arrondissements for Belgium.

The Netherlands

1. Oost-Groningen
2. Delfzijl e.o.
3. Overig Groningen
4. Noord-Friesland
5. Zuidwest-Friesland
6. Zuidoost-Friesland
7. Noord-Drenthe
8. Zuidoost-Drenthe
9. Zuidwest-Drenthe
10. Noord-Overijssel + Zuidelijke IJsselmeerpolders
11. Zuidwest-Overijssel
12. Twente
13. Veluwe
14. Achterhoek
15. Arnhem/Nijmegen
16. Zuidwest-Gelderland
17. Utrecht
18. Kop van Noord-Holland
19. Alkmaar e.o.
20. Ijmond
21. Agglomeratie Haarlem
22. Zaanstreek
23. Groot-Amsterdam

23a Amsterdam

24. Het Gooi en Vechtstreek
25. Agglomeratie Leiden en Bollenstreek
26. Agglomeratie 's-Gravenhage
27. Delft en Westland
28. Oost Zuid-Holland
29. Groot-Rijnmond

29a Rijnmond

30. Zuidoost Zuid-Holland
31. Zeeuwsch-Vlaanderen
32. Overig Zeeland
33. West Noord-Brabant
34. Midden Noord-Brabant
35. Noordoost Noord-Brabant

35a Stadsgewest 's-Hertogenbosch

36. Zuidoost Noord-Brabant
37. Noord-Limburg
38. Midden-Limburg
39. Zuid-Limburg

Belgium

1. Antwerpen
2. Mechelen
3. Turnhout
4. Brux. Cap-Br. Hoofdstad
5. Halle-Vilvoorde
6. Leuven
7. Nivelles
8. Brugge
9. Diksmuide
10. Ieper
11. Kortrijk
12. Oostende
13. Roeselaere
14. Tielt
15. Veurne
16. Aalst
17. Dendermonde
18. Eeklo
19. Gent
20. Oudenaarde
21. Sint-Niklaas
22. Ath
23. Charleroi
24. Mons
25. Mouscron
26. Soignies
27. Thuin
28. Tournai
29. Huy
30. Liège
31. Verviers
32. Waremme
33. Hasselt
34. Maaseik
35. Tongeren
36. Arlon
37. Bastogne
38. Marché-en-Famenne
39. Neufchateau
40. Virton
41. Dinant
42. Namur
43. Philippeville

APPENDIX II: Correlation matrices.

Matrix 1: Correlations between the variables used in tables 6.3., 6.4., 6.5., 6.8. and 6.9. - Belgium and the Netherlands - N = 85.

1. Admissions	1.00																
2. Residual adm. rate	.80	1.00															
3. Standardized adm. rate	.68	.78	1.00														
4. Mean stay	-.08	-.13	.21	1.00													
5. Mortality	.42	.12	-.16	-.40	1.00												
6. Perc. 65+	.29	.01	-.34	.02	.50	1.00											
7. Perc. 0-4 years	-.41	.04	.19	-.01	-.45	-.74	1.00										
8. Birth rate	-.04	.09	.02	-.34	-.09	-.38	.60	1.00									
9. Mean income	-.00	-.12	-.00	-.01	-.08	-.02	-.13	-.28	1.00								
10. Population density	.06	.02	.10	.21	-.13	.11	-.18	-.42	.47	1.00							
11. Beds	.36	.00	.39	.35	-.07	.02	-.14	-.09	.14	.18	1.00						
12. Size of hospitals	-.27	-.00	.31	.37	-.57	-.55	.50	-.00	.06	.17	.17	1.00					
13. No of inh. per g.p.	-.40	.01	.33	.25	-.77	-.81	.79	.14	-.04	.08	-.06	.70	1.00				
14. No of inh. per specialist	-.32	.02	.11	.08	-.47	-.46	.66	.40	-.37	-.25	-.13	.17	.52	1.00			
15. No of inh. per common specialist	-.29	.05	.17	.10	-.48	-.49	.64	.38	-.35	-.25	-.12	.32	.55	.91	1.00		
16. g.p./spec. ratio	-.09	-.03	-.12	-.02	.01	.06	.15	.32	-.44	-.40	-.09	-.29	-.15	.74	.63	1.00	
17. g.p. + common spec./other spec. ratio	-.12	.04	-.03	-.02	-.12	-.04	.25	.25	-.35	-.31	-.11	-.10	.01	.70	.61	.89	1.00
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Matrix 2: Correlations between the variables used in tables 6.3., 6.4., 6.5., 6.8. and 6.9. - The Netherlands - M = 42.

1. Admissions	1.00																
2. Residual adm. rate	.04	1.00															
3. Standardized adm. rate	.97	.83	1.00														
4. Mean stay	.09	-.26	-.02	1.00													
5. Mortality	.18	.20	.23	.01	1.00												
6. Perc. 65+	-.11	-.15	-.32	.55	-.15	1.00											
7. Perc. 0-4 years	-.32	-.07	-.30	-.60	-.16	-.55	1.00										
8. Birth rate	-.27	-.04	-.16	-.55	-.18	-.50	.96	1.00									
9. Mean income	.17	-.05	.15	.01	-.36	-.08	-.19	-.21	1.00								
10. Population density	.13	-.12	.03	.41	-.03	.38	-.71	-.61	.38	1.00							
11. Beds	.54	-.00	.51	.50	.01	.04	-.50	-.44	.39	.44	1.00						
12. Size of hospitals	.02	-.03	.08	.11	.18	-.19	-.17	-.14	-.01	.07	.09	1.00					
13. No of inh. per g.p.	.16	.11	.34	-.31	.10	-.80	.27	.27	.03	-.12	.17	.26	1.00				
14. No of inh. per specialist	-.07	.19	-.04	-.36	.04	-.15	.54	.49	-.44	-.44	-.44	-.42	.03	1.00			
15. No of inh. per common specialist	.00	.24	.04	-.40	.14	-.19	.50	.48	-.42	-.45	-.36	-.38	.06	.07	1.00		
16. g.p./spec. ratio	-.10	.19	-.10	-.31	.02	.01	.49	.43	-.44	-.42	-.47	-.46	-.16	.98	.85	1.00	
17. g.p. + common spec./other spec. ratio	.02	.33	-.01	-.30	-.05	.05	.38	.30	-.36	-.35	-.48	-.48	-.30	.89	.69	.92	1.00
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Matrix 3:

1. Admissions	1.00																
2. Residual adm. rate	.94	1.00															
3. Standardized adm. rate	.91	.80	1.00														
4. Mean stay	.06	-.07	.36	1.00													
5. Mortality	.08	.18	.01	-.40	1.00												
6. Perc. 65+	.06	.09	-.16	.11	.39	1.00											
7. Perc. 0-4 years	.37	.33	.36	-.31	-.06	-.56	1.00										
8. Birth rate	.30	.28	.34	-.15	-.16	-.53	.87	1.00									
9. Mean income	-.13	-.17	-.14	-.05	-.06	.01	-.32	-.45	1.00								
10. Population density	.15	.11	.10	.02	-.05	.17	-.09	-.20	.55	1.00							
11. Beds	.35	.00	.45	.38	-.35	-.08	.08	.09	.08	.14	1.00						
12. Size of hospitals	.26	.03	.39	.40	-.19	-.18	-.08	-.06	.34	.19	.65	1.00					
13. No of inh. per g.p.	-.02	-.01	.17	.06	-.36	-.69	.43	.49	-.21	-.08	-.01	.03	1.00				
14. No of inh. per specialist	-.25	-.29	-.02	.40	-.47	-.45	.10	.35	-.54	-.38	.06	.07	.51	1.00			
15. No of inh. per common specialist	-.10	-.21	.01	.45	-.50	-.38	.10	.30	-.53	-.39	.05	.05	.42	.95	1.00		
16. g.p./spec. ratio	-.24	-.28	-.11	.44	-.24	-.00	-.15	-.01	-.47	-.40	.06	.06	-.16	.74	.77	1.00	
17. g.p. + common spec./other spec. ratio	-.33	-.38	-.16	.37	-.20	-.06	-.07	.04	-.41	-.36	.00	.12	-.08	.73	.63	.89	1.00
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Matrix 4: Correlations between the variable used in table 6.6. - The Netherlands - N = 42.

1. Residual adm. rate	1.00			
2. Perc. publicly insured	-.19	1.00		
3. No of inh. per specialist	-.19	.48	1.00	
4. Mean stay	.26	-.07	-.36	1.00
	1	2	3	4

Matrix 5: Correlations between the variables used in table 6.7.

1. Residual adm. rate	1.00							
2. Perc. not-active	.50	1.00						
3. Perc. 'régime indép.'	-.25	-.23	1.00					
4. Health insurance fund owned beds	-.02	.22	-.23	1.00				
5. Birth rate	.01	-.25	.03	.00	1.00			
6. Mean income	-.17	-.16	-.52	.17	.13	1.00		
7. No of inh. per spec.	-.29	-.53	.60	-.26	.03	-.54	1.00	
8. Common spec. + g.p.'s/ other spec. ratio	.29	.29	-.25	-.09	-.01	.04	-.16	1.00
	1	2	3	4	5	6	7	8

APPENDIX III: Regional variation in hospital admissions in the Netherlands and Belgium; a repeat analysis with data from 1979 and a comparison with the results of 1974.

1. INTRODUCTION[1]

In the foregoing chapters we reported the analysis of regional variation in the number of hospital admissions in the Netherlands and Belgium. After the completion of this report but before the proofs went to the printer. We received Belgian data for 1979 (Leroy, 1983). We collected comparable information for the Dutch situation in 1979 and repeated our analysis. The following article presents our findings.

2. THE PROBLEM

The question with which our earlier work on regional variation in hospital admissions in the Netherlands and Belgium was concerned, was: "Is regional variation in the number of hospital admissions in the Netherlands and Belgium to be explained in a model containing both general and system-specific variables?" General variables are variables which are generally assumed to obtain in all industrialized western countries and which influence the number of admissions independently of differences between health care systems: such as the hospital size and the health status of the population at large. There are, in addition, determinants of regional variation in the number of admissions which either exert an influence dependent of the nature of the system, or are unique for a particular health care system.

The most important conclusions drawn from the analysis of the 1974 data were:

- the only variable to have a clear and equal influence on variation in the number of admissions is the number of hospital beds per 1000 inhabitants in the Netherlands and Belgium. No operationalizations of the concept of 'health status' show any relation with the admission coefficient.
- the influence of system-specific variables has been analysed, taking the ratio of the actual number of admissions to the expected number of admissions, on the basis of the numer of beds as the independent variable. In the Netherlands, none of the variables appears to have a clear influence on the level of this ratio, whereas in Belgium there is a greater number of admissions than expected in regions with a higher birthrate[2] and a higher number of both general practitioners (gps) and specialists in the common disciplines (internists, pediatricians, gynacologists) in relation to the total number of specialists.
- furthermore the higher percentage of the non-active in the population (WIGW's) seems to coincide in Belgium with the higher number of admissions.

The question that we pose in this article is concerned with the stability

of these relations. The quality of the 1974 data is dubious in some respects. However, the question can be answered by a replication of the analysis, using 1979 data, the quality of which is generally better.
There is no reason to assume that the relations found for the situation in 1974, are no longer to be found in 1979 - because of changes in the health care system - simply because there have not been any. There has been, however, a general increase in the number of health care professionals in both countries; while the number of hospital beds in the Netherlands has decreased somewhat, but has increased in Belgium (c.f. Groenewegen and Leroy, 1985).

3. MATERIALS AND METHODS

As we are concerned here with a replication, we have used the same methods as were used for the 1974 analysis. In table 1 the variables and their origin are given (see page 105 and further).
The methods of analysis used are linear regression analysis and analysis of residuals. The analysis is approached in the following way: a regression analysis is carried out on total admissions with variables which can be assumed to be independent of the difference in health care systems in terms of their influence on the number of admissions, as the independent variables. The expected number of admissions can then be calculated on the basis of these first step variables which have the same sort of influence in both countries. The ratio of actual to expected admissions is then used as the dependent variable in the specific model. The independent variables are then, on the one hand, variables which may be assumed to have a different influence on regional variation in the admission totals in each of the two systems; and, on the other hand, variables which only obtain in one of the two systems.

4. RESULTS

Before presenting the regression analysis, we give a synopsis of the mean and standard deviations of the variables used for the Netherlands and Belgium and in the index figure for the change in mean values when compared with the 1974 figures (table 2).
The number of admissions rose a little in both countries between 1974 and 1979. A rise in supply can be observed principally in Belgium as far as the independent variables are concerned: this means an increase in the number of hospital beds - in part, a consequence of a different method of calculation - an increase in hospital size and in the number of gps in relation to the number of specialists, and further a fall in the number of inhabitants per gp and per specialist - in this respect there is a

clear fall in the Netherlands too.

The regression analysis is first carried out with the general determinants of regional variation in total admissions as the independent variable (see table 3).

The only variable that clearly has the same influence in both countries is again the number of hospital beds per 1000 inhabitants. In this respect the results agree with those of 1974. In addition, for Belgium, there is the clear influence of standardized mortality and population density. As far as the standardized mortality is concerned, this reflects other differences between Flanders and Wallonia at the time, because there is a clear differentiation in the mortality rates between both parts of the country (see map 1). In the Netherlands, only the mean stay has any influence (the T value does not quite reach a 5% level of significance)[3].

The ratios of the actual number of admissions to the expected number of admissions, were calculated as the second step in the analysis with the number of hospital beds per 1000 given. This ratio was related to the system-specific independent variables in a regression analysis. These variables were: the number of births (cf note 1), the density of general practitioners and specialists and the relation between the number of general practitioners and specialists (see table 4). When these are compared with the analysis of 1974 data, the following characteristics emerge:

a. the results are the same for the Netherlands, i.e. the chosen variables do not influence the ratio of the actual to expected admission rates;
b. the number of births in Belgium does not have an influence of its own - in contrast to the situation in 1974;
c. the results in respect of the manpower variables agree with the 1974 results for Belgium.

The addition of variables that influence variation in the number of admissions, i.e. population density and standardized mortality for Belgium and mean stay per admission for the Netherlands, in the first regression analysis (the general model), does not change the result.

We shall now examine those variables which only arise in one of the two countries. These are, for the Netherlands, the percentage of publicly insured patients per region, and, for Belgium, the percentage of the independents and the percentage of hospital beds that are owned by the health insurance funds.

In the Netherlands, the higher the percentage of publicly insured patients in a given area, the higher the ratio of actual hospital admissions to expected admissions ($r = .33$). In 1974, this correlation was lower ($r = .19$).

The introduction of the number of inhabitants per specialist (a variable which showed a weak positive correlation with the ratio of actual to expected admissions) cancels out the correlation with the percentage of publicly insured persons. The Belgian results are more interesting (see table 5). In 1974, only the percentage of non-active had a clear influence on the ratio of actual to expected admissions; in 1979 the percentage of the population which falls into the category of the independents, was added to this. The explained variance is also a deal higher than in the analysis using the 1974 data.

5. CONCLUSION

The answer to the question that we posed at the beginning of this article, i.e. are the relations found in the analysis with data from 1974 stable, is positive. The relations, as we find them for the same situation five years later, are in broad terms the same. There are in addition a number of interesting differenes to be observed.

In the first place, in 1979, there are the regional differences in mortality in Belgium which influence variation in the number of admissions. It should also be noted that the variation in mortality runs, to a considerable degree, parallel with the main cultural divisions in the country. In the second place, it appears that variations in the ratio of actual to expected admissions in Belgium, in 1979, can be better explained statistically than they could in 1974. Both the percentage of the non-active and the percentage of the independents had a distinct influence on this ratio in 1979. This is, to a considerable degree, the result of differences in the health status of these groups (the correlation between the percentage of the non-active and standardized mortality is .49). The extent to which the higher admission rate in areas with a high percentage of the non-active is also connected with the virtual absence of a threshold fee for this group of the population cannot be established on the basis of the material available.

The analysis clearly shows that it is still sensible to keep on examining the number of beds available per inhabitant in general hospitals, both in Belgium and in the Netherlands. In the Netherlands, this is indeed the only factor that is of influence on regional variation in hospital admissions.

NOTES

1. This appendix is a translation of a contribution to the jubilee-conference 'Het gras aan gene zijde' (The grass on the other side), March 21-22 1985, about the Dutch and Belgium health care systems. The Dutch version of this article appears in the congress-proceeding, the winter issue of 'Gezondheid en Samenleving'.

2. Publications of the Ministry of Public Health and the Family (1981) show that the number of admissions per 1000 women for confinement and delivery is 24. Exclusion of admissions for confinement and delivery would lead to a clear fall in the admission figures, albeit that the same correction in the Netherlands would also lead to a (less sharp) fall.

3. A possible explanation for the decrease in the influence of mean stay on the admission rate is the gradual 'ebbing away' of the effect of the required occupation rate of 90% in hospitals before 1973. Data for more recent years are expected to show still less influence from the mean stay in hospitals on the number of admissions.

REFERENCES:

GROENEWEGEN, P.P. & J. VAN DER ZEE, Regionale verschillen in ziekenhuisopnamen in Nederland en België, deel I: vraagstelling en beschrijvende gegevens. (Regional variation in hospital admissions in the Netherlands and Belgium, part I: the problem and descriptive data). Gezondheid en Samenleving, 6, 1985.

GROENEWEGEN, P.P. & J. VAN DER ZEE, Regionale verschillen in ziekenhuisopnamen in Nederland en België, deel II: algemeen model, systeemverschillen, analyse-resultaten. (Regional differences in hospital admissions in the Netherlands and Belgium, part II: general model, health system related variation, results of analysis). Gezondheid en Samenleving, 6, 1985.

GROENEWEGEN, P.P. & X. LEROY, Aanbodzijde in de Belgische en Nederlandse gezondheidszorg. (The supply side in the Belgian and Dutch health care systems). In: R.F. Peeters, F.C.J. Stevens and J. van der Zee (red.), Basisgegevens van de Belgische en Nederlandse systemen van gezondheidszorg en sociale zekerheid bij ziekte en invaliditeit. (Basic data on the Belgian and Dutch health care systems and social security in sickness and disability). Deventer, Van Loghum Slaterus, 1985.

LEROY, X., L'accès aux soins médicaux Tôme III, Données régionales d'offre et de consommation en 1979. (Access to medical care, regional data on supply and demand in 1979). Service d'études socio-économiques de la santé, Université Catholique de Louvain, Brussel, 1983.

MINISTERIE VAN VOLKSGEZONDHEID EN VAN HET GEZIN, Herkomst van de patiënten opgenomen in ziekenhuizen gedurende 1978. (Origin of patients admitted to hospitals in 1978). Brussel, 1981.

Table 1: data used.

	Belgium	The Netherlands
Dependent variables		
Number of admissions	Ministry of Public Health & the Family, all hospital admissions, correction for admissions in psych. institutions per provincie	Ministry of Public Health, Welfare & Culture all hospital admissions, except admissions to psychiatric institutions
General model		
Percentage elderly	NIS*-population according to age and sex on 31/12; provisional outline	CBS*-population in terms of age, sex and marital status
Mortality	NIS-mortality per arrondissement in terms of sex, year of birth, age and marital status - 1979 direct standardization for composition by age and sex	CBS-deaths per COROP area in terms of sex and age - 1979 direct standardization for composition by age and sex
Income	NIS-financial statistics nr. 25	CBS-personal income 1978, part I
Population density	Z-scores NIS statistical yearbook	Z-scores CBS-municipal population
Beds	Ministry of Public Health and the Family, beds in acute hospitals per arrondissement, corrected on the basis of origin, data in Leroy, 1981, table 41.	NZI-institutions of in-patient care; basic data 1.1.1979. Available beds in general and teaching hospitals corrected for origin of patients (origin data from Ministry of Public Health, Welfare

		& Culture)
Hospital size	Ministry of Public Health & the Family First and principal statistical results of the inquiry into the institutions of care	NZI-institutions for in-patients care, basic data 1.1.1979
Stay	Ministry of Public Health & the Family mean stay per admission-all admissions	NZI-institutions for in-patient care; basic data 1.1.1979. Mean stay per admission in general and teaching hospitals.
Specific model		
Birth rate	NIS-population in terms of age and sex on 31/12: provisional outline number of 0-year olds per 1000 inhabitants	CBS-population in terms of age, sex and marital status number of 0-year olds per 1000 inhabitants
Number of gps and specialists	Leroy, 1983 tables 21, 23 and 25	NIVEL records of professions in Primary Care NZI hospital inquiry
Percentage of publicly insured persons	-	LISZ-1979
Percentage non-active	Leroy, 1983 Chapter I	-
Percentage independent	Leroy, 1983 Chapter 1	-

Percentage hospital beds owned by the health insurance funds	Ministry of Public Health & the Family First and principal statistical results of the inquiry into institutions for health care	-

NIS - National Institute of Statistics (Belgium)
CBS - Central Bureau of Statistics (The Netherlands)
NZI - National Hospital Institute (The Netherlands)
NIVEL - Netherlands Institute for Primary Health Care (The Netherlands)

Table 2: Mean and standard deviation for the variables used in 1979 and the index figures for the change between 1974 and 1979.

Variable	Belgium		The Netherlands		Index 1974=100	
	$\bar{X}$	Sd	$\bar{X}$	Sd	Belgium	The Netherlands
Dependent variable						
number of admissions	127.70	19.28	109.73	11.43	109	105
General model						
percentage of the elderly	14.37	2.06	11.15	2.16	103	107
mortality rate	10.38	.83	8.65	.46	96	96
average income (z-scores)	0.00	1.00	0.00	1.00	/	/
population density	466.05	935.56	687.33	821.57	99	95
beds per 1000 inh.	5.84	1.39	4.55	.73	122*	99
hospital size	185.66	68.27	315.64	154.81	127	106
mean stay	20.15	8.69	13.61	1.44	/**	90
specific model						
birth rate	12.53	1.22	12.72	.09	93	94
ratio gp:specialists	1.68	1.22	.96	.31	158	98
ratio gp + common spec:remaining spec.	2.87	1.88	1.78	.59	103	61
number of inh. per gp	1283.96	237.46	2732.86	221.32	76	92
number of inh. per spec.	1487.26	414.89	2574.92	719.81	84	89
percentage publicly insured	/	/	68.65	5.13	/	101
perc. non-active	22.84	3.88	/	/	98	/
perc. independents	18.79	6.46	/	/	90	/
perc. insurance funds owned beds	13.67	25.70	/	/	106	/

* in part real growth in the number of beds (nationally 6%), for the rest a consequence of the difference in operationalization.

** not comparable; 1974 stay in acute beds; 1979 stay in all beds.

Table 3: Regression analysis on the number of admissions in the Netherlands and Belgium.
General model, regression coefficients for 1979 and the comparison with 1974.

	1979		significant coefficients in 1974	
	B	NL	B	NL
percentage of elderly	-.215	.215		
standardized mortality	10.656	1.704		
mean income	-.880	-.434	+	
population density	.008	.002		
number of beds per 1000 inh.	4.824	12.035	+	+
hospital size	.016	.011		
length of stay per admission	.031	-3.658		+
R^2	.22	.24		

Table 4: Regression of variables which are expected to have a different effect in the Netherlands and Belgium on the ratio of actual and expected admissions per region for 1979 (Belgium N = 43; the Netherlands N = 42).

	B	NL	B	NL	B	NL	B	NL	B	NL
birth rate	-.019	.0001	-.016	.0007	-.007	.005	-.019	-.0002	.032	-.002
ratio gp:specialiststst	-.043	.064	-	-	-	-	-	-	-	-
ratio gp + common spec.: remaining specialists	-	-	-.029	.029	-	-	-	-	-	-
number of inhabitants per gp	-	-	-	-	-.0001	$-.76\times10^{-5}$	-	-	-	-
number of inhabitants per common specialist	-	-	-		-	-	$-.98\times10^{-5}$	$.98\times10^{-5}$	-	-
number of inhabtants per specialist	-	-	-		-	-	-	-	-.0002	$.33\times10^{-4}$
R^2	.13	.00	.13	.00	.01	.00	.12	.01	.34	.01

Table 5: Stepwise regression analysis of the variables that represent unique characteristics of the Belgian health care system, on the ratio of actual to expected admissions per region for 1979 (N = 43).

	1 B-coefficient	2 B-coefficient	3 B-coefficient
% non-active	.016	.018	.015
% independents	-.008	-.006	-.006
% hospital beds owned by health insurance funds	.0006	.0005	.0004
birth rate		.015	.018
ratio gp + common spec.: remaining specialists		-.013	-.012
population density			.00002
mortality rate			.031
R^2	.44	.46	.45

Map 1: Geographical dispersion of age-based standardized mortality per 1000 inhabitants in the Netherlands and Belgium (1979).