

**8th Report of the Hospital Committee,  
Working Group of Leading Health Officials,**

**on the**

**State of Heart Surgery  
in Germany  
1995**

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Situation der Herzchirurgie 1995 in Deutschland

8. Bericht des Krankenhausausschusses der Arbeitsgemeinschaft der Leitenden Medizinalbeamtinnen und Medizinalbeamten (AGLMB)

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Report **no 8** analyses the situation of Heart Surgery in Germany 1995. Results from Old Federal States (former Federal Territory including West Berlin) and New Federal States (former German Democratic Republic including East Berlin) have been processed separately. Data have been collected at Federal State level by the Hospital Committee and by the author in close collaboration with the Society for Thoracic, Heart and Vascular Surgery.

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#### Abbreviations:

New States: Sachsen (Saxony); Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Thüringen, former East Berlin

Old States: Nordrhein-Westfalen, Bayern (Bavaria), Baden-Württemberg, Schleswig-Holstein, Niedersachsen, Hessen, Rheinland-Pfalz, Saarland, Berlin, Hamburg, Bremen

pmp: per million population

IHD: Ischemic Heart Disease

AMI: Acute Myocardial Infarction

CHD: Coronary Heart Disease

PTCA: percutaneous transluminal coronary angioplasty

LHC: left heart catheterisation

HLM: heart-lung machine

AGLMB: Arbeitsgemeinschaft der Leitenden Ministerialbeamten der Länder

SGB V: Sozialgesetzbuch V - Social Security Law relating to Health.  
Completely rewritten 1988, amended annually

# 1 Morbidity and Mortality of Acute Myocardial Infarction

## 1.1 Morbidity 1993

Collection of diagnoses at discharge from hospital after in-patient treatment started in 1993 (legal provision in Krankenhausstatistikverordnung in conjunction with § 28 (2) of Krankenhausfinanzierungsgesetz - KHG). The main diagnosis is given the three digit code of the International Classification of Diseases, Injuries and Causes of Death, 9th Revision (ICD-9). The main diagnosis known at discharge was recorded.

Of 13,835,924 recorded in-patient hospital cases 648,380 (4.7 per cent) related to ischemic heart diseases (ICD 410-414). Included are 129,675 acute myocardial infarctions (ICD 410) (Table 1). In-patients discharged from hospitals are tabulated by Federal State where treatment was carried out.

**Table 1:** In-patient cases of ischemic heart disease in Germany 1993

State	Cases (ICD 410-414) per State		Case (ICD 410) per State		ICD 410 (per cent) within ICD 410-414
	actual	per Mill.	actual	per Mill.	
Sachsen-Anhalt	21.408	7.706	5.502	1.994	25,70
Hamburg	23.218	13.634	3.233	1.895	13,92
Bremen	6.845	10.021	1.251	1.840	18,28
Sachsen	28.526	6.191	8.306	1.812	29,12
Rheinland-Pfalz	32.724	8.335	7.094	1.795	21,68
Thüringen	19.616	7.745	4.360	1.732	22,23
Nordrhein-Westfalen	167.028	9.405	30.623	1.719	18,33
Schleswig-Holstein	17.566	6.518	4.648	1.716	26,46
Niedersachsen	59.853	7.826	13.195	1.710	22,05
Brandenburg	15.958	6.288	4.265	1.681	26,73
Berlin	29.386	8.455	5.736	1.652	19,52
Saarland	11.691	10.780	1.771	1.633	15,15
Hessen	56.301	9.435	9.237	1.544	16,41
Mecklenburg-Vorpommern	12.819	6.954	2.706	1.477	21,11
Baden-Württemberg	57.100	5.579	13.437	1.308	23,53
Bayern	88.341	7.447	14.311	1.200	16,20
<b>Germany</b>	<b>648.380</b>	<b>7.971</b>	<b>129.675</b>	<b>1.590</b>	<b>20,00</b>

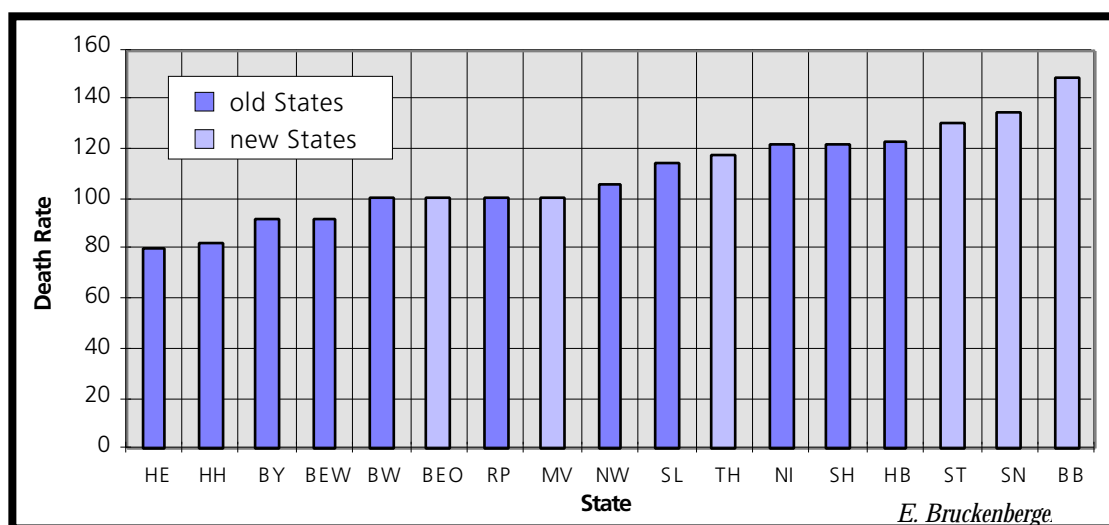
Source: Statistisches Bundesamt

## 1.2 Mortality 1994

Diseases of the heart and circulation were the leading cause of death in Germany in 1994 (1993) with 430,542 (440,896) deaths amounting to 48.7 (49.1) per cent. The Old States recorded 334,751 (343,462) deaths or 47.6 (48.3) per cent, the New States 95,791 (97,434) or 52.8 (52.4) per cent. Of the 334,751 (343,462) deaths in the Old States 67,183 (69,486) or 20.1 (20.2) resulted from a fatal myocardial infarction in 1994 (1993); the corresponding figure for the New States was 19,732 (19,602) or 20.6 (20.1) per cent.

The death rate for acute myocardial infarction - number of deaths per 100,000 population was 101.8 in the Old States in 1994 and 127.1 or 25 per cent higher in the New States. The death rate for acute myocardial infarction has been declining in the Old States. Interstate discrepancies exist. In the former West, Bremen has the highest rate (122.2) as compared with Hessen (79.7), Hamburg (82.5) and Bavaria (92.1) - see Figure 1. The former East has the highest rate in Brandenburg (148.9) and the lowest rate in Mecklenburg-Vorpommern (101.2).

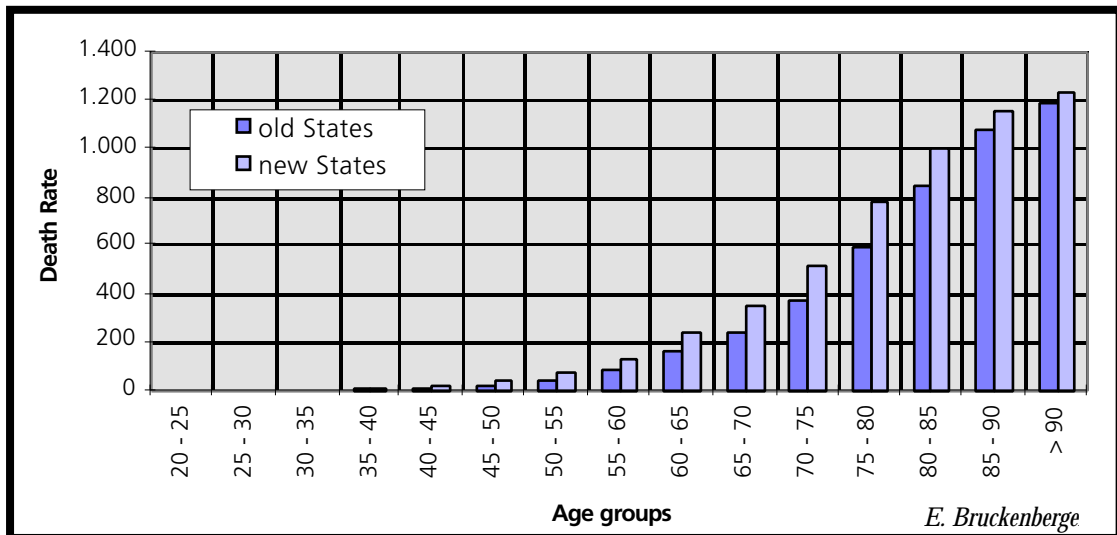
**Figure 1:** Death Rate from Acute Myocardial Infarction 1994



MV = Mecklenburg-Vorpommern, BY = Bayern, HE = Hessen, BW = Baden-Württemberg, SN = Sachsen, NW = Nordrhein-Westfalen, RP = Rheinland-Pfalz, BEW = Berlin (West), BEO = Berlin (Ost), BB = Brandenburg, TH = Thüringen, HH = Hamburg, HB = Bremen, ST = Sachsen-Anhalt, SL = Saarland, NI = Niedersachsen, SH = Schleswig-Holstein

Analysis by age group reveals a higher death rate from acute myocardial infarction in 1994 for all ages in the New States (Figure 2).

**Figure 2:** Death rates for acute myocardial infarction 1994 by age

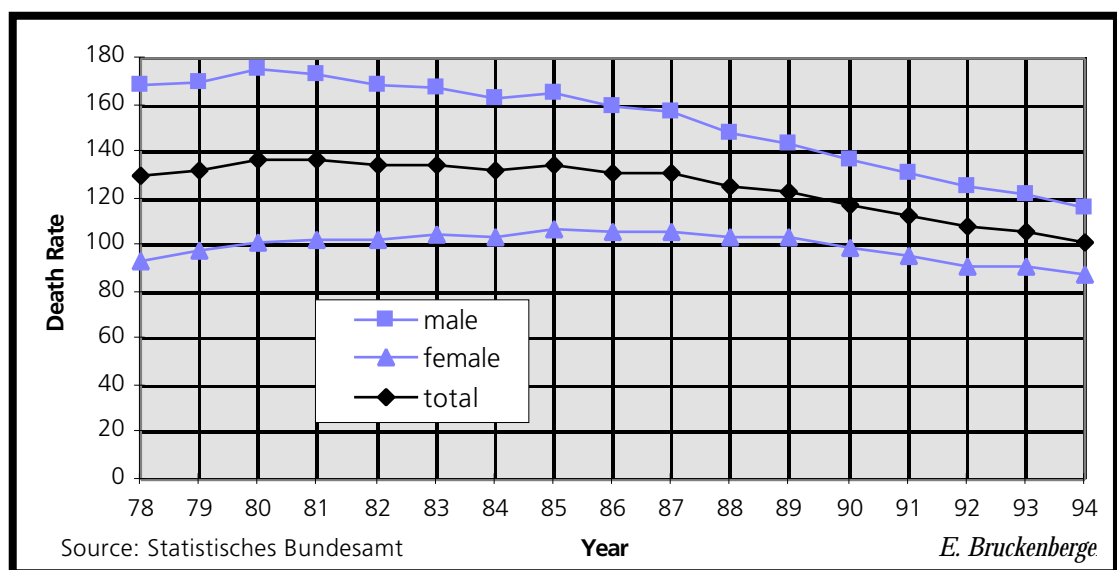


Source: Statistisches Bundesamt Wiesbaden, Fachserie 12, Reihe 4, Todesursachen

### 1.3 Evolution of Mortality

The death rate for acute myocardial infarction in men in the Old States has been in decline since 1985. From 1990, this has applied to women also (Figure 3 / Table 2)

**Figure 3:** Death Rate from AMI, Old States, 1978-1994



Source: Statistisches Bundesamt

**Table 2:** Death Rate from AMI, Old States, 1979-1994

Year	Deaths		Deaths		per 100,000 population	
	number	per 100,000 population	male	female	male	female
1979	81.121	132,0	49.701	31.420	169,9	97,9
1980	84.144	136,5	51.449	32.695	174,9	101,7
1981	84.122	136,3	51.043	33.079	173,0	102,8
1982	82.771	134,5	49.705	33.066	168,6	102,8
1983	82.646	134,8	49.113	33.533	167,3	104,6
1984	80.752	132,3	47.616	33.136	162,8	103,8
1985	82.026	134,4	48.056	33.970	164,7	106,7
1986	80.286	131,3	46.515	33.771	159,1	106,1
1987	79.754	130,2	45.986	33.768	156,8	106,3
1988	76.679	124,2	43.741	32.938	148,1	103,2
1989	76.193	121,6	42.954	33.239	143,7	103,3
1990	74.153	116,4	41.842	32.311	136,8	98,9
1991	72.423	112,3	40.674	31.749	131,0	96,2
1992	69.940	107,1	39.358	30.582	124,8	91,5
1993	69.486	105,7	39.004	30.482	122,3	90,6
1994	67.183	101,8	37.460	29.723	116,1	87,9

Source: Statistisches Bundesamt Wiesbaden, Fachserie 12, Reihe 4, Todesursachen

Death rates from acute myocardial infarction in men and women are converging. Adaptation of risk factors due to adoption of male lifestyles and behavioral patterns seems to produce comparable outcomes.

Comparable figures for the New States have been available only since 1991. The death rate is increasing in both sexes (Table 3).

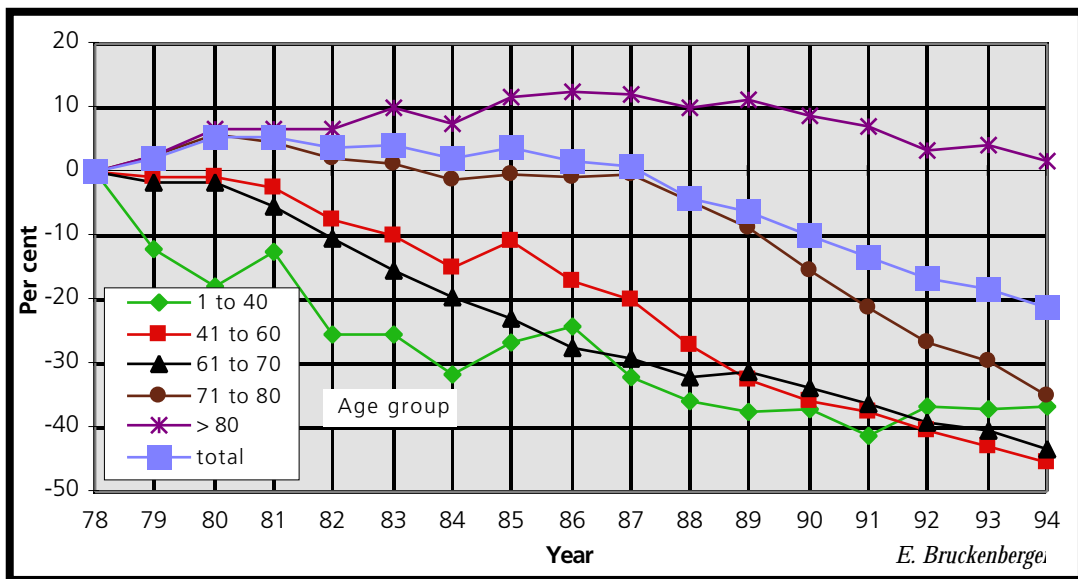
**Table 3:** Death rate from AMI, New States, 1991-1994

Year	Deaths		Deaths		Deaths per 100,000 population	
	actual	per 100,000	male	female	male	female
1991	17.903	113,4	10.442	7.461	138,2	90,6
1992	18.218	116,1	10.553	7.665	139,9	94,2
1993	19.602	125,7	11.488	8.114	152,6	100,5
1994	19.732	127,1	11.508	8.224	153,3	102,5

Source: Statistisches Bundesamt Wiesbaden, Fachserie 12, Reihe 4, Todesursachen

Analysis of death rate by age group confirms the observation that death from acute myocardial infarction has shifted to later life in the West (Figure 4).

**Figure 4:** Death rate from AMI by age, Old States



Source: Statistisches Bundesamt Wiesbaden, Fachserie 12, Reihe 4, Todesursachen

The death rate from AMI for age groups 41 to 60 and 61 to 70 has declined by about 45 per cent; the death rate for age group 71 to 80 declined by about 35 per cent. Only patients up to 40 years of age had no further decline in death rate since 1992.

**Figure 5:** Death rate from ischemic heart disease per million population: Old States, 1978-1994

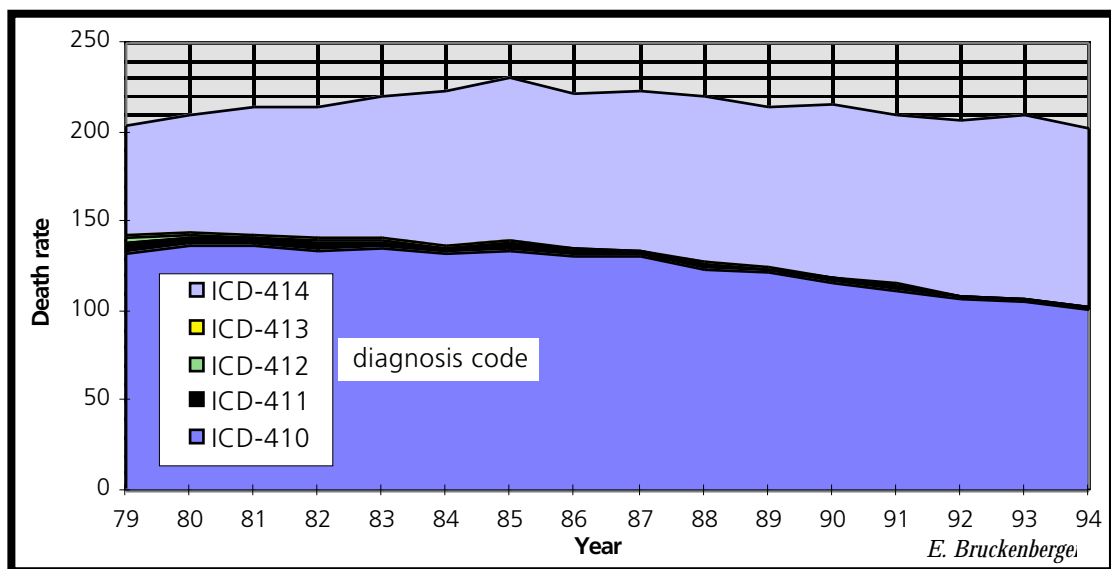
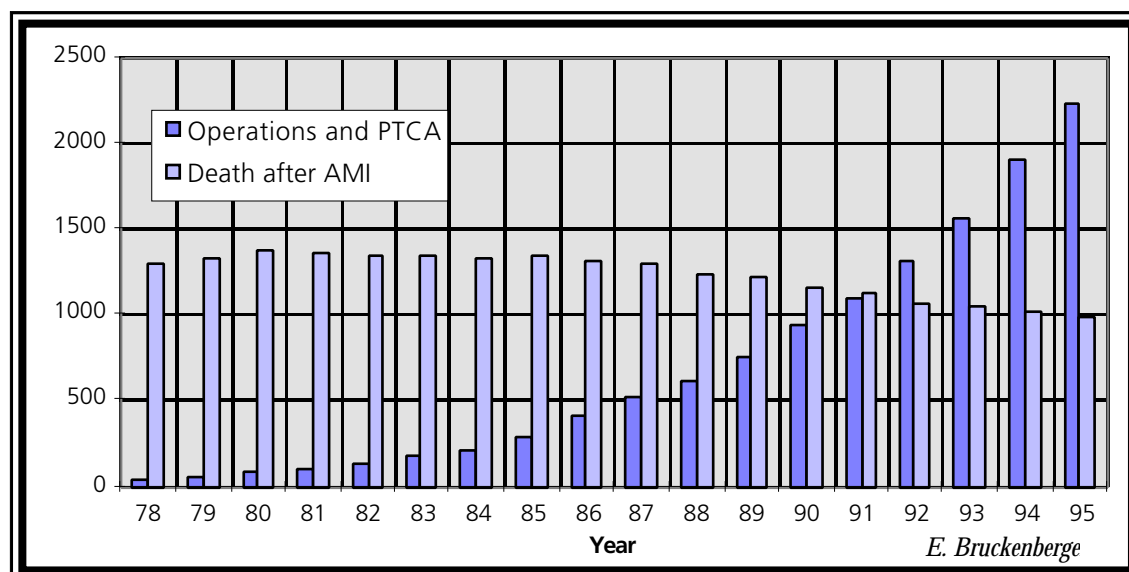


Figure 5 testifies a moderate overall change in total deaths from ischemic heart diseases (ICD 410 to 414) since 1979. The decline in deaths from acute myocardial infarction (ICD 410) is offset by a marked increase in deaths from chronic ischemic heart disease (ICD 414). This is another example of how medical progress can generate costs.

The volume of therapeutic interventions aimed at infarct prevention such as heart surgery with the heart-lung machine and percutaneous transluminal coronary angioplasty (PTCA) has multiplied from 3,142 in 1978 to 147,129 (including an estimated 95,000 PTCA) in 1995 in the former West. The rate of interventions (operations, PTCA) per million population rose from 51 to 2,221 (see Figure 6). The number of deaths from AMI per million population declined from 1,294 to 995 (own estimate) in the same period.

**Figure 6:** Coronary Heart Diseases in the Old States, 1978-1995 Interventions and Deaths after AMI per million population



Source: Statistisches Bundesamt Wiesbaden, Fachserie 12, Reihe 4, Todesursachen  
Hospital Committee Federal States' Working Party, own estimate for 1995

## 2 Cardiology

### 2.1 Cardiologists in Germany, 1995

There were 906 cardiologists on contract to Social Security in Germany as at June 30, 1995. On average, one cardiologist was on contract for about 90,000 population, ranging from about 52,000 to 690,000 people per cardiologist. The City States of Hamburg, Bremen and Berlin have the highest relative density of cardiologists. The New States of Sachsen-Anhalt, Brandenburg, Mecklenburg-Vorpommern and Saxony have the lowest density of cardiologists on contract to Social Security (see Table 4 and Figure 7).

According to the latest available statistics on Health Professionals ("Berufe des Gesundheitswesens"), 1,654 cardiologists were active in Germany on 31st December 1994; 1,074 worked in hospitals. An additional 196 cardiologists were active in pediatrics, 144 working in hospitals. The highest density of cardiologists is found in Hamburg, Bavaria and Saarland.

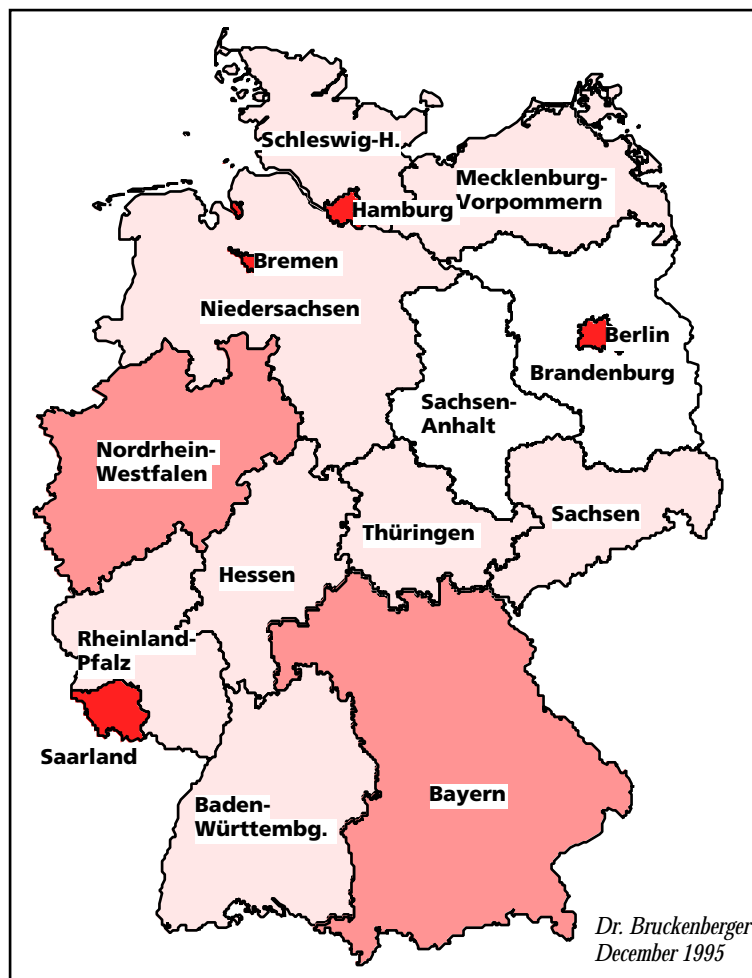
**Table 4:** Cardiologists in Germany

	cardiologists on contract total*	active cardio- logists on contract**	population per contract cardiologist	population per active cardiologist
Hamburg	33	67	51.693	25.461
Bremen	13	14	52.310	48.574
Berlin	58	77	59.862	45.091
Saarland	17	29	63.777	37.386
Bayern	155	379	76.916	31.456
Nordrhein-Westfalen	205	308	86.908	57.844
Baden-Württemberg	114	244	90.106	42.099
Schleswig-Holstein	30	31	90.280	87.367
Hessen	62	121	96.463	49.427
Rheinland-Pfalz	40	14	98.789	282.255
Thüringen	25	70	100.711	35.968
Niedersachsen	76	106	101.518	72.786
Sachsen	45	109	101.874	42.058
Mecklenburg-Vorpommern	13	***	140.946	***
Brandenburg	16	29	158.547	87.474
Sachsen-Anhalt	4	56	689.803	49.272
<b>Germany</b>	<b>906</b>	<b>1.654</b>	<b>89.998</b>	<b>49.298</b>

\* Federal Register of Doctors as at 30 June 1995

\*\* Statistisches Bundesamt Wiesbaden: 31 December, 1994

\*\*\* no data

**Figure 7:** Cardiologists on Contract June 30, 1995

Population per cardiologist on contract	■ 50.000 to 75.000 (4)
	■ 75.000 to 89.998 (2)
	■ 89.998 to 150.000 (8)
German average 89.998	■ 150.000 to 690.000 (2)

## 2.2 Active Left Heart Catheter Laboratories, early 1996

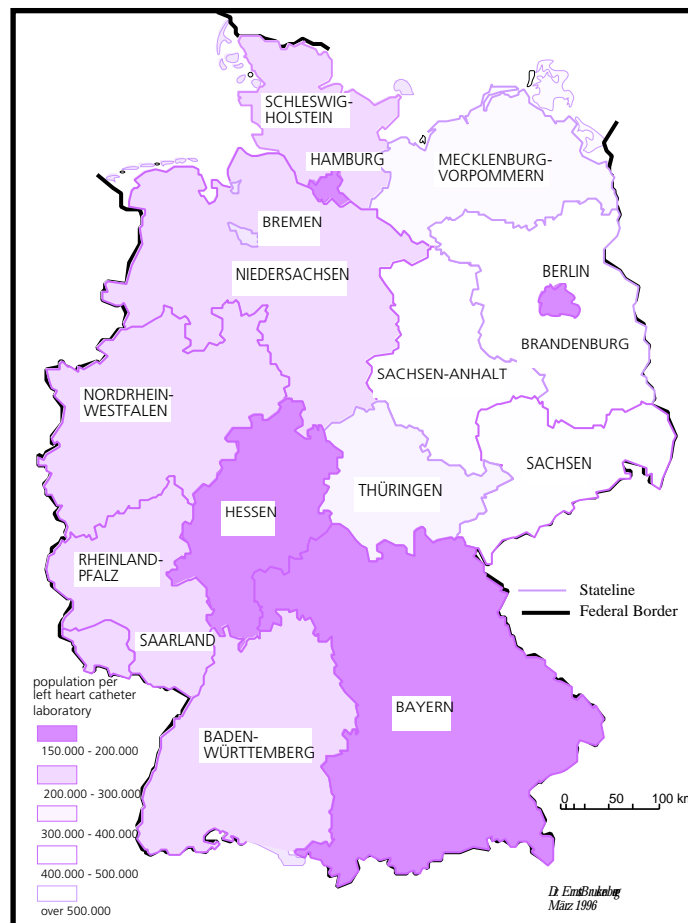
The Hospital Committee of AGLMB surveyed catheter laboratories in hospitals and practices as at 1st January 1996 (see Table 5). Active laboratories which lack recognition under § 122 SGB V are included, recognised laboratories which are not yet active are discounted. Germany thus had 356 Left Heart Catheter Laboratories for adults and children in function on 1st January 1996. With few exceptions, these installations have accredited status under § 122 SGB V. A further 36 laboratories have been accredited but were not functioning at the time of survey.

**Table 5:** Active Left Heart Catheter Labs (adults & children) 1/1, 1996

State	Number of Labs			population per lab
	Hospital 1)	Office 1)	total	
Hamburg	9	4	13	131.221
Hessen	26	9	35	170.877
Berlin (gesamt)	17	2	19	182.737
Bayern	59	4	63	189.237
Nordrhein-Westfalen	80	9	89	200.181
Schleswig- Holstein	12	1	13	208.338
Saarland	5	0	5	216.840
Bremen	2	1	3	226.676
Rheinland-Pfalz	13	3	16	246.973
Niedersachsen	27	2	29	266.047
Baden-Württemberg	35	3	38	270.318
Thüringen	7	0	7	359.682
Mecklenburg-Vorpommern	5	0	5	366.460
Sachsen	7	3	10	458.435
Sachsen-Anhalt	5	1	6	459.869
Brandenburg	5	0	5	507.349
<b>Germany</b>	<b>314</b>	<b>42</b>	<b>356</b>	<b>229.041</b>

1) by location (not by ownership)

**Figure 8:** Population per Left Heart Catheter Lab, 1/1 1996



Source: State Survey Hospital Committee, AGLMB

The Federal average was one active left heart catheter laboratory per 229,000 population as at 1st January 1996. The ratio was 192,000 : 1 in the Old States and 317,000 in the New States. The highest density of 131,000 population per left heart catheter laboratory was recorded in Hamburg (see Figure 8).

### 2.3 Left heart catheterisations and PTCA 1994

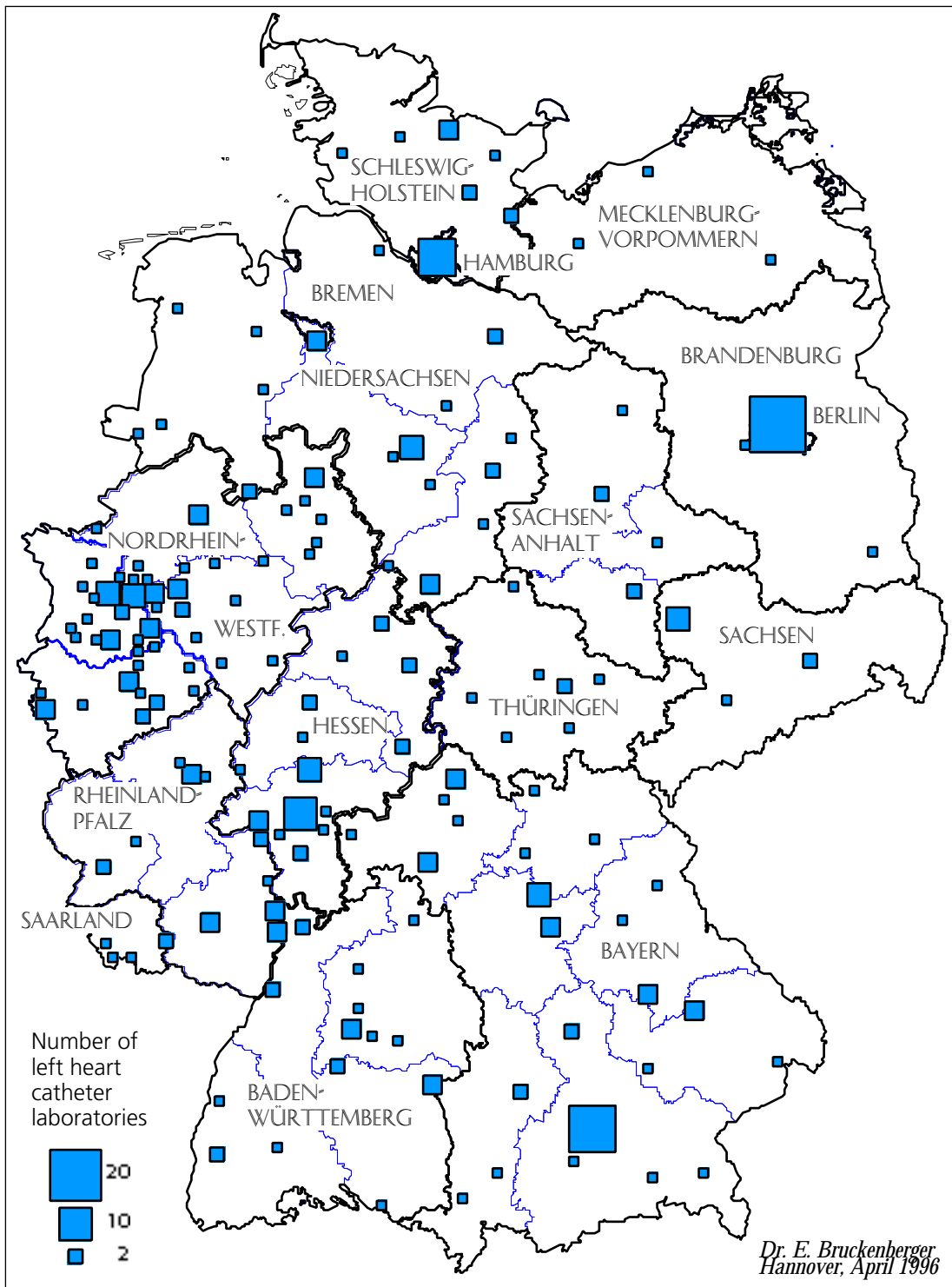
According to the State Survey by the AGLMB Hospital Committee and from own estimates, a total of 345,776 left heart catheterisations were performed on adults in Germany in 1994. The PTCA total was 86,488 (see Table 6). Figure 9 details the geographic distribution and density of left heart catheter laboratories active in 1994. There is a marked 23 (24) per cent increase in invasive diagnostic interventions and interventional therapy over the preceding year 1993. The total number of procedures performed in 1995 is not yet available.

**Table 6:** Left heart catheterisations and PTCA, by State (adults) 1994

State	LHC total	LHC pmp	PTCA total	PTCA pmp
Hamburg	14.853	8.707	4.888	2.865
Bremen	4.389	6.454	1.359	1.998
Saarland	6.770	6.244	2.837	2.617
Hessen	32.670	5.463	13.856	2.317
Berlin	18.571	5.349	5.916	1.704
Bayern	63.137	5.296	12.686	1.064
Nordrhein-Westfalen	92.494	5.192	20.582	1.155
Rheinland-Pfalz	17.803	4.505	5.113	1.294
Niedersachsen	27.964	3.624	5.877	762
Baden-Württemberg	32.652	3.179	7.896	769
Mecklenburg-Vorpommern	5.014	2.736	660	360
Schleswig- Holstein	6.507	2.403	1.677	619
Sachsen-Anhalt	6.558	2.377	481	174
Thüringen	5.721	2.272	1.060	421
Sachsen	8.949	1.952	1.298	283
Brandenburg	1.724	680	302	119
<b>Germany</b>	<b>345.776</b>	<b>4.241</b>	<b>86.488</b>	<b>1.061</b>
<b>Germany 1993</b>	<b>280.378</b>	<b>3.447</b>	<b>69.601</b>	<b>856</b>

Source: State Survey Hospital Committee, AGLMB

Figure 9: Location of Left Heart Catheter Laboratories, 1994



Source: State Survey Hospital Committee, AGLMB

An additional 2,023 thrombolytic interventions and 14,906 electrophysiological investigations were recorded in 1994. Thus, altogether 449,193 interventions were undertaken by the 324 active left heart catheter laboratories. This translates to an average 1,386 procedures per laboratory.

The average number of left heart catheterisations for adults was 1,070 per laboratory. This excludes other invasive and interventional (PTCA) procedures. Certain accredited locations with one or more left heart catheter laboratories are in marked excess of, or much below, the average

The number of left heart catheterisations per million population ranged from 680 (Brandenburg, New State) to 8,707 (Hamburg).

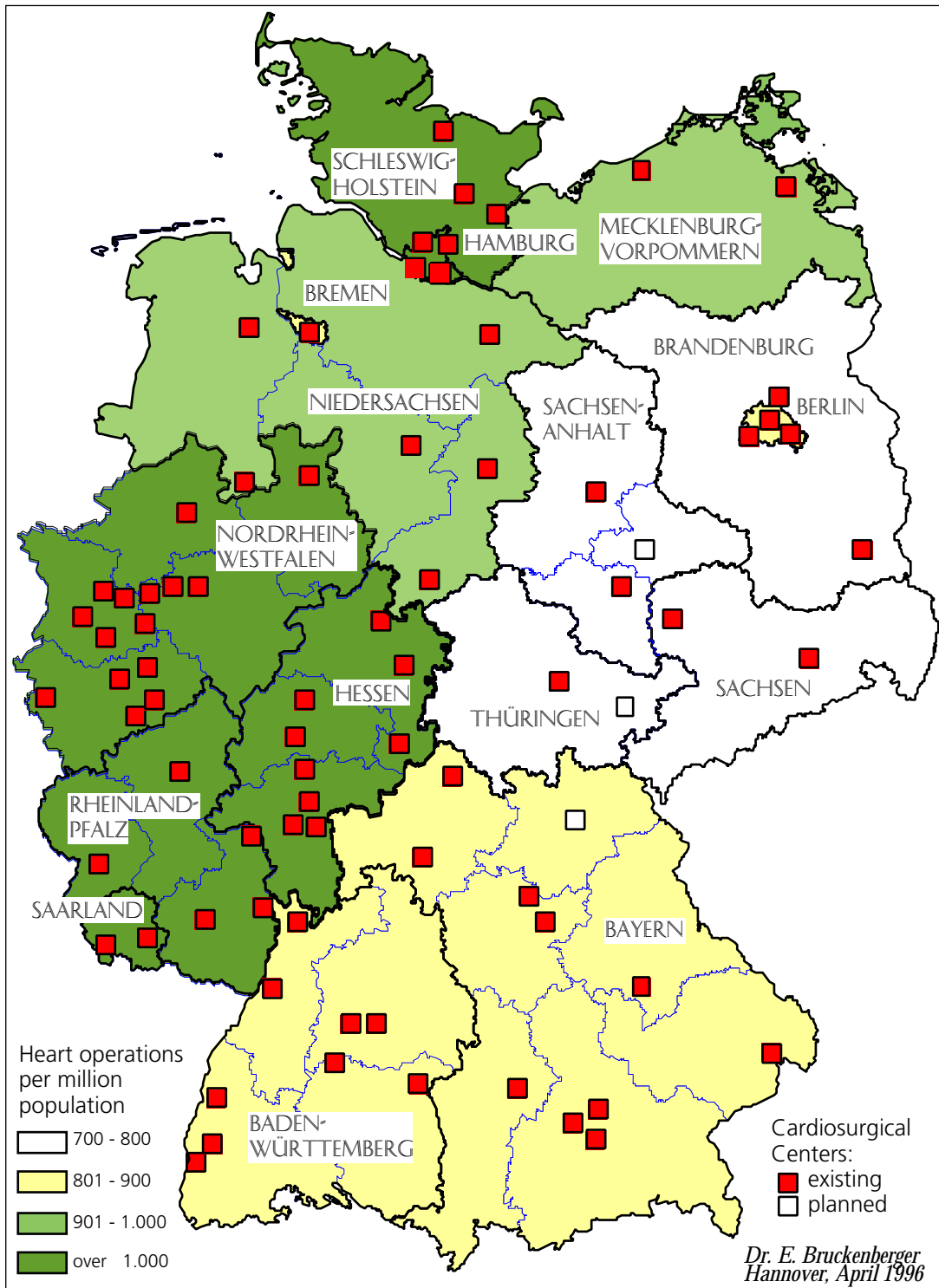
An average of 267 PTCA was performed per left heart catheterisation laboratory in 1994. The range was 119 (Brandenburg) to 2,865 (Hamburg) per million population.

The comparison of left heart catheterisation and PTCA between Federal States does not take into account patient movement across statelines as in urban centers such as Hamburg, Bremen and Berlin which attract a wider catchment area. The comparative figures therefore do not reflect the actual service level for the population. The relative small number of interventions in the New States reflects an enormous need to catch up.

### 3 Heart Surgery

#### 3.1 Cardiosurgical Centers

Figure 10: Location of Cardiosurgical Centers 1995



Source: State Survey Hospital Committee, AGLMB

A total of 76 Cardiosurgical centers operated in Germany in 1995. Sixty-six centers were located in the Old States and ten in the New States. For location see Figure 10. The Havel Klinik in Berlin and the "CardioClinics" in Hamburg, Frankfurt am Main and Köln are not on contract with Social Security and have not been accredited within hospital planning.

In the Old States, four new centers opened in 1995:

- **Karlsruhe** , Klinik für Herzchirurgie; **Köln** (Cologne), Cardioclinic; **Krefeld** , Städtische Krankenanstalten; **Koblenz** , Bundeswehr Zentralkrankenhaus;

In the New States, another four centers opened in 1995:

- **Cottbus** , Karl-Thiem-Klinikum; **Dresden** , Uni-Klinik; **Karlsburg/Greifswald**, Zentrum f. THG-Chirurgie; **Magdeburg** , Uni-Klinikum.

### 3.2 Cardiosurgical Centers and Left Heart Catheter Laboratories

Of 338 catheter laboratories for adults active on 1st January 1996 in Germany, 130, or 38 per cent, are directly connected to Cardiosurgical Centers. More than one left heart catheter laboratory is available at 50 Cardiosurgical Centers in the Old States; 13 centers have three catheter laboratories each. Of the 10 Cardiosurgical Centers in the New States, four have more than one catheter laboratory (Table 7).

**Table 7:** Cardiosurgical Centers and left heart catheter laboratories (adults) - 1/1, 1996

number of cardiosurgical centers (CC)	number of catheter lab. Old States		number of cardiosurgical centers (CC)	number of catheter lab. New States	
	per CC	total		per CC	total
4	0	0	0	0	0
12	1	12	6	1	6
37	2	74	3	2	6
13	3	39	1	3	3
<b>66</b>		<b>125</b>	<b>10</b>		<b>15</b>

Source: State Survey Hospital Committee, AGLMB

### 3.3 Heart Operations with Heart-Lung Machine, 1995

In 1995, the 76 Cardiosurgical Centers performed 78,184 open heart operations (with heart-lung machine) (1994 = 65,347). The 66 centers in the Old States accounted for 69,398 (60,491) operations, and the 10 centers in the New States for 8,786 (4,856). The Old States had 1,051 (920) operations per million population and the New States 566 (311).

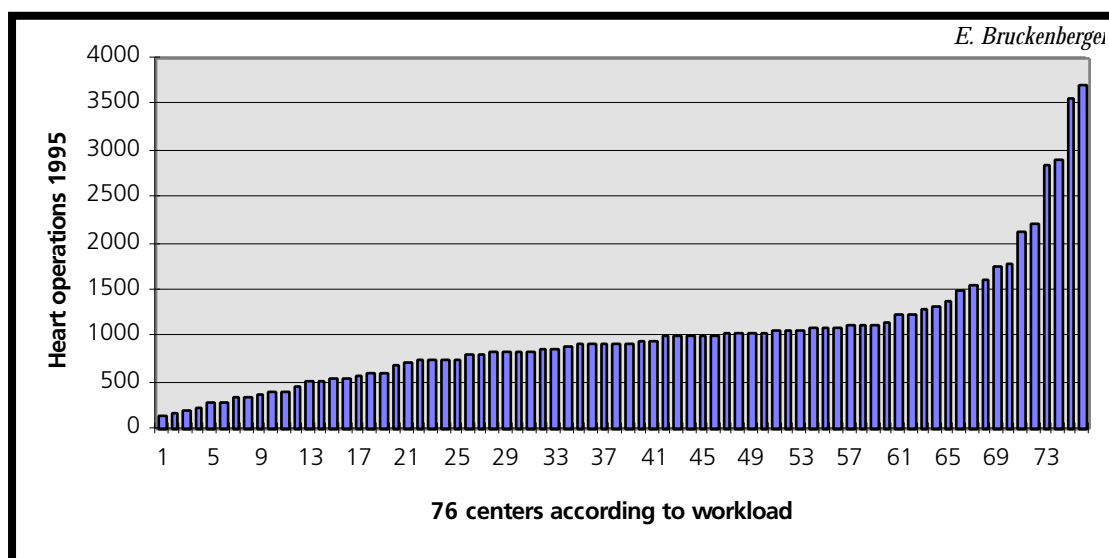
The average workload was 1,029 (961) operations per center in the Old States, range 177 (34) (newly opened center) to 3,713 (3,545). The average workload per cardiosurgical center in the New States was 878 (809) operations, range 155 (412) to 2,116 (1,435) heart operations.

In the Old States, 22.7 per cent of centers performed up to 700 operations; 30.3 per cent of centers performed between 701 and 1,000 operations and 39.4 per cent of centers performed between 1,001 and 2,000 operations. More than 2,000 operations have been performed in five centers with two of the top five exceeding 3,500. In the New States, 50 per cent of heart operations with the heart-lung machine have been performed in centers doing more than 700 operations (see Table 8 and Figure 11).

**Table 8:** Workload of heart centers 1995

Heart operations with HLM	number of centers Old States		number of centers New States	
	total	per cent	total	per cent
bis 400	8	12	2	20
401 bis 700	7	11	3	30
701 bis 1.000	20	30	1	10
1.001 bis 2.000	26	39	3	30
2.001 bis 3.000	3	5	1	10
über 3.000	2	3	0	0
<b>all centers</b>	<b>66</b>	<b>100</b>	<b>10</b>	<b>100</b>

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

**Figure 11:** Workload of Heart Centers, 1995

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

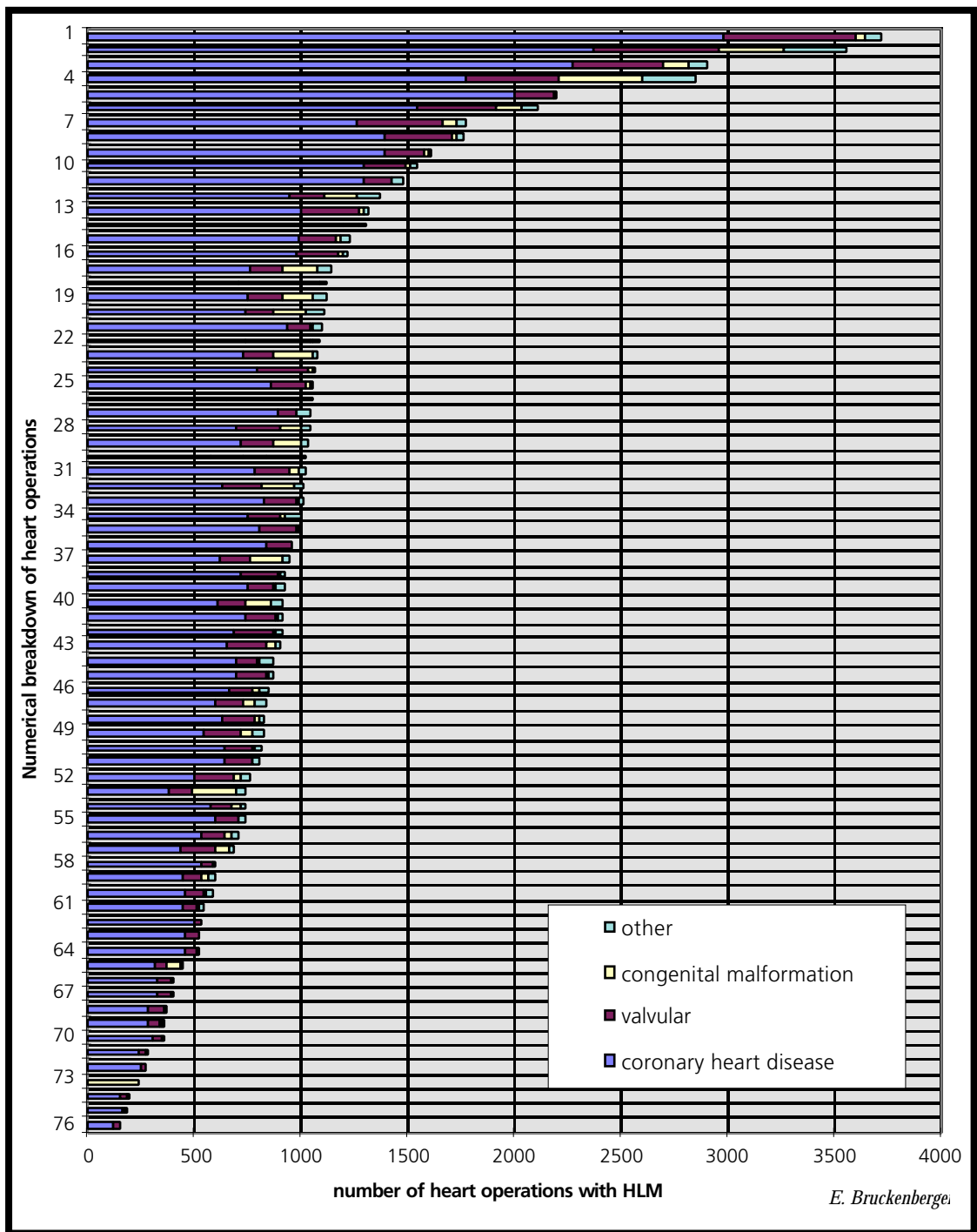
Minor variations remain between Old and New States in the type of operation. Coronary operations account for 75.1 per cent of interventions in the Old States and for 71.6 per cent in the New States (see Table 9). The relative amount of valvular surgery and operations for congenital defects is higher in the New States. Only a few centers which do operations for congenital cardiac malformations do them in greater numbers (see Figure 12). Only five centers did more than 200 such operations.

**Table 9:** Type of heart operation, 1995

type	operations	relative	operations	relative
	Old States	amount	New States	amount
	total	per cent	total	per cent
Valvular	10.423	15,0	1.661	18,9
coronary	52.129	75,1	6.291	71,6
congenital	3.994	5,8	509	5,8
other	2.852	4,1	325	3,7
<b>total</b>	<b>69.398</b>	<b>100,0</b>	<b>8.786</b>	<b>100,0</b>

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

Figure 12 : Type of operation per center, 1995



Source: State Survey Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

E. Brucknerberger.

As regards first and repeat operations, there are only minor differences between cardiosurgical centers in the Old and New States (Table 10).

**Table 10:** First and repeat operations, 1995

Type	Operations Old States		Operations New States	
	total	per cent	total	per cent
first operation	64.445	92,9	8.250	93,9
second operation	4.432	6,4	469	5,3
third operation	424	0,6	60	0,7
more	97	0,1	7	0,1
<b>total</b>	<b>69.398</b>	<b>100,0</b>	<b>8.786</b>	<b>100,0</b>

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

A total 7,238 emergency operations (Quadra definition) was performed in German cardiosurgical centers in 1995. Of these, 6,585 or 9.5 per cent of open heart operations were done in the Old States and 653 or 7.4 per cent of operations in the New States (Table 11).

**Table 11:** Emergencies 1995

Operation	Old States		New States	
	total	per cent	total	per cent
heart operation with HLM	69.398	100,0	8.786	100,0
emergencies	6.585	9,5	653	7,4
emergencies after PTCA	962	14,6	62	9,5

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

The rate of emergency operations varies widely between centers. Table 12 gives an overview.

**Table 12:** Emergency rate in cardiosurgical centers, 1995

number of emergencies	number of heart centers Old States		number of heart centers New States	
	total	per cent	total	per cent
1 to 50	24	36,4	3	30,0
51 to 100	22	33,3	5	50,0
101 to 200	13	19,7	2	20,0
> 200	7	10,6	0	0,0
<b>total</b>	<b>66</b>	<b>100,0</b>	<b>10</b>	<b>100,0</b>

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

### 3.4 Heart transplants, 1995

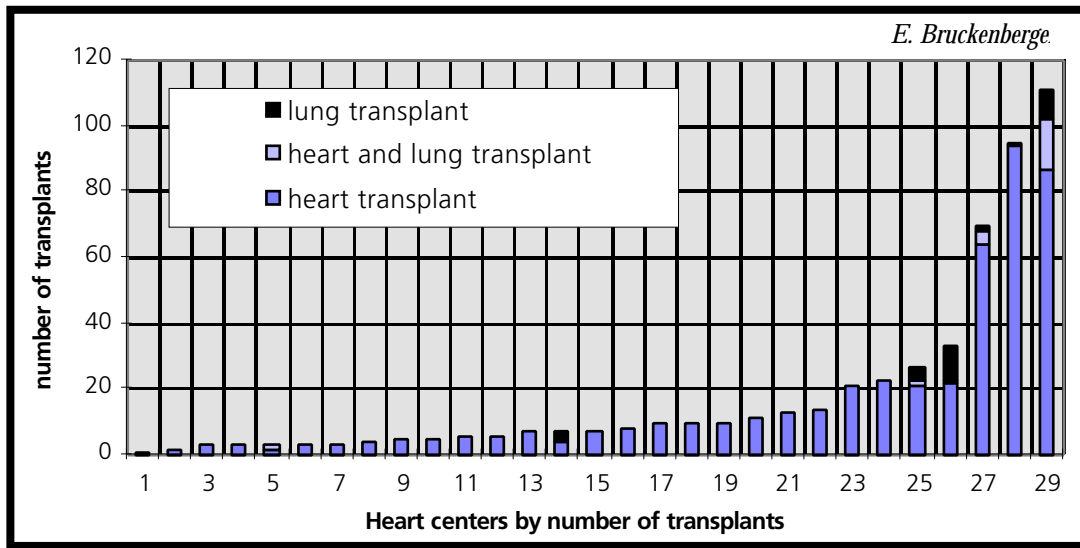
The number of transplants using the heart-lung machine increased slightly from 509 in 1994 to 521 in 1995. Of the total (adults and children), 469 were heart transplants; 454 were performed in the Old and 15 in the New States. An additional 24 heart and lung transplants plus 28 lung transplants were done in the Old States. Transplantations were done at 29 of 76 cardiosurgical centers (Table 13).

**Table 13:** Heart centers undertaking heart transplants 1995

State	Location
Berlin	Berlin, Deutsches Herzzentrum
Nordrhein-Westfalen	Bad Oeynhausen, Herzzentrum NRW
Bayern	München, Uni-Klinik Großhadern
Niedersachsen	Hannover, Medizinische Hochschule
Schleswig-Holstein	Kiel, Uni-Klinik
Nordrhein-Westfalen	Münster/Westfalen, Uni-Klinik
Baden-Württemberg	Heidelberg, Uniklinik
Hamburg	Hamburg, Uniklinik Eppendorf
Bayern	München, Deutsches Herzzentrum
Sachsen	Dresden, Uni-Klinik
Rheinland-Pfalz	Mainz, Uni-Klinik
Hessen	Fulda, Städtische-Kliniken
Nordrhein-Westfalen	Essen, Uni-Klinikum
Niedersachsen	Göttingen, Uni-Klinik
Hessen	Frankfurt/Main, Uni-Klinik
Rheinland-Pfalz	Kaiserslautern, Städtische-Kliniken
Baden-Württemberg	Bad Krozingen, Herz-Zentrum
Nordrhein-Westfalen	Aachen, Technische Hochschule
Berlin/Ost	Berlin, Uni-Klinik (Charite)
Saarland	Homburg, Uni-Kliniken d. Saarlandes
Nordrhein-Westfalen	Köln, Uni-Klinik
Bayern	Würzburg, Uni-Klinik
Baden-Württemberg	Freiburg, Uniklinik
Nordrhein-Westfalen	Bochum, BG-KA Bergmannsheil
Sachsen-Anhalt	Halle, Uni-Klinik
Hessen	Bad Nauheim, Kerckhoff-Klinik
Bayern	Regensburg, Uni-Klinik
Hessen	Gießen, Uni-Klinik
Sachsen	Leipzig, Herzzentrum-Leipzig GmbH

The number of transplants done in 1995 in the 29 centers varied widely. Twenty-two centers performed less than 20; only one center did more than 100 (Figure 13).

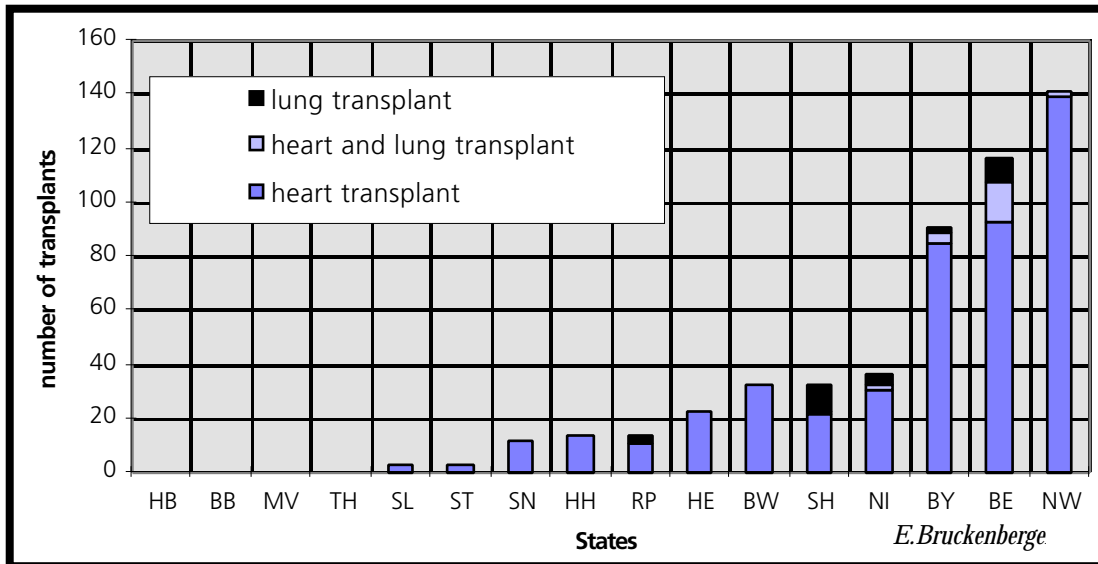
**Figure 13:** Transplantations by center, 1995



Source: State Survey Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

By far the most transplantations were done in Nordrhein-Westfalen, Berlin and Bavaria; the fewest in Bremen, Brandenburg and Mecklenburg-Vorpommern (Figure 14).

**Figure 14:** Transplantations by State, 1995

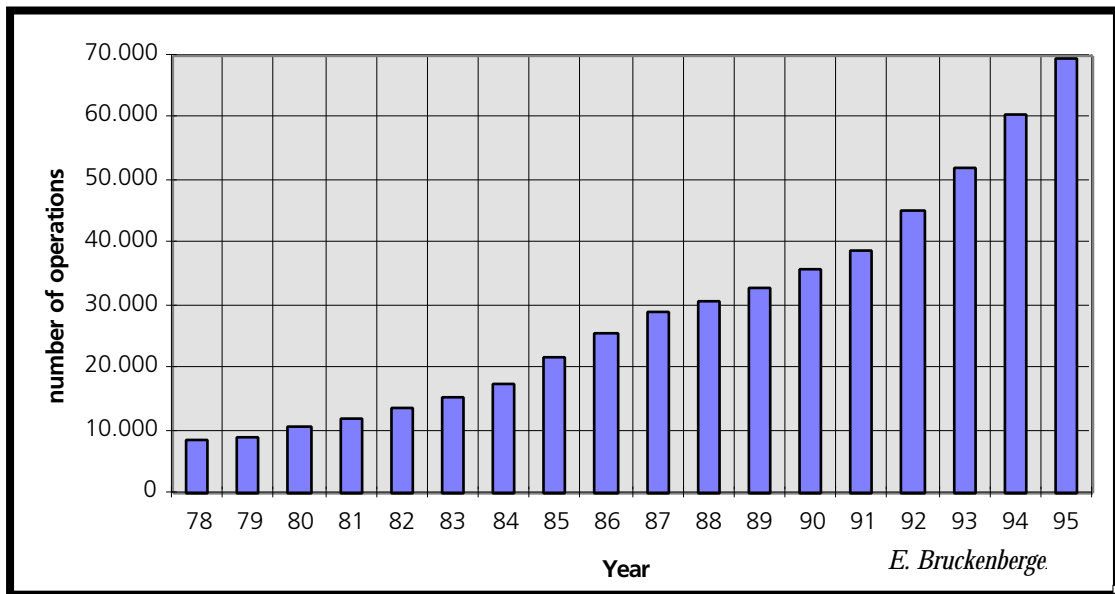


Source: State Survey Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

### 3.5 Evolution of heart operations with HLM since 1978

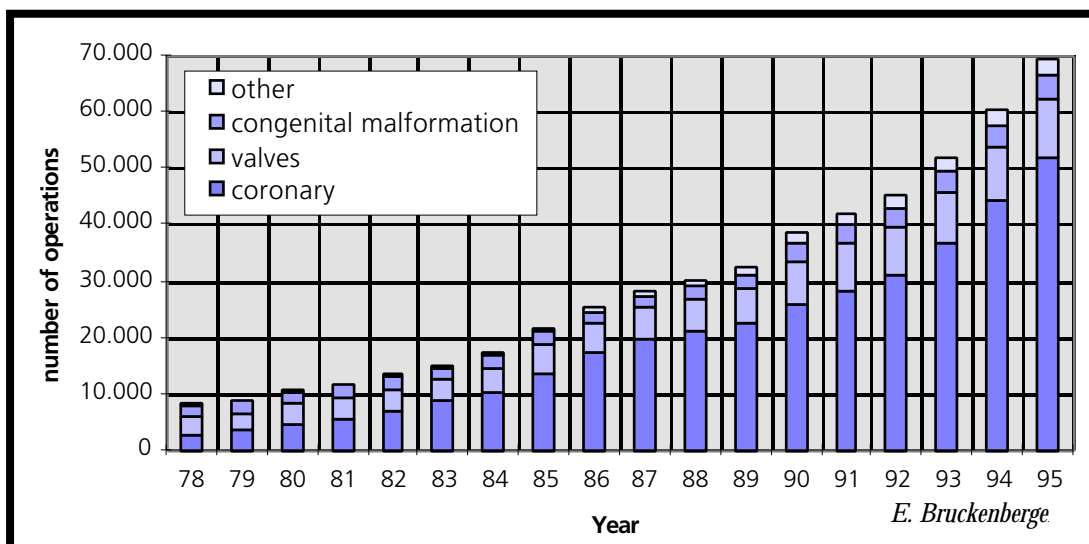
In the period from 1978 to 1995, the number of heart operations with HLM rose from 8,365 to 69,398 (Figure 15). This is an increase from 136 to 1,051 operations per million population.

**Figure 15:** Evolution of heart operations, Old States



Source: State Survey Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

**Figure 16:** Evolution of heart operation by type, Old States



Source: State Survey Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

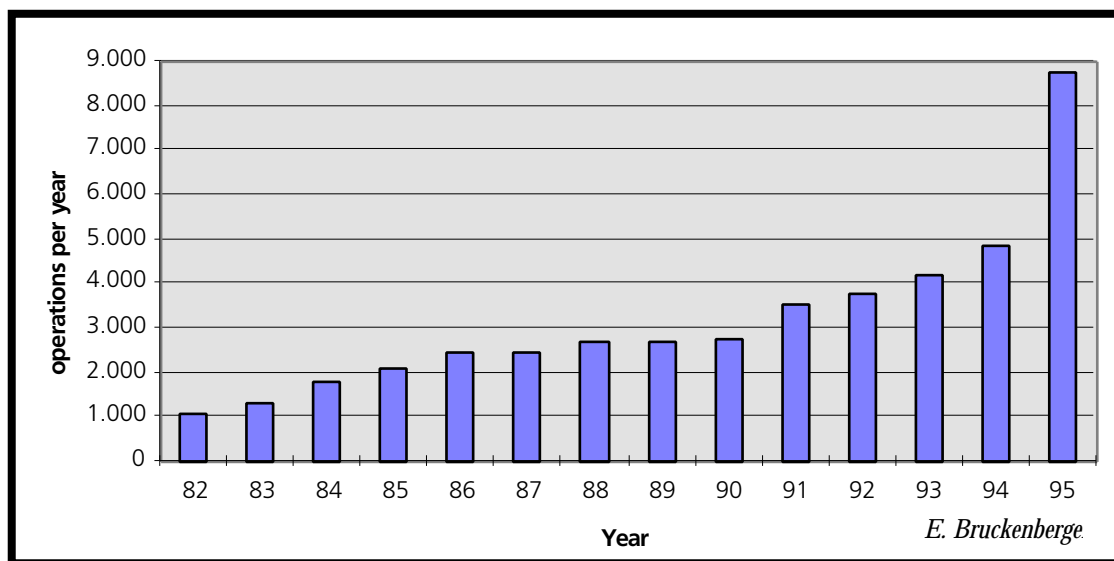
There were considerable shifts in the types of operations performed in the Old States between 1978 and 1995. The number of coronary operations increased seventeenfold from 3,042 to 52,129. Valvular operations increased more than threefold from 2,955 to 10,423, and operations for congenital malformations twofold from 2,089 to 3,994. Various other operations using the HLM (including transplants) multiplied by twelve from 239 to 2,852 (see Table 14 and Figure 16). Operations for coronary heart disease are by far the most numerous.

**Table 14:** Heart Operations, by type, Old States

Year	Heart operations with HLM	other			
		coronary	valves	congenital	other
1978	8.325	3.042	2.955	2.089	239
1979	9.042	3.612	3.056	2.108	266
1980	10.680	4.887	3.397	2.075	321
1981	12.001	5.899	3.560	2.169	373
1982	13.671	7.287	3.788	2.126	470
1983	15.213	8.911	3.775	2.064	463
1984	17.699	10.458	4.237	2.259	745
1985	21.875	13.678	5.271	2.268	658
1986	25.471	17.489	5.216	2.027	739
1987	28.476	19.959	5.453	2.016	1.048
1988	30.270	21.363	5.801	2.270	836
1989	32.786	22.484	6.308	2.409	1.585
1990	38.783	26.137	7.461	3.311	1.874
1991	42.291	28.528	8.226	3.548	1.989
1992	45.178	31.338	8.330	3.362	2.148
1993	51.911	36.833	9.170	3.594	2.314
1994	60.491	44.307	9.819	3.723	2.642
1995	69.398	52.129	10.423	3.994	2.852

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

Between 1982 and 1995 the number of heart operations with HLM in the New States increased from 1.083 to 8,786 (Figure 17). The rate per million population rose from 65 to 566 operations with HLM. By comparison, this rate was 1,051 pmp for the Old States in 1995.

**Figure 17:** Heart Operations, New States

Source: State Survey Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery  
K.-F. Lindau "Gegenwärtiger Stand der Herzchirurgie in der DDR und Ausblick", The Cardiovascular Surgeon, No 4, Vol 38, August 1990

### 3.6 Age Distribution of Patients

Differences in the age distribution of patients treated in centers in the Old and New States have disappeared over the past few years (Table 15, Figure 18).

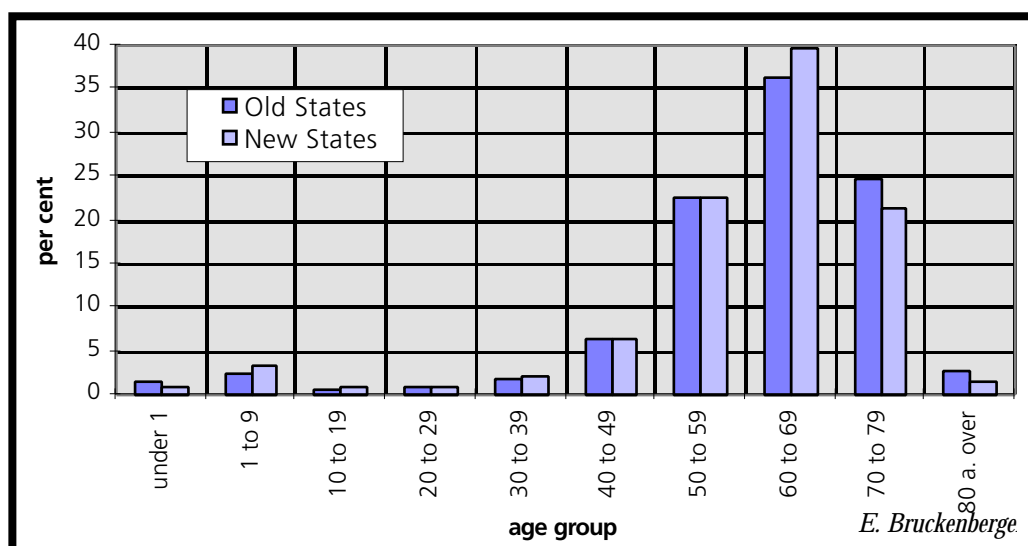
Centers in the Old States did 63.7 per cent of heart operations with HLM on patients over 60 years of age in 1995. Two years earlier, 1993, the percentage was 58.8. Centers in the New States caught up to a rate of 62.5 per cent in 1995 (from 45.8 per cent in 1993). In the general population, persons over 60 years of age account for 20.7 per cent in the Old and 19.3 per cent in the New States.

The majority of heart operations were done for patients aged 60 to 69 years. This group accounted for 36.3 per cent of the operations in the Old and 39.6 per cent in the New States.

**Table 15:** Age Distribution, operated patients, 1995

age group	Old States		New States	
	total	%	total	%
under 1	1.094	1,6	80	0,9
1 bis 9	1.719	2,5	301	3,4
10 bis 19	521	0,8	90	1,0
20 bis 29	608	0,9	78	0,9
30 bis 39	1.204	1,7	182	2,1
40 bis 49	4.370	6,3	576	6,6
50 bis 59	15.691	22,6	1.980	22,5
60 bis 69	25.166	36,3	3.483	39,6
70 bis 79	17.168	24,7	1.873	21,3
80 and over	1.857	2,7	143	1,6
<b>total</b>	<b>69.398</b>	<b>100,0</b>	<b>8.786</b>	<b>100,0</b>

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

**Figure 18:** Age Distribution, operated Patients, 1995

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

### 3.7 Waiting List, 1995

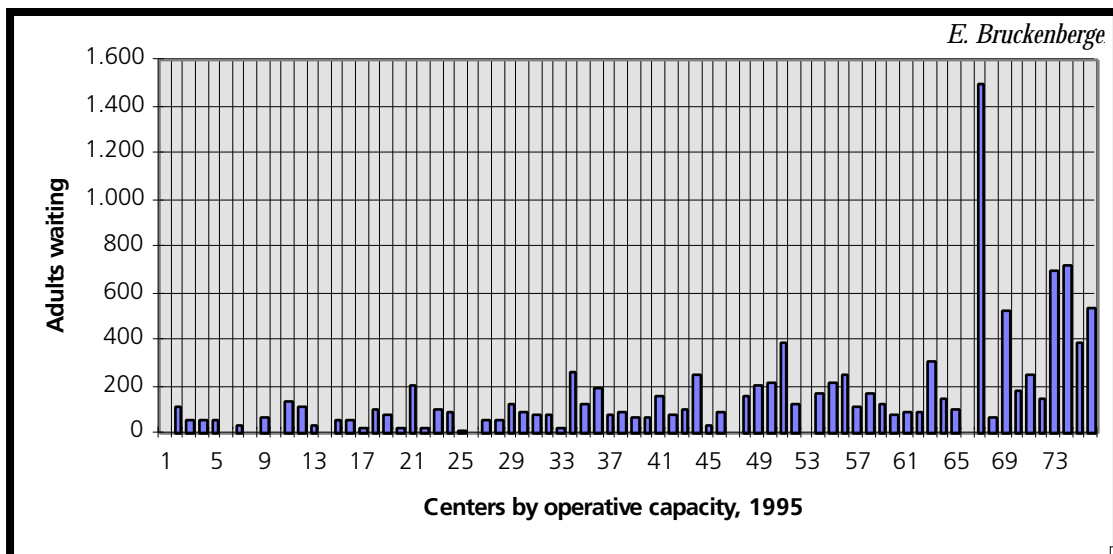
A total of 12,669 patients was registered for a heart operation with HLM in Germany in 1995. The waiting list shrank by about 2,500 patients from the previous year. Patients listed in the Old States totaled 10,549 and in the New States 2,120 (Table 16).

**Table 16:** Waiting List for Heart Operations, 1995

Patients	Old States		New States	
	number	per cent	number	per cent
Children	1.000	9,5	61	2,9
Valvular (adults)	1.785	16,9	460	21,7
Coronary (adults)	7.124	67,5	1.476	69,6
Other (adults)	640	6,1	123	5,8
<b>Total</b>	<b>10.549</b>	<b>100,0</b>	<b>2.120</b>	<b>100,0</b>

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

The waiting list for adults was 9,549 for cardiosurgical centers in the Old States and 2,059 in the New States. This is equivalent to about 15 per cent of 1995 operating capacity in the Old and 25 per cent in the New States. Waiting lists differ greatly between centers. They relate, inter alia, to attraction, patient preference and cooperation between cardiologists and heart surgeons rather than to operating capacity per center (Figure 19). Multiple referrals distort the figures.

**Figure 19:** Waiting list (adults) by center, 1995

Source: State Survey Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

### 3.8 Workload per center

Table 17 gives the number of heart operations with HLM performed in 1995 by State. On average, 1,029 heart operations with HLM were done per center in Germany.

**Table 17:** Heart Operations with HLM per center, by State, 1995

State	Cardiosurgical Centers	heart operations with HLM	
		in State	per center
Thüringen	1	1.777	1.777
Sachsen	2	3.119	1.560
Berlin	3	4.133	1.378
Bremen	1	1.316	1.316
Bayern	10	11.604	1.160
Nordrhein-Westfalen	15	17.034	1.136
Hessen	9	9.895	1.099
Niedersachsen	6	6.521	1.087
Schleswig- Holstein	3	2.872	957
Baden-Württemberg	9	8.520	947
Hamburg	4	3.727	932
Rheinland-Pfalz	5	3.421	684
Saarland	2	1.365	683
Brandenburg	2	1.238	619
Sachsen-Anhalt	2	839	420
Mecklenburg-Vorpommern	2	803	402
<b>Germany</b>	<b>76</b>	<b>78.184</b>	<b>1.029</b>

Source: State Survey, Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

### 3.9 Patient movement between Federal States

The Annual State Survey done jointly by the AGLMB Hospital Committee and the Society for Thoracic, Heart and Vascular Surgery included the catchment areas of the 76 Cardiosurgical Centers. This part of the survey allows calculation of heart operations performed for the population of each State irrespective of surgical center location. Patient movement from State to State (Table 18) is recognised by planning of cardiosurgical centers across statelines at the federal level (§ 6 (2) of Federal Hospital Law) and explains the varying density of centers between States.

**Table 18:** Patient movement between States (heart operations with HLM)

Treatment Center by State	Patients' residence by State																total	
	SH	HH	NI	HB	NW	HE	RP	BW	BY	SL	BE	BB	MV	SN	ST	TH		SO
Schleswig-Holstein	2.057	36	74	6	6	2	1	0	0	0	6	22	571	5	85	0	1	2.872
Hamburg	1.061	1.795	534	7	17	13	2	2	5	0	6	30	169	64	9	1	12	3.727
Niedersachsen	10	41	4.860	15	936	110	9	9	14	0	13	38	14	6	341	95	10	6.521
Bremen	0	2	744	530	22	0	0	0	0	0	0	10	4	0	3	0	1	1.316
Nordrhein-Westfalen	12	8	678	16	15.724	68	319	31	36	3	13	11	3	9	14	2	87	17.034
Hessen	23	11	368	21	1.688	5.951	748	247	172	16	28	35	12	121	96	308	50	9.895
Rheinland-Pfalz	1	2	4	0	26	354	2.474	421	38	66	0	0	1	3	0	0	31	3.421
Baden-Württemberg	1	1	58	3	174	63	209	7.618	259	37	27	12	0	29	10	6	13	8.520
Bayern	17	0	7	2	289	206	42	500	10.015	0	21	4	3	63	6	217	212	11.604
Saarland	0	0	2	0	11	13	162	44	2	1.068	1	1	0	43	0	0	18	1.365
Berlin	13	20	84	9	49	31	8	32	29	9	2.566	885	73	124	154	30	17	4.133
Brandenburg	0	0	1	0	1	0	0	0	0	0	217	869	77	39	33	1	0	1.238
Mecklenburg-Vorpommern	1	0	1	1	1	0	0	0	0	0	1	7	782	2	3	1	3	803
Sachsen	1	0	7	0	0	5	0	3	3	0	0	36	3	2.604	316	140	1	3.119
Sachsen-Anhalt	0	0	6	0	3	0	0	1	0	0	1	3	15	38	767	4	1	839
Thüringen	0	0	14	0	2	10	0	1	21	0	1	8	4	510	180	1.026	0	1.777
<b>Operations total</b>	<b>3.197</b>	<b>1.916</b>	<b>7.442</b>	<b>610</b>	<b>18.949</b>	<b>6.826</b>	<b>3.974</b>	<b>8.909</b>	<b>10.594</b>	<b>1.199</b>	<b>2.901</b>	<b>1.971</b>	<b>1.731</b>	<b>3.660</b>	<b>2.017</b>	<b>1.831</b>	<b>457</b>	<b>78.184</b>

Source: State Survey, Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

More than 90 per cent of the resident population were cared for in-State in Bavaria and Hamburg in 1995 (Table 19). A relatively high proportion of residents went out-of-state in 1995 for their heart operations with HLM in Rheinland-Pfalz, Niedersachsen and Schleswig-Holstein. Geographic location of these Old States is a factor.

**Table 19:** Treatment by location, 1995

State	in-State heart operations		heart operations out-of-state for residents (excluding operations abroad)	heart operations for residents total (excluding operations abroad)
	total	for resident population		
Schleswig-Holstein	2.872	2.057	1.140	3.197
Hessen	9.895	5.951	875	6.826
Hamburg	3.727	1.795	121	1.916
Saarland	1.365	1.068	131	1.199
Nordrhein-Westfalen	17.034	15.724	3.225	18.949
Rheinland-Pfalz	3.421	2.474	1.500	3.974
Niedersachsen	6.521	4.860	2.582	7.442
Mecklenburg-Vorpommern	803	782	949	1.731
Bremen	1.316	530	80	610
Bayern	11.604	10.015	579	10.594
Baden-Württemberg	8.520	7.618	1.291	8.909
Berlin	4.133	2.566	335	2.901
Sachsen	3.119	2.604	1.056	3.660
Brandenburg	1.238	869	1.102	1.971
Sachsen-Anhalt	839	767	1.250	2.017
Thüringen	1.777	1.026	805	1.831
<b>Germany</b>	<b>78.184</b>	<b>60.706</b>	<b>17.021</b>	<b>77.727</b>

Source: State Survey, Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

Heart operations with HLM per million population 1995 range from 727 for residents of Thüringen to 1,180 for residents of Schleswig-Holstein (Table 20). More than 1,000 operations per million population were performed for the population of six States, and not fewer than 700 in any of the other States. The highest number of out-of-state heart operations per million population was done for residents of Mecklenburg-Vorpommern in 1995.

**Table 20:** Treatment location by State 1995, per million population

State	operations in-State		heart operations out-of-State for residents (excluding operations abroad)	total operations for residents (excluding operations abroad)
	total	for residents		
Schleswig-Holstein	1.060	759	421	1.180
Hessen	1.654	995	146	1.141
Hamburg	2.185	1.052	71	1.123
Saarland	1.259	985	121	1.106
Nordrhein-Westfalen	956	883	181	1.064
Rheinland-Pfalz	866	626	380	1.006
Niedersachsen	845	630	335	965
Mecklenburg-Vorpommern	438	427	518	945
Bremen	1.935	779	118	897
Bayern	973	840	49	889
Baden-Württemberg	829	742	126	867
Berlin	1.190	739	96	836
Sachsen	680	568	230	798
Brandenburg	488	343	434	777
Sachsen-Anhalt	304	278	453	731
Thüringen	706	408	320	727
<b>Germany</b>	<b>959</b>	<b>745</b>	<b>209</b>	<b>953</b>

Source: State Survey, Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

The average number of heart operations with HLM for German residents was 953 per million population in 1995 (1994 = 797). Heart operations in foreign countries have not been included because of lack of information.

For residents of the New States, a total of 3,742 heart operations with HLM were done in 1995 at cardiosurgical centers in the Old States including Berlin. Out of this total, 1,266 operations were done in Berlin, 683 in Schleswig-Holstein, 572 in Hessen, 494 in Niedersachsen, 293 in Bavaria and 271 in Hamburg. The average capacity of three to four cardiosurgical centers in the Old States has thus been made available to patients from the New States.

## 4 Pediatric Cardiology and Pediatric Heart Surgery

### 4.1 Pediatric Cardiology

Successful pediatric heart surgery relies on direct cooperation with a unit for pediatric cardiology since intensive care of neonates and babies after operations needs special skills. Thorough experience in anesthesia is another requirement.

The German Society for Pediatric Cardiology (author: Professor Dr Meyer, Department of Pediatric Cardiology, Heart Center of Nordrhein-Westfalen at Bad Oeynhausen) analysed investigations done at 27 catheter laboratories. An average of 205 right heart catheterisations (including descending aorta via patent ductus arteriosus) has been done per laboratory in 1995. The range was 3 to 567 catheterisations. An average of 188 left heart catheterisations was performed per center; about half of these were done via pre-existing shortcuts (patent foramen ovale, atrial septal defect, ventricular septal defect. For the remainder (excluding one per cent transseptal procedures), the approach was generally via the femoral artery. The number of left heart catheterisations varied from 3 to 554 procedures per center.

Age of pediatric patients who underwent cardiac catheterisation: about 14.4 per cent neonates up to one month old (including premature births); 21.7 per cent infants (age 1 month to 1 year), 54.7 per cent children (1 to 16 years) and 8.7 per cent adolescents (over 16 years).

Congenital cardiac malformations accounted for 90.6 per cent of diagnoses; cardiomyopathies made up 1.9 per cent, acquired heart defects 1.0 per cent and arrhythmias 0.8 per cent.

Heart catheterisations preceded "corrective surgery" in 41.5 per cent and palliative operations in about 8.3 per cent. The remainder served to clarify diagnosis (18.4 per cent) or postoperative assessment (14.3 per cent).

Therapeutic cardiac catheterisation (balloon dilatation, balloon septostomy, electrotherapy, occlusion of vessels) was performed in 19.2 per cent of cases. General anesthesia was necessary in 17.7 per cent of investigations, the remainder were done under sedation. The mean duration of catheterisation (patient stay in catheter laboratory) was 109 minutes.

Venesection or arteriotomy was necessary in rare cases (about 2.9 per cent). Complications were led by arrhythmias generally limited to the investigation. Bleeding, thrombosis etc occurred in about one per cent of procedures; these were either self-limiting or needed anticoagulation.

One particular development merits attention: therapeutic interventions performed by pediatric cardiologists during catheterisation. These include balloon atrioseptostomy (3.1 per cent of all catheterisations), balloon dilatation of stenotic valves (10.7 per cent) and occlusion of vessels (6.4 per cent).

## 4.2 Evolution of Pediatric Heart Surgery

Before the advent of coronary heart operations, surgical repair of congenital cardiac malformations was a central task in cardiac surgery. Because of the high risk of open heart surgery with HLM in infants and neonates at that time, these operations were postponed to a later age. Since the eighties there have been enormous improvements in heart-lung machines, anaesthesia, operative technique and intensive care, and these have made corrective surgery in the first 12 months of life feasible, even for complex malformations.

Taking into account the diversity and complexity of cases, a pediatric heart surgeon needs long-time practice and cooperation with experienced pediatric cardiologists and anethetists to reach and maintain performance at top international standard.

Cardiac surgery for infants and children differs from cardiac surgery for adults especially in pre- and postoperative management and operative procedures. The organs and vessels of infants and neonates require special methods. Progress in heart surgery allows early corrective operations in many complex congenital malformations.

Corrective operations done on neonates and very young infants have replaced palliative procedures. There is general agreement that congenital malformations should be corrected as early as possible. The operative risk does not exceed the adult level, thanks to improved operative technique and better postoperative management. Cumulative mortality and complications occurring between palliative and corrective surgery have been reduced. The exacting requirements for this work will be met only at a few cardiosurgical centers in Germany.

### 4.3 Heart Operations for Children 1995

A total of 3,805 heart operations with HLM were performed on infants, children and adolescents in Germany in 1995. Of 3,334 operations performed in the Old States, 1,094 were for patients up to 1 year of age; 1,719 for patients aged 1 to 9 years and 521 for patients aged 10-19 years.

In the New States, the age distribution was 80, 301 and 90 operations (Table 21). Not included are operations for children done abroad (e.g. England and Monaco).

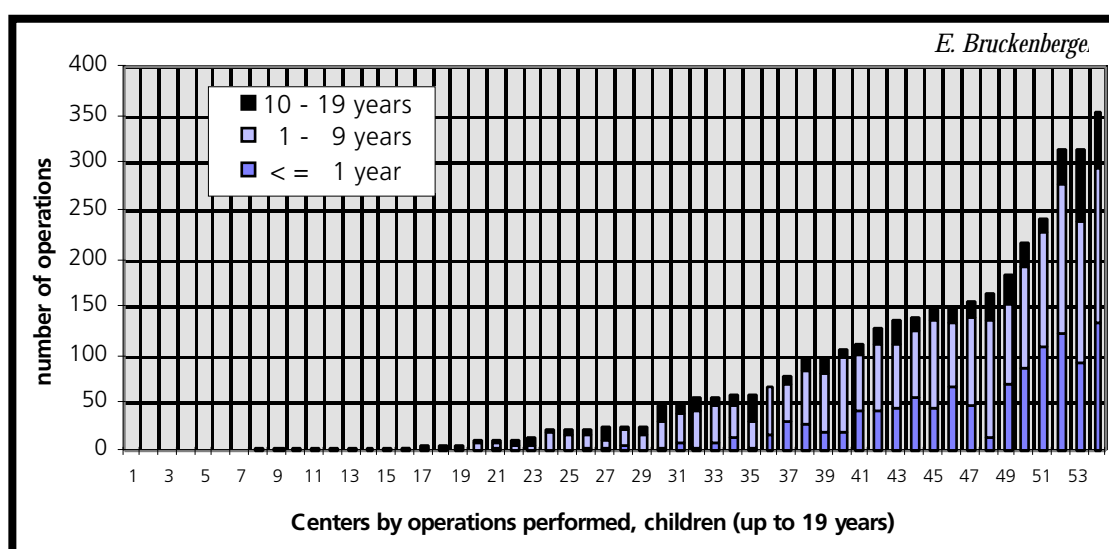
**Table 21:** Heart operations for infants, children and adolescents, 1995

Age group	Old States		New States		Germany	
	total	%	total	%	total	%
under 1	1.094	32,8	80	17,0	1.174	30,9
1 to 9	1.719	51,6	301	63,9	2.020	53,1
10 to 19	521	15,6	90	19,1	611	16,1
<b>total</b>	<b>3.334</b>	<b>100,0</b>	<b>471</b>	<b>100,0</b>	<b>3.805</b>	<b>100,0</b>

Source: State Survey, Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

Heart operations with HLM for infants up to 1 year of age were done at 30 centers, for children aged 1 to 9 years at 39 centers and for patients aged 10 to 19 years at 54 cardiosurgical centers in 1995 (Figure 20). All age groups were cared for at centers where infants were operated upon.

**Figure 20:** Open heart operations with HLM for infants, children and adolescents, 1995

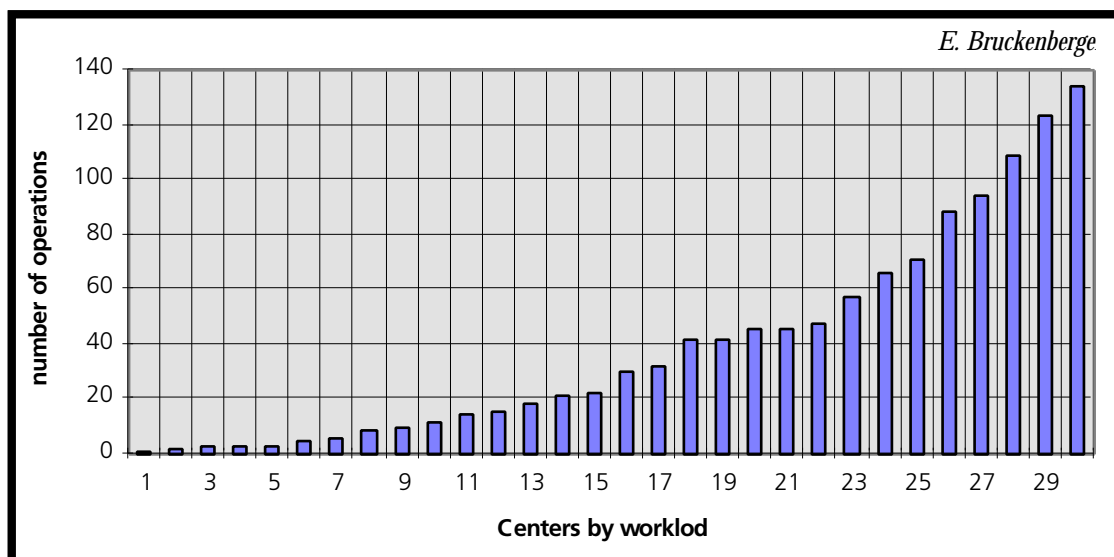


Source: State Survey, Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

About 76 per cent of 3,804 heart operations with HLM were performed at only 15 of 76 cardiosurgical centers. These active centers also saw the majority of patients in each age group: 85 per cent up to 1 year, 74 per cent age 1 to 9 and 62 per cent age 10 to 19. Heart surgery for the very young is centralised in a small number of centers.

The total of 1,176 heart operations with HLM for infants up to 1 year including premature births were performed at 30 out of 76 cardiosurgical centers in Germany in 1995; workload ranged from 1 to 134 (Figure 21). 75 per cent of operations in this age group were performed at 11 centers only. There were only three centers where more than 100 operations were performed. The work of centers doing only a few operations needs critical appraisal and quality assessment.

**Figure 21:** Open heart operations with HLM for infants up to 1 year, 1995

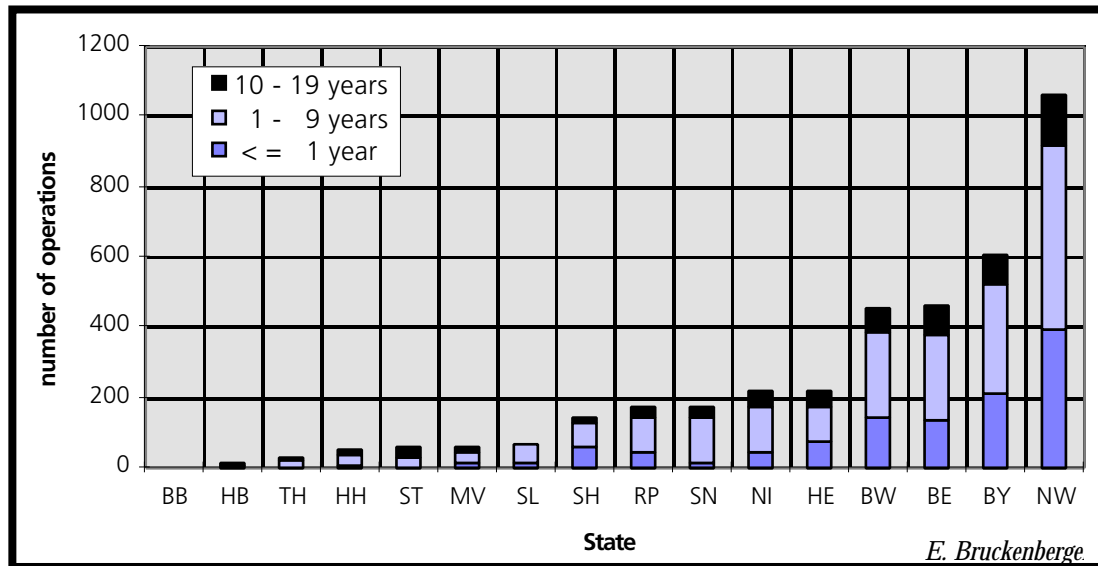


Source: State Survey, Hospital Committee, AGLMB with Society for Thoracic, Heart and Vascular Surgery

Six centers, namely Bad Oeynhausen, Berlin (Deutsches Herzzentrum, Charité), Gießen, Mainz and München-Großhadern, performed a total of 23 heart transplants and four heart and lung transplants for infants in 1995.

The distribution of heart operations with HLM for infants, children and adolescents by State is given in Figure 22. The highest absolute number were performed in Nordrhein-Westfalen, followed by Bavaria, Berlin and Baden-Württemberg.

**Figure 22:** Open heart operations with HLM for infants, children and adolescents, by state, 1995

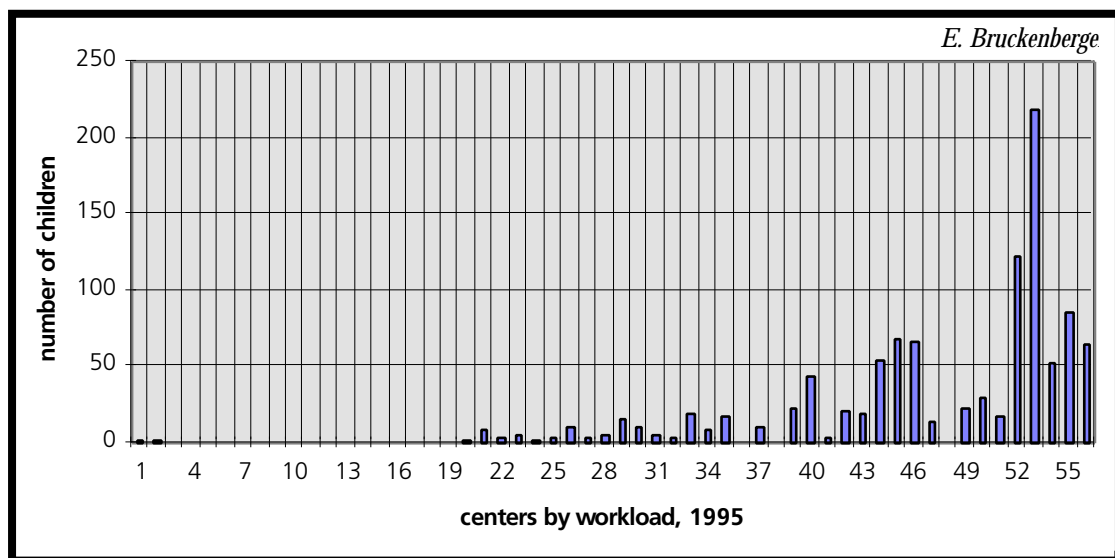


Source: State Survey, Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

#### 4.4 Waiting List

The pediatric waiting list (infants, children and adolescents) numbered 1,000 for centers in the Old States and 61 in the New States. This represents about 30 and 13 per cent of operative capacity 1995. The waiting list shrank from the preceding year. The list includes bookings for infants whose congenital malformation does not need immediate surgery.

Pediatric waiting lists by center differ widely, as is also true of adults (Figure 23). Two cardiosurgical centers report a waiting list, but performed no heart operations with HLM on children in 1995.

**Figure 23:** Pediatric waiting list, by center, 1995

Source: State Survey, Hospital Committee, AGLMB  
with Society for Thoracic, Heart and Vascular Surgery

#### 4.5 Centralisation of Pediatric Heart Surgery

The German Society for Pediatric Cardiology estimates that about 6,000 to 8,000 children are born annually with congenital heart malformations in Germany. About 30 per cent of these children do not need an operation, are inoperable or can be treated by catheter intervention. About 4,500 need heart surgery with HLM and some may have several operations as they grow up. The proportion of additional operations is estimated at about 30 per cent. The total number of open heart operations done on infants, children and adults in Germany does not reflect the severity of malformations or the range of surgical tasks. Experts rate about fifty per cent of operations for congenital cardiac malformations as difficult because of early age and complex conditions. High performance in heart surgery for infants and children depends on sound infrastructure in pediatric cardiosurgery and cardiology and demands that the number of complex open heart operations performed every year must not drop below a certain minimum. Coronary surgery for adults is essentially a routine procedure. The quality of pediatric heart surgery in Germany will not be improved by country-wide establishment of new centers. The wide range of congenital malformations and complex operative procedures calls for expansion of existing active centers. Preference should be given to relieving staff shortages and increasing operative capacity in the top league. A pediatric cardiosurgical center should perform a minimum of 200 to 300 heart operations with HLM per year for medical, economic and quality assurance reasons. At present only five centers reach this minimum.

The German Society for Thoracic, Heart and Vascular Surgery and the German Society for Pediatric Cardiology recommend that a paediatric cardiosurgical program should meet the following requirements:

- A department of pediatric cardiology which performs diagnostic and therapeutic catheterisations regularly.
- A postoperative intensive care unit specifically tailored to pediatric patients and managed jointly by pediatric cardiologists and paediatric cardiosurgeons.
- A 24-hour-service for emergency operations, i.e. more than one experienced pediatric cardiosurgeon.
- Full adherence to quality assessment programs in Heart Surgery and pediatric cardiology.

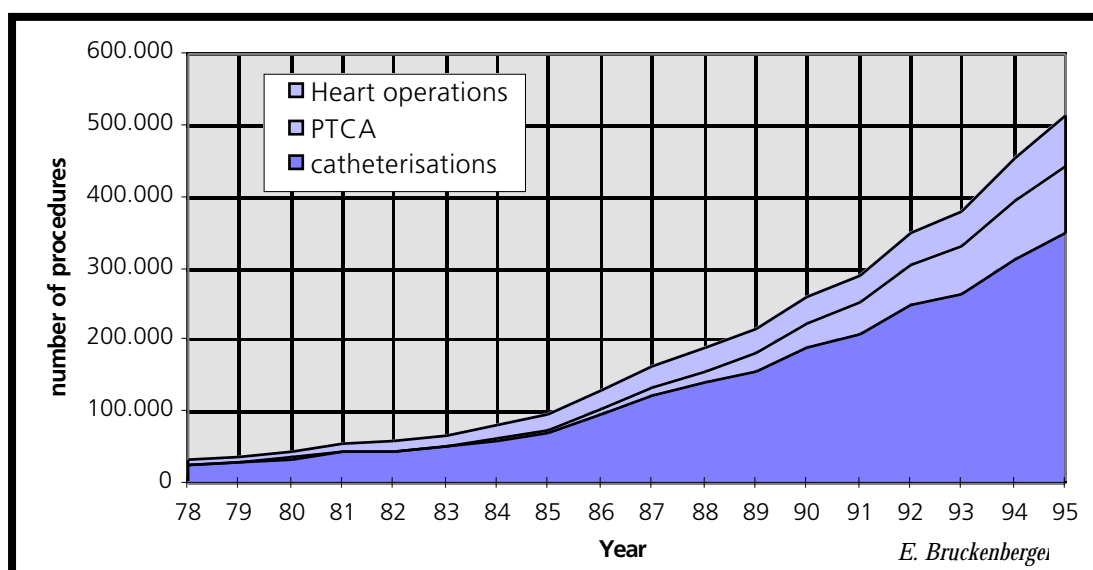
For medical and economic reasons, the following targets are set:

- A) Minimum number of operations: total of 150 operations with HLM; out of these, 60 operations on infants (up to 1 year of age) and neonates desirable.
- B) Target number of more than 200 operations with HLM including 100 operations on infants (up to 1 year of age) and neonates.

## 5 Evolution of Diagnostic and Therapeutic Interventions

Diagnostic and therapeutic interventions to combat myocardial infarction have seen unabated growth in the Old States. Since 1978, the number of heart operations with HLM has increased eightfold (from 8,365 to 69,398); the number of left heart catheterisations 14-fold (from 24,281 to 386,000), and the number of PTCA 950-fold (from 100 to 950,000) - see Figure 24.

**Figure 24:** Evolution of diagnostic and therapeutic interventions, Old States, 1978-1995



Source: State Survey, Hospital Committee, AGLMB

It is open to doubt whether this enormous growth reflects true medical indications. Part of the evolution may stem from the system. The Commission on Clinical Cardiology now warns of excessive capacity in left heart catheterisation. Yet it is the physician or cardiologist who orders left heart catheterisation and PTCA and sets the demand.

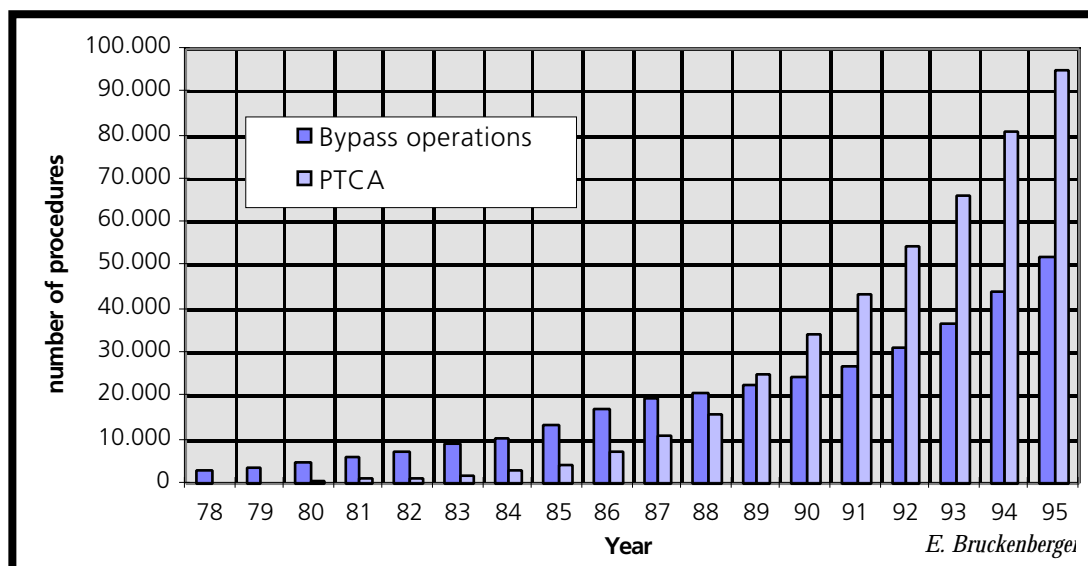
The demand for coronary heart operations has not been reduced by PTCA. Expectations to the contrary proved unfounded. A familiar experience has been repeated:

*The number of investigations or interventions generated by a new procedure exceeds the number of obsolete investigations and interventions which are discarded.*

Left heart catheterisation is a reliable diagnostic procedure and PTCA is an effective, essential and gentle method of intervention. Coronary heart surgery may be postponed but is eventually required in some cases. Time gained by PTCA can improve patient survival.

Back in 1978, only 3 per cent of invasively treated patients underwent PTCA, and 97 per cent had coronary operations. The ratio was reversed in 1989 when the number of PTCA exceeded the number of coronary operations for the first time. In 1995, an estimated 95,000 PTCA exceeded 52,159 coronary heart operations by 82 per cent (Figure 25). This tendency is reinforced by second and third PTCA.

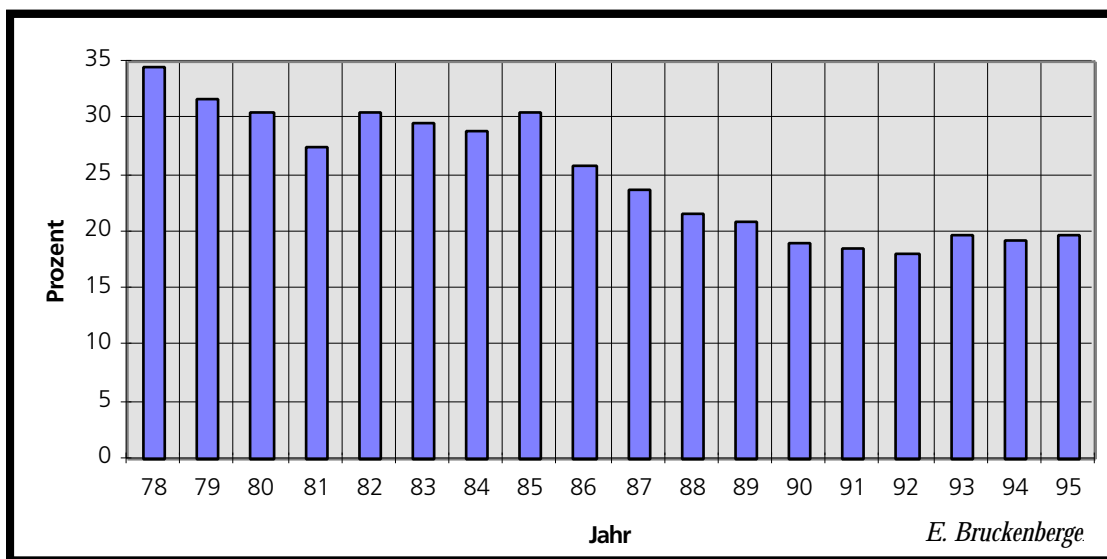
**Figure 25:** PTCA and coronary operations, Old States, 1978-1995



Source: State Survey, Hospital Committee, AGLMB and own estimates

The national average of left heart catheterisations showing an indication for surgery was 18,9 per cent in 1994 and about 20 per cent in 1995. In the Old States, the percentage of left heart catheterisations with indication for surgery sank from about 35 in 1978 to about 18 in 1992. A slight increase occurred from 1993 (Figure 26), and catching up on demand from the New States may be a factor.

**Figure 26:** Left heart catheterisations with indication for surgery, Old States, 1978 - 1995



Source: State Survey, Hospital Committee, AGLMB and own estimates

## 6 Expansion of Facilities

### 6.1 Expansion in Old States (West)

A further 27 left heart catheter laboratories were accredited but not yet operative as at 1st January 1996. Left heart catheterisations done at these new installations will be additive and increase demand for coronary operations. The cardiosurgical center at **Bayreuth** started operations in 1996, and no further cardiosurgical centers are planned. The need for operative centers in the Old States has been met. Pediatric cardiac surgery needs further improvement.

### 6.2 Expansion in New States (East)

Complementary cardiological units and out-patient facilities are needed in conjunction with planning and building of new cardiosurgical centers in the New States. To match the actual density of left heart catheterisation laboratories in the West, an additional 42 catheter laboratories would be required in the New States on top of the 39 existing. Nine installations were accredited at the beginning of 1996 but are not yet active.

3,742 patients from the New States (excluding East Berlin) equivalent to the capacity of three to four cardiosurgical centers underwent operations in the Old States in 1995. Only two further surgical centers are planned, in **Coswig** and **Jena**. When completed, a total of 12 cardiosurgical centers will be available in the New States. To attain about 1,000 heart operations per million population, some centers would have to perform much more than 1,000 operations, or two to three more regional cardiosurgical centers will be needed.

## 7 New Billing System from 1996

Until 1995 hospitals billed heart operations with HLM by charging a special rate per operation plus a general per diem. Both rates were negotiated separately for each cardiosurgical center between the contracting parties (Hospital and Health Funds) and licensed by the State authority.

Nation-wide Global Payment (Fallpauschalen) and Special Rates (Sonderentgelte) came into force 1996 for many surgical interventions including heart operations. All-inclusive Global payment covers all hospital services with respect to one specific in-patient case. Special rates cover cost for specified services, namely operations. The actual level of compensation (in Deutschmarks) is negotiated at state level for all hospitals; the relative amount of compensations (in points) is laid down in the Federal Regulation on Hospital Charges (Bundespfllegesatzverordnung). Services not covered by Global Payment and Special Rates are to be negotiated within individual hospital budgets and split into basic hospital charges and special service charges (per diems) in defined hospital departments (e.g. oncology, nephrology, cardiology).

Case definitions for heart and thoracic surgery and obstetrics have been developed with medical specialist societies and professional associations. Calculations set up by a research institute were presented in 1992 at the Federal Ministry of Health. Points are given to determine the relative distance between compensations. The actual value per point (in Deutschmarks) is to be negotiated at state level by Health Funds organisations.

Uniform calculation of global payment can lead to patient selection between centers which may be unacceptable on medical and economic grounds.

## 8 Quality assurance

### 8.1 Heart Surgery

A Federal League to implement quality assurance in heart surgery came into being 1991. The German Hospital Federation, top Health Fund organisations, the Federal Chamber of doctors and the Society for Heart and Thoracic Surgery are represented. Quality assurance has been written into the Federal Law relating to Health Insurance (Sozialgesetzbuch V). The Federal League aims at nation-wide coverage of all cardiosurgical centers to assess and secure quality of care in cardiac surgery and to implement quality improvement where necessary.

The Office for data collection and processing is in Düsseldorf (Ärztammer Nordrhein).

On its inception in 1991, the League reckoned with 43 cardiosurgical centers and about 35,000 heart operations with HLM; the estimated growth was about 50,000 operations up to the end of the decade. In fact 76 cardiosurgical centers (including one center for pediatric cardiosurgery) were active at the end of 1995.

A total of 60,596 documented interventions for 60,169 patients in 1995 have been processed since April 1996. Included are operations with HLM on coronaries, valves and aortic aneurysms. Not included are corrective or palliative operations for congenital malformations, heart transplants and implantation of pacemakers or defibrillators.

Operations registered in 1995 range from isolated procedures such as coronary or valvular surgery (about 89 per cent) to combined operations such as coronary and valvular (about 11 per cent). A total of 37 different constellations can be assessed.

At the time of completion of this report (July 1996), no evaluation is available for the variety of interventions. The report will be presented at the 7th meeting of the Advisory Committee in October 1996. The range of interventions and the apparent diversity of affiliation in cardiosurgical centers does preclude a simple ranking of centers. Patient selection between centers is a factor. Raw data from cardiac surgery have to be further analysed before reliable conclusions can be drawn.

The League partners are determined to continue and promote quality assurance in cardiosurgery.

## 8.2 Pediatric Heart Surgery

A model program for Quality assurance in pediatric surgery (1993-1996) is being supported by the Federal Minister of Health. Data collection, quality assessment and quality improvement in pediatric heart surgery are to be studied with a view to application in clinical routine as directed by Federal Law.

The brochure „Quality Assessment in Pediatric Cardiology, German Society of Pediatric Cardiology, supported by Federal Minister of Health, 1996“ summarises:

„To implement quality assurance in pediatric cardiology, ten pilot centers cooperate with a common coding system which allows recording of complex cardiac malformations. A distinction between the main defect and the leading haemodynamic defect has been introduced which allows comparative representation and evaluation of procedures.

Diagnostic and therapeutic standards will be presented for discussion. Deficiencies will be identified. Risk adjustment in caseload will allow precise classification of center performance. Shortcomings will be addressed stepwise by anonymous score notification, disclosure and visits.

The project aims at quality improvement; eventually, centers should perform in the upper third of standard deviation of the overall average. Implementation of quality assurance procedures in the centers necessitated intensive on-the-spot training which was time-consuming. Centers must be compensated for their effort.“

The project is carried out at the Ärztekammer Nordrhein in Düsseldorf. The same partner as in Quality Assessment of Heart Surgery was chosen for synergy.

Presently, the Society for Thoracic, Heart and Vascular Surgery and the Ärztekammer Nordrhein, supported by the Federal Ministry of Health, are engaged in negotiations with the Health Funds and the German Hospital Association to transfer the pilot scheme into routine funding. An interim funding arrangement has been found to continue until early 1999.

## 9 Medical Rehabilitation

In early 1996, Germany had 122 contract institutions for medical rehabilitation offering continuing treatment for diseases of the heart and circulation.

The highest density of cardiac rehabilitation was in States Hessen, Baden-Württemberg, Nordrhein-Westfalen, and Bavaria. The City States of Hamburg and Bremen had no such institutions (Table 22, Figure 27).

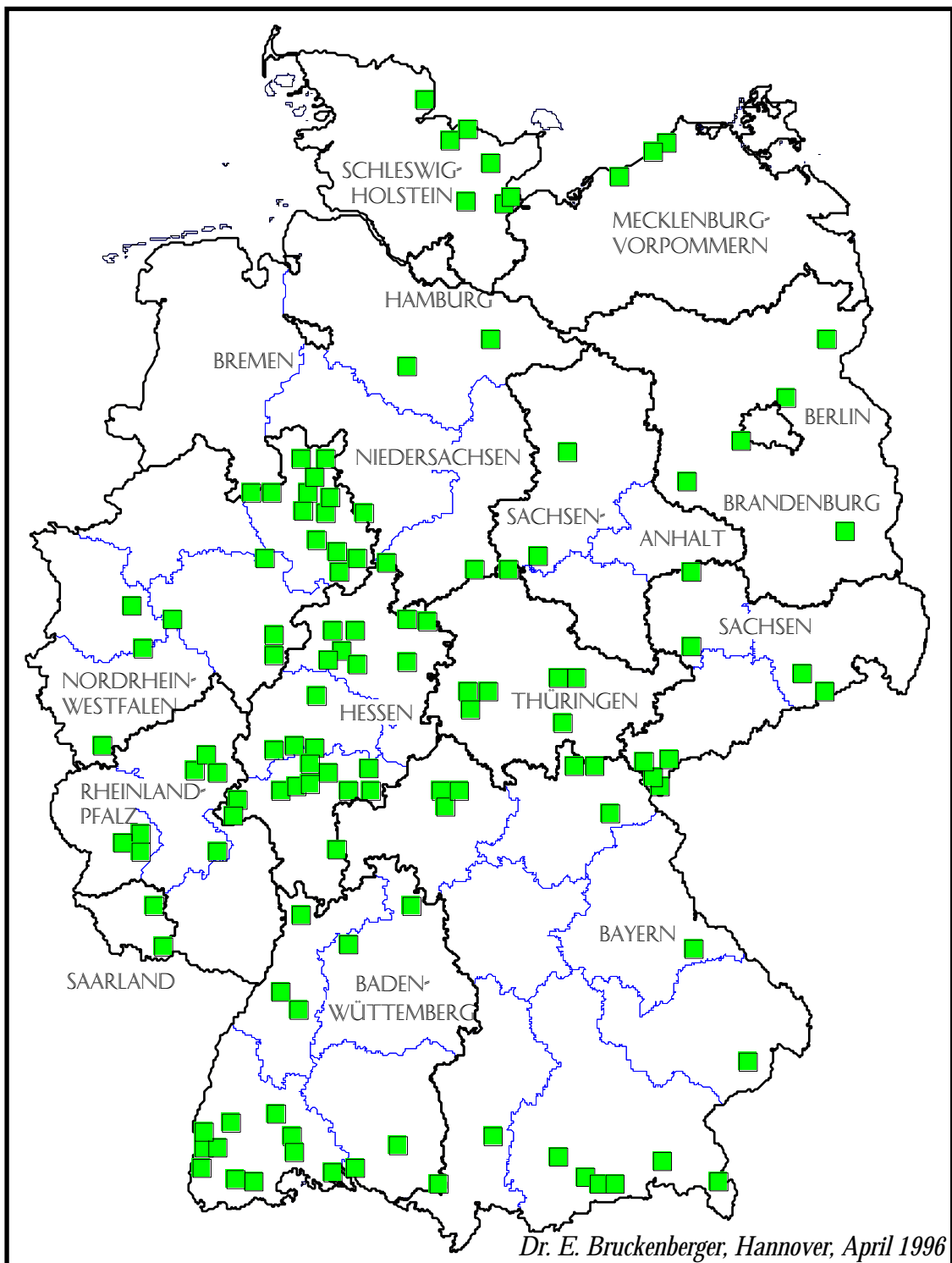
In terms of residents per facility, the highest density is found in States Hessen, Schleswig-Holstein and Thüringen and the lowest density in Berlin and Sachsen-Anhalt.

**Table 22:** : Rehabilitation centers for continuing treatment of diseases of heart and circulation

State	number of centers	residents per center
Hessen	24	249.196
Baden-Württemberg	19	540.635
Nordrhein-Westfalen	17	1.048.005
Bayern	15	794.796
Sachsen	8	573.043
Thüringen	7	359.682
Rheinland-Pfalz	7	564.510
Schleswig-Holstein	7	386.913
Niedersachsen	6	1.285.894
Brandenburg	4	634.187
Mecklenburg-Vorpommern	3	610.766
Saarland	2	542.101
Sachsen-Anhalt	2	1.379.607
Berlin	1	3.472.009
Bremen	0	0
Hamburg	0	0
<b>Germany</b>	<b>122</b>	<b>668.349</b>

*E. Bruckenberg*

Figure 27: Location of Rehabilitation Centers for Diseases of Heart and Circulation



Source: AHB Register of Social Security (Old Age Insurance)

A total of 1,398,955 in-patient courses of medical rehabilitation were given in 1994. Social Security - Old Age Insurance paid for 902,032 of these (64.5 per cent); Health Insurance paid for 388,796 (27.8 per cent) and Accident Insurance for 80,639 (5.8 per cent). The remaining 27,528 (1.9 per cent) were for War Victims and Welfare recipients.

In-patient medical rehabilitation in 1994 focused on musculoskeletal disorders in 40.3 per cent followed by diseases of the heart and circulation in 14.7 per cent and psychiatric disorders in 10.5 per cent. Hospital admissions in 1993 (figures for 1994 not yet available) were led by diseases of the heart and circulation with 15.4 per cent, neoplastic diseases in 11.1 per cent and intoxications in 11.0 per cent (Table 23).

**Table 23:** : in-patient medical rehabilitation and in-patient hospital admissions in Germany

ICD group	Diagnosis	rehabilitation 1994		hospital 1993	
		total	%	total	%
001-139	Infectious and parasitic disease	5.584	0,4	233.768	1,7
140-239	neoplasia	114.918	8,2	1.541.447	11,1
240-289	metabolic and blood disorders	49.755	3,6	475.582	3,4
290-319	psychiatric illness	146.341	10,5	652.958	4,7
320-389	nervous disorders	30.683	2,2	808.776	5,8
390-459	diseases of circulation	206.089	14,7	2.134.378	15,4
460-519	respiratory diseases	84.296	6,0	993.981	7,2
520-579	digestive disorders	25.085	1,8	1.395.029	10,1
580-629	genitourinary disorders	10.339	0,7	1.070.551	7,7
630-676	complications of pregnancy	0	0,0	1.095.581	7,9
680-709	skin diseases	19.502	1,4	224.015	1,6
710-739	musculoskeletal disorders	564.038	40,3	951.691	6,9
740-759	congenital abnormalities	6.377	0,5	109.859	0,8
760-779	perinatal disorders	0	0,0	136.882	1,0
780-799	symptoms and unclassified affections	18.539	1,3	292.769	2,1
800-999	injuries and intoxications	117.449	8,4	1.522.978	11,0
	without diagnosis	0	0,0	195.679	1,4
	<b>total</b>	<b>1.398.995</b>	<b>100,0</b>	<b>13.835.924</b>	<b>100,0</b>

Source: Statistisches Bundesamt Wiesbaden

## 10 Cardiology and Heart Surgery in Europe

This comparison is based on the Report by Professor Felix Unger, Salzburg "European Survey on Cardiac Interventions, Open Heart Surgery, PTCA, Cardiac Catheterisation, 1994" - Final Report of the European Heart Institute, Academia Scientiarum et Artium Europaea.

By far the largest numbers for left heart catheterisations and PTCA per million population were done in Germany, Switzerland, and Belgium, followed by Iceland, Austria and France (Table 24).

A total of 478 cardiosurgical centers were active in 35 European States in 1994. Because of the war, no cardiac operations were performed in Bosnia-Herzegowina. No informations are available for Albania and Macedonia. There are no cardiosurgical centers in Liechtenstein, Luxemburg or Malta (Table 24 and Figure 28).

The 478 cardiosurgical centers performed 267,746 heart operations in 1994. The European average is 522 heart operations per million population, but wide differences exist:

Heart operations per million population (pmp):

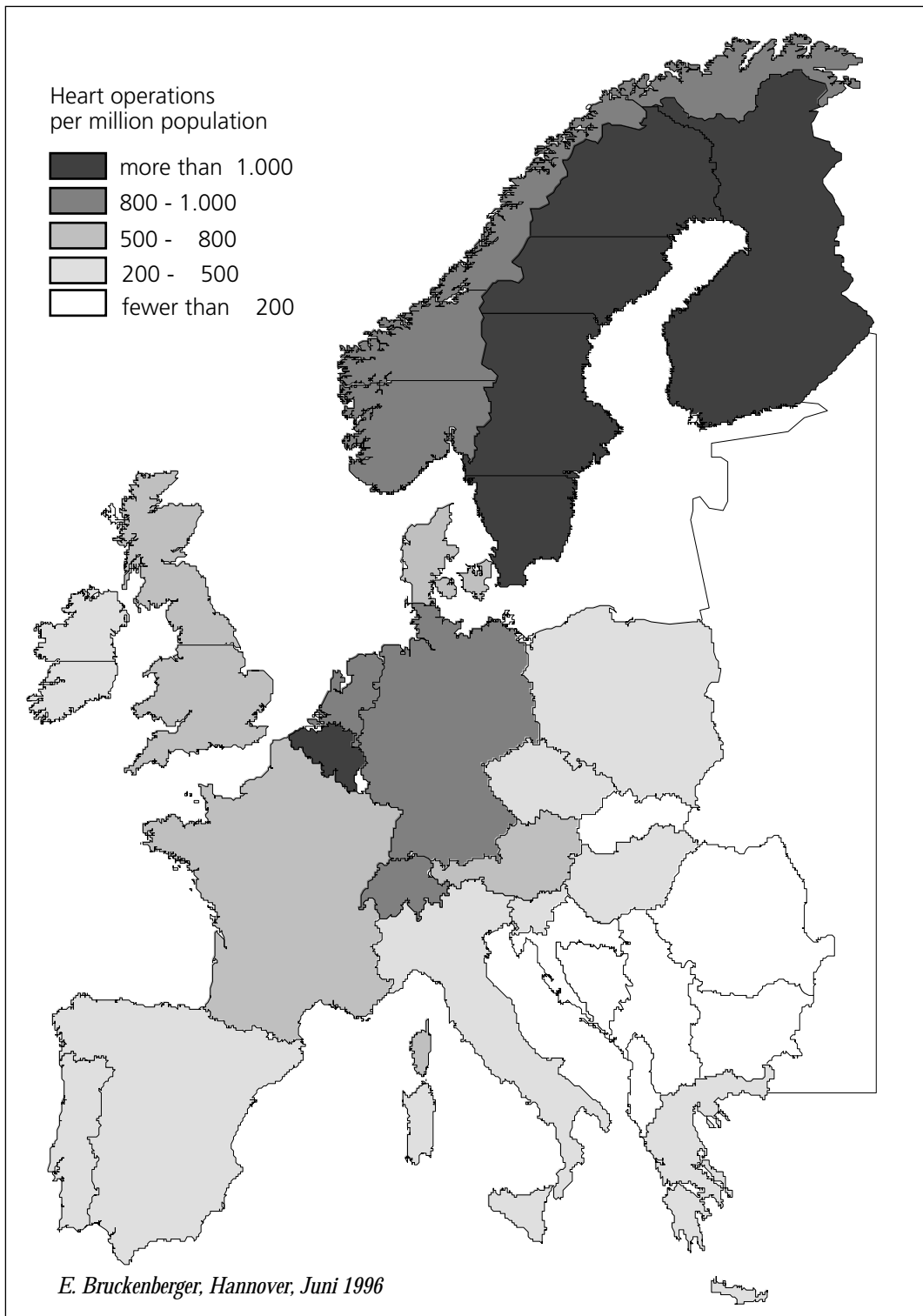
more than 1,000	Sweden, Belgium, Finland, Iceland
more than 800	Netherlands, Norway, Switzerland, Germany
more than 500	Faroe Islands, Austria, France, Denmark, United Kingdom
more than 200	Italy, Greece, Spain, Portugal, Ireland, Czech Republic, Hungary, Slovenia, Poland
Fewer than 200	Latvia, Bulgaria, Cyprus, Estonia, Slovakia, Yugoslavia, Croatia, Lithuania, Romania

**Table 24:** Heart operations and investigations in Europe

Country	internat. code	pmp	open heart operations		left heart catheterisations	PTCA	caths + PTCA pmp
			total	pmp			
Albania	AL	3,36	n. n.				
Austria	A	7,99	5.769	722	21.094	4.934	618
Belgium	B	10,05	10.814	1.076	32.000	9.500	945
Bosnia-Herzegovina	BIH	4,38	0	0			
Bulgaria	BG	8,74	1.664	190		90	10
Croatia	HR	4,79	459	96	1.678	198	41
Cyprus	CY	0,73	119	163	1.365	78	107
Czech Republic	CZ	10,33	3.101	300	7.600	1.500	145
Denmark	DK	5,18	3.251	628	5.884	1.273	246
Estonia	EE	1,53	237	155	805	160	106
Faroe Islands	FR	0,04	31	775	67	25	
Finland	SF	5,08	5.600	1.102	8.371	1.500	295
France	F	57,37	37.000	645		35.000	610
Germany	D	81,34	65.347	803	357.747	88.380	1.087
Great Britain	GB	57,70	32.625	565	88.000	13.822	240
Greece	GR	10,30	5.040	489	21.881	3.123	303
Hungary	H	10,28	2.891	281	9.200	825	80
Iceland	IS	0,26	267	1.027	911	219	842
Ireland	IRL	3,55	1.113	314	5.369	556	157
Italy	I	56,86	28.295	498	82.000	11.500	202
Lithuania	LR	3,62	256	71	1.058	56	15
Liechtenstein	FL	0,03	0	0			
Latvia	LT	3,75	735	196	4.000	110	29
Luxemburg	L	0,39	0	0			
Macedonia	MAC	2,17	0	0			
Malta	M	0,36	0	0			
Monaco	MC	0,03	748	0			
Netherlands	NL	15,18	13.928	918	40.000	11.920	785
Norway	N	4,29	3.762	877	9.466	2.637	615
Poland	PL	38,37	8.197	214	13.109	2.171	57
Portugal	P	9,86	3.200	325	n. n.		
Rumania	RO	22,76	846	37	1.900	146	6
Slovakia	SK	5,35	749	140	1.400	200	37
Slovenia	SLO	2,00	481	241	1.216	181	91
Spain	E	39,09	14.137	362	55.169	10.433	267
Sweden	S	8,71	10.100	1.160	16.786	4.365	501
Switzerland	CH	6,97	5.632	808	17.556	7.330	1.052
Yugoslavia	YU	10,60	1.352	128	3.229	170	16
Europe		513,39	267.746	15.306	808.861	212.402	9.505

Source: F. Unger, „European Survey on Cardiac Interventions, Open Heart Surgery, PTCA, Cardiac Catheterisation, 1994“, Final Report of the European Heart Institute, Academia Scientiarum et Artium Europaea

**Figure 28:** Heart operations with HLM in Europe



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# 11 Appendix

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## 11.2 Addresses

### 11.2.1 Cardiosurgical Centers in the Old States 1995

No	State	City, Hospital	Medical Director
1	Baden-Württemberg	Bad Krozingen, Herz-Zentrum	Dr. Eschenbach u. Dr. Tollenaere
2	Baden-Württemberg	Freiburg, Uniklinik	Prof. Dr. Fr. Beyersdorf
3	Baden-Württemberg	Heidelberg, Uniklinik	Prof. Dr. S. Hagl
4	Baden-Württemberg	Lahr, Deutsches Herzzentrum Baden	PD Dr. J. Ennker
5	Baden-Württemberg	Karlsruhe, Karlsruhe GmbH	Dr. H. Posival
6	Baden-Württemberg	Stuttgart, Robert-Bosch-Krankenhaus	Prof. Dr. K. Hellberg
7	Baden-Württemberg	Stuttgart, SANA Herzchirurgische Klinik	Prof. Dr. J. Rein
8	Baden-Württemberg	Tübingen, Uni-Klinik	PD Dr. Ziemer
9	Baden-Württemberg	Ulm, Uniklinik	Prof. Dr. A. Hannekum
10	Bayern	Passau, Klinikum Passau	PD Dr. P. Eigel
11	Bayern	Augsburg, Zentralklinikum	Prof. Dr. E. Struck
12	Bayern	Erlangen, Uni-Klinik	Prof. Dr. J. v. d. Emde
13	Bayern	München, Deutsches Herzzentrum	Prof. Dr. H. Meisner
14	Bayern	München, Krankenhaus Bogenhausen	Prof. Dr. B. M. Kemkes
15	Bayern	Nürnberg, Klinikum Nürnberg Süd	PD Dr. N. Doetsch
16	Bayern	Regensburg, Uni-Klinik	Prof. Dr. D. Birnbaum
17	Bayern	Würzburg, Uni-Klinik	Prof. Dr. O. Elert
18	Bayern	Bad Neustadt/Saale, Klinik	Prof. Dr. R. Hacker
19	Bayern	München, Uni-Klinik Großhadern	Prof. Dr. B. Reichart
20	Berlin	Berlin, Havelklinik *	Dr. Jaabari
21	Berlin	Berlin, Deutsches Herzzentrum	Prof. Dr. R. Hetzer
22	Bremen	Bremen, Zentral-KH Links der Weser	Prof. Dr. K. Leitz
23	Hamburg	Hamburg, AK St. Georg	Prof. Dr. J. Ostermeyer
24	Hamburg	Hamburg, CardioClinic *	Prof. Dr. H. J. Kriebber
25	Hamburg	Hamburg, Albertinen-Krankenhaus	Prof. Dr. N. Bleese
26	Hamburg	Hamburg, Uniklinik Eppendorf	Prof. Dr. P. Kalmar
27	Hessen	Kassel, Städt. Klinikum	Dr. H. Sons
28	Hessen	Frankfurt/Main, Uni-Klinik	Prof. Dr. Moritz
29	Hessen	Fulda, Städtische-Kliniken	Prof. Dr. T. Stegmann
30	Hessen	Marburg, Uni-Klinik	Prof. Dr. R. Moosdorf
31	Hessen	Rotenburg a. d. F., Herz-u. Kreislauf-Zentr.	PD Dr. H. Oster
32	Hessen	Bad Nauheim, Kerckhoff-Klinik	Prof. Dr. W. P. Klövekorn
33	Hessen	Gießen, Uni-Klinik	Prof. Dr. F. W. Hehrlein
34	Hessen	Frankfurt/Main, CardioClinic *	Dr. Zeplin
35	Hessen	Frankfurt/Main, Herzzentrum Frankfurt AG	Dr. R. Besser, PD Dr. S. Iversen
36	Niedersachsen	Braunschweig, Städtisches Klinikum	Prof. Dr. G. Frank
37	Niedersachsen	Oldenburg, Städtische Kliniken	Dr. F. Siclari
38	Niedersachsen	Bad Bevensen, Herz-Kreislauf-Klinik	Prof. Dr. J. Laas
39	Niedersachsen	Bad Rothentelde, Schüchtermannklinik	Dr. H. Warnecke
40	Niedersachsen	Göttingen, Uni-Klinik	Prof. Dr. H. Dalichau
41	Niedersachsen	Hannover, Medizinische Hochschule	Prof. Dr. A. Haverich
42	Nordrhein-Westfalen	St. Augustin, Johanniter-Kinder-Klinik	Dr. A. E. Urban
43	Nordrhein-Westfalen	Dortmund, Städtische-Kliniken	Prof. Dr. M. J. Polonius
44	Nordrhein-Westfalen	Duisburg, KA-Duisburg/Oberhausen	Prof. Dr. A. Krian
45	Nordrhein-Westfalen	Bochum, BG-KA Bergmannsheil	Prof. Dr. Laczkovics
46	Nordrhein-Westfalen	Krefeld, Städt. Krankenanstalten	PD Dr. H. Greve
47	Nordrhein-Westfalen	Bonn, Uni-Klinik	Prof. Dr. P. G. Kirchhoff
48	Nordrhein-Westfalen	Dortmund, St. Johannes-Hospital	Prof. Dr. G. Walterbusch
49	Nordrhein-Westfalen	Essen, Uni-Klinikum	Prof. Dr. J. C. Reidemeister
50	Nordrhein-Westfalen	Köln, Uni-Klinik	Prof. Dr. E. R. de Vivie
51	Nordrhein-Westfalen	Köln, Cardiolinic *	Dr. H. Ruskowski
52	Nordrhein-Westfalen	Münster/Westfalen, Uni-Klinik	Prof. Dr. H. H. Scheld
53	Nordrhein-Westfalen	Wuppertal, Städtische Kliniken	Prof. Dr. C. Minale
54	Nordrhein-Westfalen	Aachen, Technische Hochschule	Prof. Dr. B. Messmer
55	Nordrhein-Westfalen	Bad Oeynhausen, Herzzentrum NRW	Prof. Dr. R. Körfer
56	Nordrhein-Westfalen	Düsseldorf, Uni-Klinik	Prof. Dr. E. Gams
57	Rheinland-Pfalz	Ludwigshafen, Städt. Kliniken	Prof. Dr. W. Saggau
58	Rheinland-Pfalz	Mainz, Uni-Klinik	Prof. Dr. H. Oelert
59	Rheinland-Pfalz	Trier, Krankenhaus d. Barmherzigen Brüder	Dr. V. Müller
60	Rheinland-Pfalz	Kaiserslautern, Städtische-Kliniken	Prof. Dr. W. Seybold-Epting
61	Rheinland-Pfalz	Koblenz, Bundeswehrzentralrankenhaus	Prof. Dr. Ch. Weinhold
62	Saarland	Völklingen, Kreisrankenhaus	Dr. H. Isringhaus
63	Saarland	Homburg, Uni-Kliniken d. Saarlandes	PD Dr. H.-J. Schäfers
64	Schleswig-Holstein	Bad Segeberg, Seeberger Kliniken	Dr. R. Semmler
65	Schleswig-Holstein	Kiel, Uni-Klinik	Prof. Dr. D. Regensburger
66	Schleswig-Holstein	Lübeck, Uni-Klinik	Prof. Dr. Sievers

\* The center has no contract with Social Security and is not included in Hospital planning

## 11.2.2 Cardiosurgical Centers in the New States 1995

No	State	City, Hospital	Medical Director
1	Berlin	Berlin, Uni-Klinik (Charite)	Prof. Dr. Konertz
2	Brandenburg	Berlin, Klinikum Berlin-Buch	Prof. Dr. sc. med. B. Schubel
3	Brandenburg	Cottbus, Carl-Thiem-Klinikum	Dr. A. Schießer
4	Mecklenburg-Vorpommern	Rostock, Uni-Klinik	Prof. Dr. K. Emmrich
5	Mecklenburg-Vorpommern	Karlsburg, Zentrum f. THG-Chirurgie	Prof. Dr. Eckel
6	Sachsen	Leipzig, Herzzentrum Leipzig	Prof. Dr. Fr.-W. Mohr
7	Sachsen	Dresden, Uni-Klinik	Prof. Dr. St. Schüler
8	Sachsen-Anhalt	Halle, Uni-Klinik	Prof. Dr. Zerkowski
9	Sachsen-Anhalt	Magdeburg, Uni-Klinik	Prof. Dr. Chr. Huth
10	Thüringen	Bad Berka, Zentralklinikum	Dr. C. Torca

Source: State Survey, Hospital Committee, AGLMB

## 11.2.3 Addresses of Medical Directors in alphabetical order

Name	Center	Street	Zip	City
Besser, Dr. R.	Herzzentrum Frankfurt AG Abt. für Kardiochirurgie	Christophelgäßchen	60313	Frankfurt/Main
Beyersdorf, Prof. Dr. F.	Abt. für Herz- und Gefäßchirurgie der Chir. Univ. Klinik	Hugstetter Str. 55	79106	Freiburg/ Breisgau
Birnbaum, Prof. Dr. D.	Herz-, Thorax- u. herznahe Gefäß- Chirurgie der Universität	Franz-Josef-StraußAllee 11	93042	Regensburg
Bleese, Prof. Dr. N.	Albertinen-Kankenhaus Abt. für Herzchirurgie	Süntelstr. 11 A	22457	Hamburg
Dalichau, Prof. Dr. H.	Klinik für Thorax- Herz- u. Gefäßchirurgie der Universität Göttingen	Goßlerstr. 10	37075	Göttingen
Doetsch, PD Dr. N.	Herzchirurgische Abteilung Klinikum Nürnberg Süd	Breslauer Str. 201	90471	Nürnberg
Eckel, Prof. Dr.	Zentrum f. THG-Chirurgie	Greifswalderstraße 2a	17495	Karlsburg
Eigel, PD Dr. P.	Klinik für Herzchirurgie Klinikum Passau	Bischof-Pilgrim-Str. 1	94030	Passau
Elert, Prof. Dr. O.	Abt. für Thorax-, Herz- u. Thorakal. Gefäßchirurgie i. d. Chir. Univ. Klin. Luitpold-KH	Josef-Schneider-Str. 6	97080	Würzburg
Emde, Prof. Dr. J. v. d.	Chir. Univ. Klinik Abt. f. Herzchirurgie	Maximiliansplatz	91054	Erlangen
Emmrich, Prof. Dr. K.	Abt. Kardiochirurgie der Chir. Klin. Universität Rostock	Schillingallee 35	18057	Rostock
Ennker, PD. Dr. J.	Deutsches Herzzentrum Baden Klinik f. Thorax-, Herz- u. Gefäßchirurgie	Hohbergweg 2	77933	Lahr
Eschenbruch, Dr.	Benedikt-Kreutz-Reha-Zentrum	Südring 15	79189	Bad Krozingen
Frank, Prof. Dr. G.	Städt. Kliniken Braunschweig Klinik f. Thorax- Herz- u. Gefäßchirurgie	Salzdahlumer Str. 90	38126	Braunschweig
Gams, Prof. Dr. E.	Abt. für Thorax- und Herzchirurgie der Chir. Univ. - Klinik B	Moorenstr. 5	40225	Düsseldorf
Greve, PD Dr. H.	Abt. f. Thorax- und Kardiovascularchirurgie Städtische Krankenanstalten	Lutherplatz 14	47805	Krefeld
Hacker, Prof. Dr. R.	Herz- und Gefäßchirurgie	Salzburger Leite 1	97616	Bad Neustadt/ Saale
Hagl, Prof. Dr. S.	Abt. f. Herzchirurgie - Chirurgische Klinik Ruprecht-Karls-Universität	Im Neuenheimer Feld 110	69120	Heidelberg
Hannekum, Prof. Dr. A.	Sektion Herzchirurgie der Univ. Klinik	Steinhovelstr. 9	89075	Ulm / Donau
Haverich, Prof. Dr. A.	Med. Hochschule Hannover Thorax- Herz- und Gefäßchirurgie	Konstanty-Gutschow-Str. 8	30625	Hannover
Hehrlein, Prof. Dr. F. W.	Abt. für Kardiovaskularchirurgie des Z. f. Chirurgie Justus-Liebig-Universität	Klinikstraße 37	35392	Gießen
Hellberg, Prof. Dr. K.	Robert-Bosch-Krankenhaus Herzchirurgie	Auerbachstr. 110	70376	Stuttgart
Hetzer, Prof. Dr. R.	Deutsches Herzzentrum am Rudolf Virchow Krankenhaus	Augustenburger Platz 1	13353	Berlin

Name	Center	Street	Zip	City
Huth, Prof. Dr. Chr.	Klinik für Herzchirurgie Uni.-Klinikum Magdeburg	Leipziger Straße 44	39120	Magdeburg
Isringhaus, Dr. H.	Klinik f. Herz- und Thoraxchirurgie Kreiskrankenhaus Völklingen	Richardstr. 5-9	66333	Völklingen
Iversen, PD Dr. S.	Herzzentrum Frankfurt AG Abt. für Kardiochirurgie	Christophelgäßchen	60313	Frankfurt/Main
Jaabari, Dr.	Havelklinik - Herzchirurgie	Gatower Straße 191	13595	Berlin
Kalmar, Prof. Dr. P.	Abt. f. Thorax- Herz- u. Gefäßchirurgie Chirurgische Univ.-Klinik	Martinistr. 52	20246	Hamburg
Kemkes, Prof. Dr. B.M.	Herzchirurg. Abt. Städt. Krankenhaus München-Bogenhausen	Englschalkinger Str. 77	81925	München
Kirchhoff, Prof. Dr. P. G.	Klinik für Herz- und Gefäßchirurgie der Universität	Siegmund-Freud-Str.	53127	Bonn- Venusberg
Klövekorn, Prof. Dr. W.P.	Abt.f.Thorax- u. Kardiovaskularchirurgie Kerckhoff -Klinik	Benekestr. 4-8	61231	Bad Nauheim
Konertz, Prof. Dr.	Klinik für Herz- und Gefäßchirurgie Charite der Humboldt Universität	Schumannstr. 20-21	10117	Berlin
Körper, Prof. Dr. R.	Herzzentrum Nordrhein/Westfalen Thorax- und Kardiovaskularchirurgie	Georgstr. 11	32545	Bad Oeynhausen
Krebber, Prof. Dr. H.-J.	CardioClinic	Heilwigstr. 39	20249	Hamburg
Krian, Prof. Dr. A.	Herzzentrum Kaiser-Wilhelm-Krankenhaus	Gerrickstr. 21	47137	Duisburg
Laas, Prof. Dr. J.	Herz-Kreislauf -Zentrum	Rörmstedter Str. 25	29549	Bad Bevensen
Laczkovics, Prof. Dr. A.	Klinik f. Herz- und Thoraxchirurgie BG-Krankenanst.Bergmannsheil	Gilsingstr. 14	44789	Bochum
Leitz, Prof. Dr. K.	Zentralkrankenhaus "Links der Weser" Abt. für Herzchirurgie	Senator-Weißling-Str. 1	28277	Bremen
Meisner, Prof. Dr. H.	Klinik für Herz- und Gefäßchirurgie am Deutschen Herzzentrum	Lothstr. 11	80335	München
Messmer, Prof. Dr. B.	Abt. für Herz- und Gefäßchirurgie Klinikum der RWTH	Pauwelsstr. 27	52074	Aachen
Minale, Prof. Dr. C.	Klinik für Gefäßchirurgie am Klinikum Barmen	Heusnerstr. 40	42283	Wuppertal
Mohr, Prof. Dr. Fr.-W.	Herzzentrum Leipzig GmbH	Russenstr.19	04285	Leipzig
Moosdorf, Prof. Dr. R.	Klinik für Herzchirurgie Philipps-Universität Marburg	Baldinger Straße	45043	Marburg
Moritz, Prof. Dr.	Abt. für Thorax- Herz- u. Gefäßchirurgie am Zentrum für Chirurgie d. Universität	Theodor-Stern-Kai 7	60596	Frankfurt/Main
Müller, Dr. V.	Herz- und Thoraxchirurgische Klinik Krankenhaus der Barmhienigen Brüder		54292	Trier
Oelert, Prof. Dr. H.	Abt. für Thorax- u. Kardiovaskularchirurgie der J. Gutenberg Universität	Langenbeckstr. 1	55131	Mainz
Oster, PD Dr. H.	Klinik für Herz- und Gefäßchirurgie Herz- und Kreislaufzentrum Rotenburg	Panoramastr. 100	36199	Rotenburg/ Fulda
Ostermeyer, Prof. Dr. J.	Herzchirurgie AK St. Georg	Lohmühlenstr. 5	20099	Hamburg
Polonius, Prof. Dr. M. J.	Städt. Kliniken Dortmund Abt. f. Thorax- u. Kardiovaskularchirurgie	Beurhausstr. 40	44137	Dortmund
Posival, Dr. H.	Klinik für Herzchirurgie Karlsruhe GmbH	Franz-Lust Straße 30	76185	Karlsruhe
Regensburger, Prof. Dr. D.	Kardiovaskular Chirurgie Chirurgische Univ. - Klinik	Arnold-Heller-Str. 7	24105	Kiel
Reichart, Prof. Dr. B.	Herzchirurgische Universitätsklinik Klinikum Großhadern	Marchioninstr. 15	81377	München
Reidemeister, Prof. Dr. J. C.	Abt. für Thorax- und Vaskularchirurgie Universitätsklinikum d. Gesamthochschule Essen	Hufelandstr. 55	45147	Essen
Rein, Prof. Dr. J.	Sana - Herzchirurgische Klinik Stuttgart GmbH	Schwarenbergstr. 7	70190	Stuttgart
Ruskowski, Dr. H.	Cardioclinic	Buchforststraße 2	51103	Köln
Saggau, Prof. Dr. W.	Herzchirurgische Klinik Akadem.Lehr-KH d. Joh. Gutenberg Univ.	Bremserstr. 79	67063	Ludwigshafen
Schäfers, PD Dr.H.-J.	Abt. für Herz- und Thoraxchirurgie der Chir. Univ. Klinik		66424	Homburg/Saar
Scheld, Prof. Dr. H. H.	Abt. für Thorax- Herz u. Gefäßchirurgie Chirurgische Univ. - Klinik	Albert-Schweitzer-Str. 41	48149	Münster / Westf.

Name	Center	Street	Zip	City
Schießler, Dr. A.	Herzzentrum Kleeblatt Carl-Thiem-Klinikum	Thiemstraße 111	03120	Cottbus
Schubel, Doz. Dr. c. med.	Klinik für Herzchirurgie Klinikum Berlin-Buch	Hobrachtsfelder Chaussee 98	13125	Berlin
Schüler, Prof. Dr. St.	Herz- u. Kreislaufzentrum Dresden Universitätsklinikum Carl Gustav Carus	Schubertstr. 18	01307	Dresden
Semmler, Dr. R.	Segeberger Kliniken GmbH -Herzchirurgie-	Kurpark	23795	Bad Segeberg
Seybold-Epting, Prof. Dr. W.	Städt. Krankenhaus Klinik für Herz- und Gefäßchirurgie	Friedrich-Engels-Str. 25	67655	Kaiserslautern
Siclari, Dr. F.	Städt. Kliniken Oldenburg Klinik für Thorax- und Kardiovaskularchirurgie	Dr. Eden-Str. 10	26133	Oldenburg
Sievers, Prof. Dr.	Kardiovaskular Chirurgie der Universität Lübeck	Ratzeburger Allee 1600	23562	Lübeck
Sons, Dr. H.	Klinik für Thorax-, Herz- und Gefäßchirurgie Städt. Klinikum Kassel	Mönchebergstraße 41-43	34125	Kassel
Stegmann, Prof. Dr. T.	Städt. Kliniken Fulda Thorax- Herz- und Gefäßchirurgie	Pasellallee 4	36043	Fulda
Struck, Prof. Dr. E.	Herzchirurgische Klinik am Zentralkrankenhaus KZVA	Stenglinstr. 8	86156	Augsburg
Tollenaere, Dr.	Benedikt-Kreutz-Reha-Zentrum	Südring 15	79189	Bad Krozingen
Torka, Dr. C.	Klinik für Herzchirurgie an der Zentralklinik Bad Berka GmbH	Robert-Koch-Allee 9	99438	Bad Berka
Urban, Dr. A. E.	Kinderklinik St. Augustin Abt. für Herz- und Thoraxchirurgie	Arnold-Janssen-Str. 29	53767	St. Augustin
Vivie, Prof. Dr. E. R. de	Abt. für Herzchirurgie Chir. Univ. Klinik	Joseph-Stelzmann-Str. 9	50931	Köln
Walterbusch, Dr. G.	St. Johannes Hospital	Johannesstr. 9 - 11	44137	Dortmund
Warnecke, Dr. H.	Schüchtermann-Klinik Abt. f. Herzchirurgie	Ullmenallee 11	49214	Bad Rothenfelde
Weinhold, Prof. Dr. Ch.	Herzchirurgische Abteilung Bundeswehrzentrankrankenhaus	Rübenacherstraße 170	56072	Koblenz
Zeplin, Dr.	CardioClinic Frankfurt/Main	Usinger Str. 5	60389	Frankfurt/Main
Zerkowski, Prof. Dr.	Abt. Herz- u. Thoraxchirurgie Klinik f. Chir. der ML-Universität	Ernst-Grube-Str. 40	06120	Halle
Ziemer, PD Dr.	Abt. für Thorax- Herz- u. Gefäßchirurgie der Chir. Univ. Klinik	Hoppe-Seyler-Str. 3	72076	Tübingen