Annex VII

Third Coordination Meeting of WHO Collaborating Centres
in Radiation Emergency Medical Preparedness and Assistance
(Leningrad, 21-24 May 1990)

PUBLIC HEALTH CONCERNS IN THE SOVIET UNION FOLLOWING THE CHERNOBYL ACCIDENT*

Following the Chernobyl accident, public health actions have been undertaken to cover three main groups:

a) a group of immediate emergency response who developed acute radiation illness;

b) intervention teams under planned and controlled working conditions;

c) populations living in areas affected by the accident.

The public health actions for these three groups require different approaches, and specific guidelines and recommendations should be elaborated.

1. All-Union Distributed Registry (AUDR)

A large-scale project for monitoring long-term health effects in persons exposed to radiation following the Chernobyl accident has led to the establishment of the All-Union Distributed Registry in the city of Obninsk (fig.1). The Registry is a computerized multi-level system (fig.2-3) which stores the whole information on exposed individuals wherever they live in the USSR. More than 530,000 persons are now covered by the system. It also contains information on the dose reconstruction, and permits to study incidence and patterns of diseases as well as health consequences of exposure in various cohorts (fig. 4-7).

The medical and dosimetric data for 531,000 persons are grouped according to initial registration (so-called groups of primary registration - GPR):

1) group one - participants in recovery operations after the Chernobyl accident - 198.5 thousand;
2) group two - evacuated - 64.5 thousand;
3) group three - those living in contaminated territories - 265.5 thousand
4) group four - children whose parents are in enhanced risk groups (GPR 1 - 3) - 2.5 thousand.

The age distribution is given in fig.8.

Using the software designed for the Register, one can group the registered population according to sex and age or other combinations. This is necessary for long-term planning of medical monitoring for different cohorts.

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The Ministries for Public Health of Russia, the Ukraine and Byelorussia provide the main part of information for the All-Union level of the Register. The percentage of persons living in each Republic is also given in fig.8.

Fig.9 shows that the mean dose received by GPR1 decreased considerably only by the end of 1987. Therefore the collection and analysis of dosimetric data for all workers during 1986-1987 is the main task for the Register.

Fig.10 represents the distribution of GPR1 according to absorbed doses of external irradiation. The individual dosimetric data for 86.5 thousand persons have so far been analyzed. The doses absorbed by 46.9% of GPR1 are 10-25 rad. It should be noted (fig.11) that about 88% of GPR1 are at the age of 20-45 years.

The morbidity detected among the GPR1 group in 1987-88 is given in fig.12-20. The apparent growth of morbidity is a matter of concern. However, medical examinations carried out in 1988 were more profound and complete than in 1987. Besides, initial documents filled in 1987 contained many errors.

Special attention is paid to younger children and adolescents in the affected areas. Fig.21 provides dosimetric data on radioiodine uptake obtained after thyroid scanning of children living in Bryansk, Kaluga, Zhitomir and Chernigov regions. The number of examined children ranged between 5.7 thousand in the Kaluga region and 25 thousand in the Chernigov region. These data were provided to the All-Union level of the Register by Republican Ministries of Public Health of Russia, the Ukraine and Byelorussia. Comparing dosimetric data from Russia with those from the Ukraine, one can see that absorbed doses for most of the children living in Russia are below 30 rad, whereas the radiation load on the thyroid of children living in the Ukraine is higher.

Fig.22 presents changes in the total morbidity among children and adolescents examined in 1987-88. With an exception of the Kiev region, the morbidity has apparently increased. However, for thyroid diseases the trend is variable (fig.23). The same conclusion can be made for incidence of anaemia (fig.24).

2. The situation in Byelorussia

It has become obvious that the most affected Republic in terms of contaminated territory is Byelorussia. It can be seen from a map available on request.

The share of the contaminated area with a contamination higher than 15 Ci/km^2 is 70% of total area contaminated in the USSR More than 100,000 people including 50,000 children live in this area. Twenty per cent of the population of Byelorussia live in the area with contamination higher than 1 Ci/km^2 and 18% of the agricultural production is there.

Specific features of the contaminated areas are their mosaic geography, even within a very small spot, and a wide spectrum of radionuclides, which leads to problems in the evaluation of doses.

The amount of incorporated ^{137}Cs decreased 1.5-2 times in 1989 compared to 1986. A correlation was found between levels of contamination and the amount of incorporated ^{137}Cs.

There is a trend of increasing thyroid gland disorders and anaemia among children.

The main efforts in the future should be directed towards turning out radionuclides from the natural circulation in the contaminated areas.

3. Psychological problems

A special issue is the psychological reaction of the population "radiophobia", accompanied by loss of credibility in experts' conclusions and enhanced by insufficient information and education. It has been found that the population mostly trust the local authorities, less the regional ones and always casts doubts about recommendations of central authorities, such as the Ministry of Health, in spite of the quality of expertise mostly available at the central authorities. International guidelines and recommendations would be very helpful under these circumstances. Here are some examples of guidelines which could be produced by WHO.

1) Manual on health protection in the areas of high radiation levels;

2) Recommendation on basic health requirements for relocation of the population;

3) Health consequences of stress and radiophobia after accidents;

4) International requirements for radiation control in the areas of high radiation levels;

5) Needs for personal dosimetry of the population;

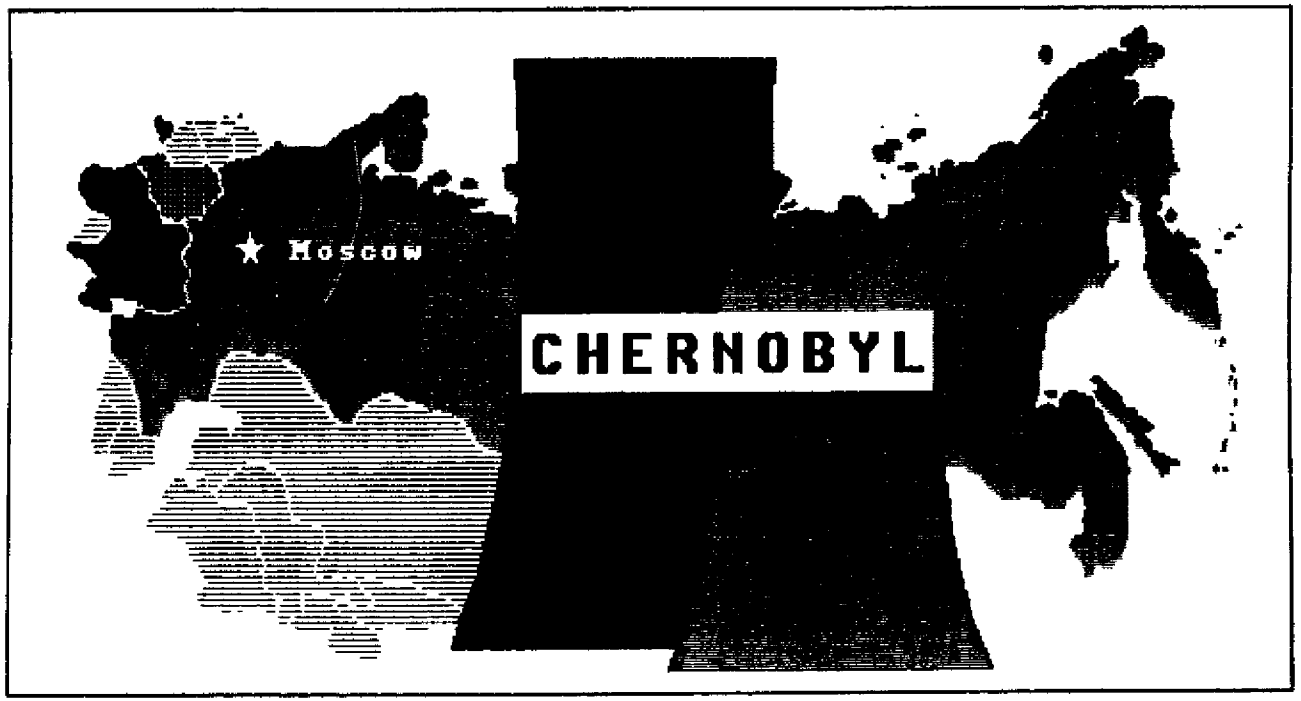
6) Basic principles for the establishment of action levels in the areas with permanently higher radiation levels;

7) A WHO movie/video "Radiation accidents and public health";

8) A quarterly information bulletin on radiation levels, public exposure and epidemiological data for Europe including the USSR;

9) Organization of WHO inspection teams and consultations for the assessment of exposure and population health

All-Union Distributed Registry



IMR AMS USSR Obninsk

Fig.1

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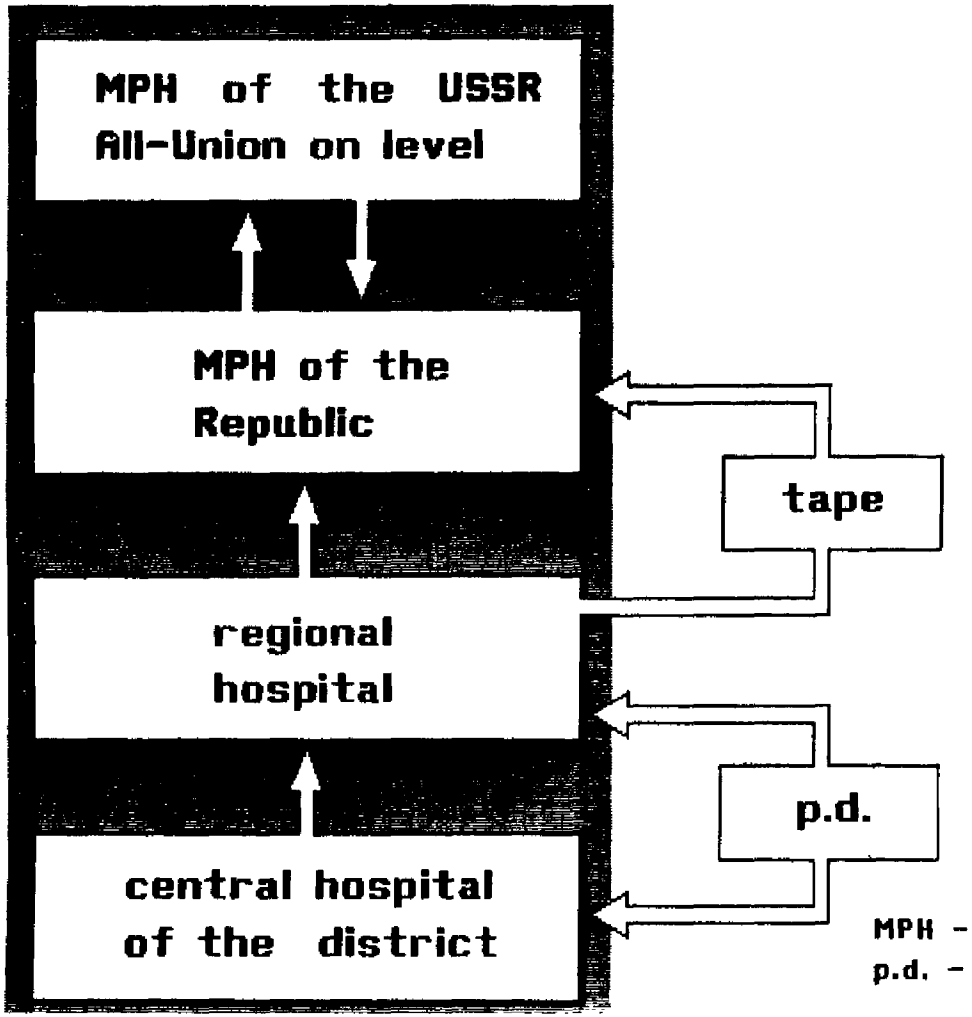
Hierarchical configuration of AUDR as distributed System



MPH - Ministry of Public Health
p.d. - paper document

Fig.2

Fig.3

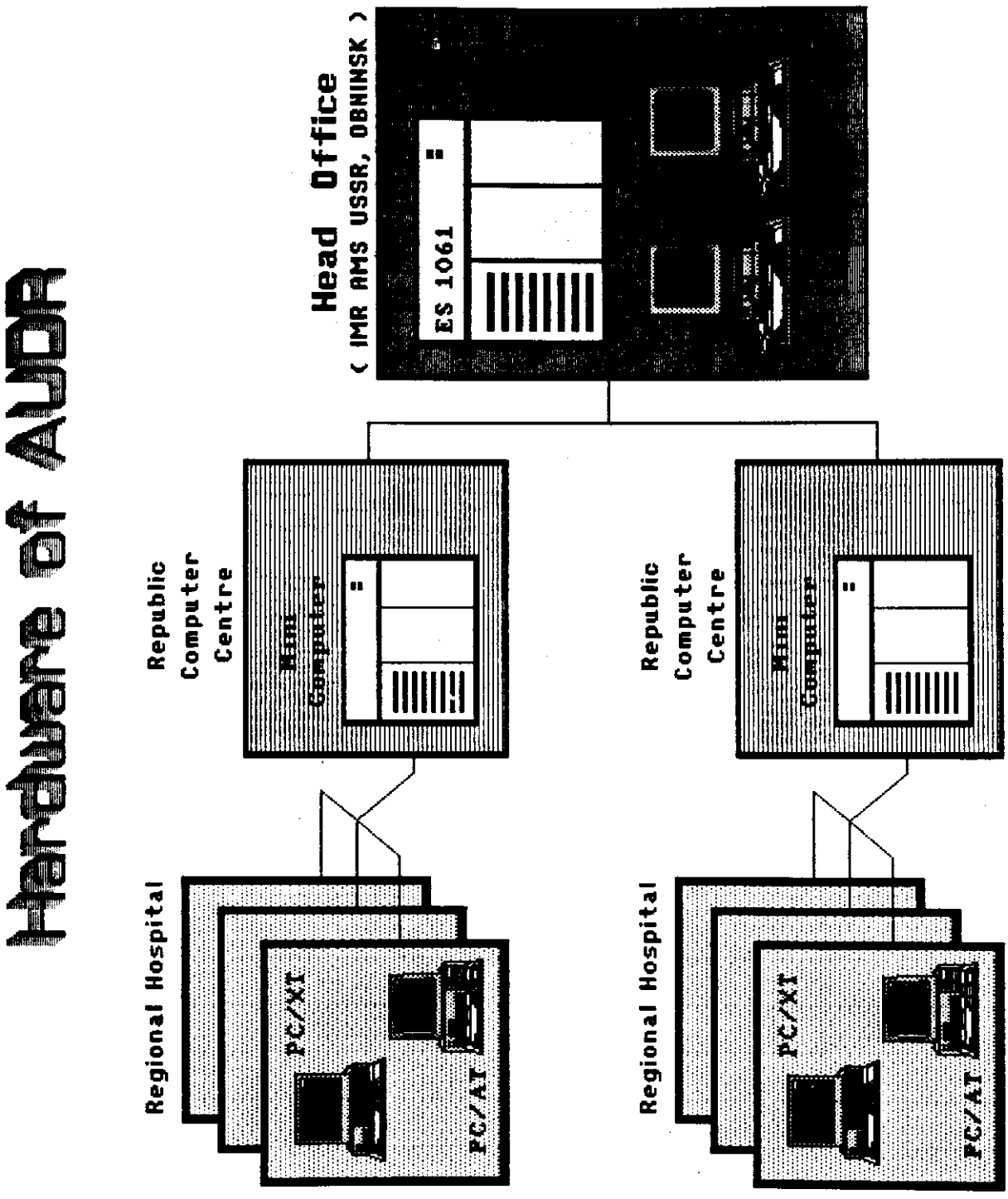
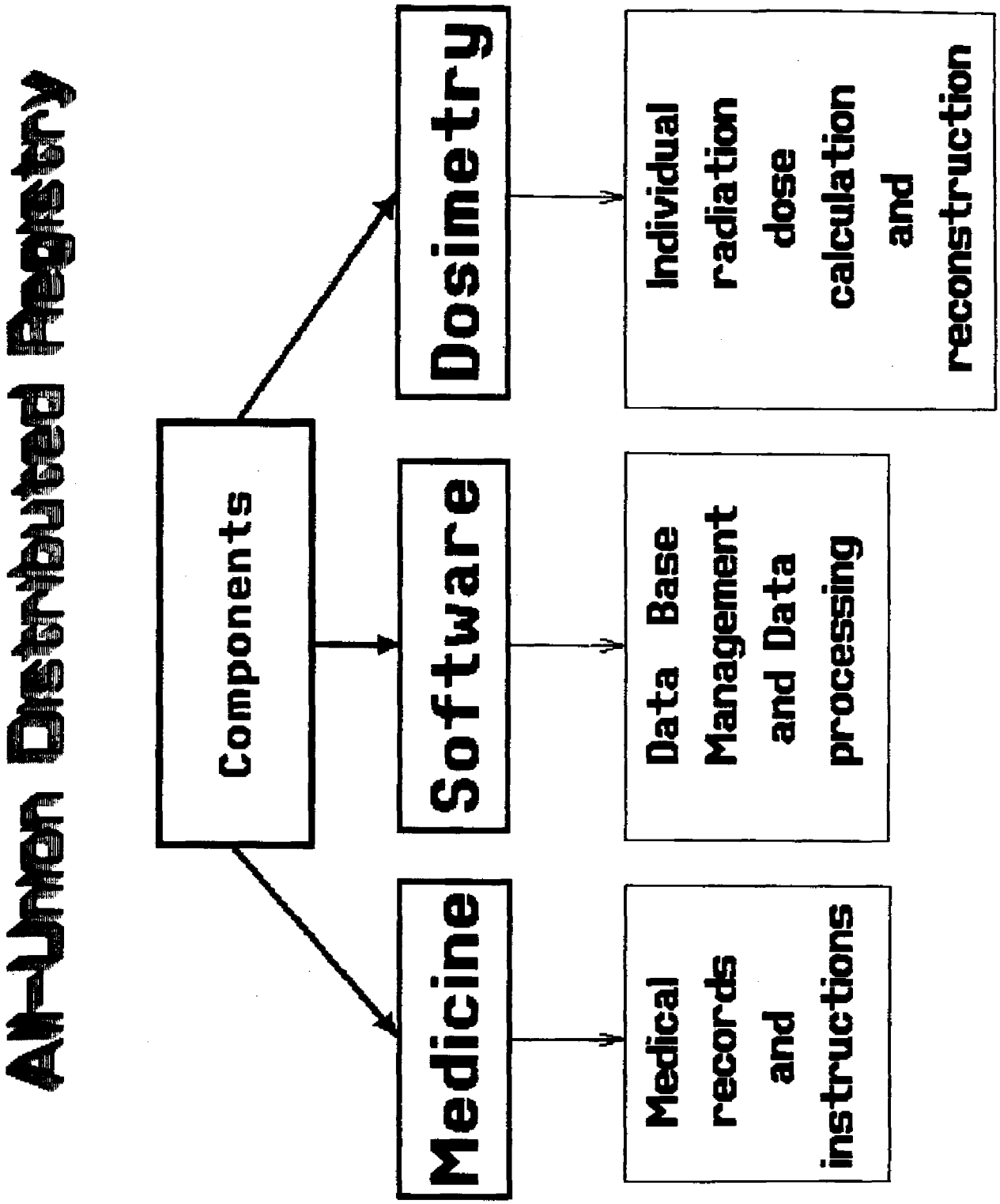

Hardware of AUDR
Head Office
(IMR AMS USSR, OBNINSK)
ES 1061
Republic Computer Centre
Mini Computer
Republic Computer Centre
Mini Computer
Regional Hospital
PC/XT
PC/AT
Regional Hospital
PC/XT
PC/AT

Fig.4


An Union Distributed Registry
Components
Dosimetry
Software
Medicine
Individual radiation dose calculation and reconstruction
Data Base Management and Data processing
Medical records and instructions

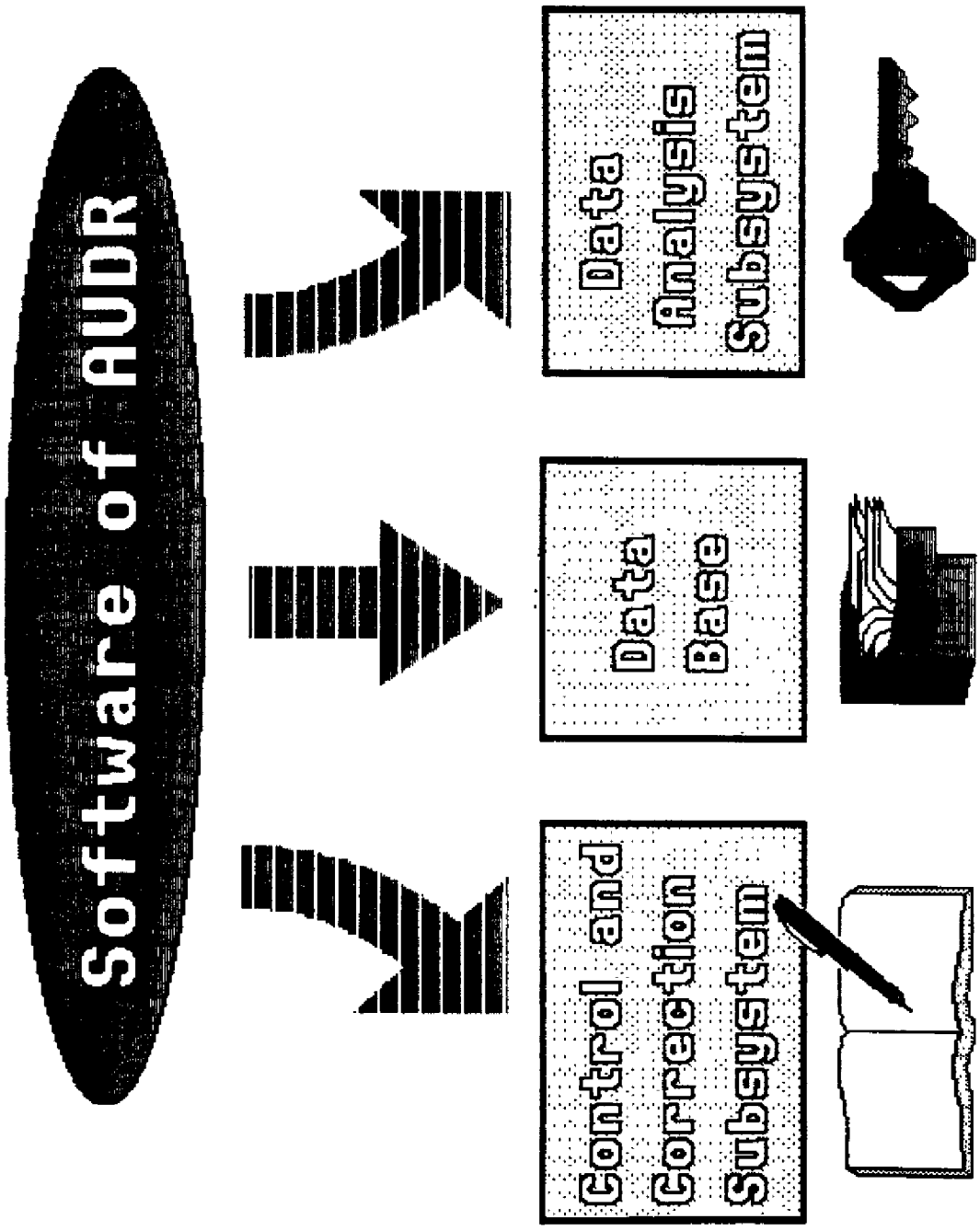
Informational basis of AUDR

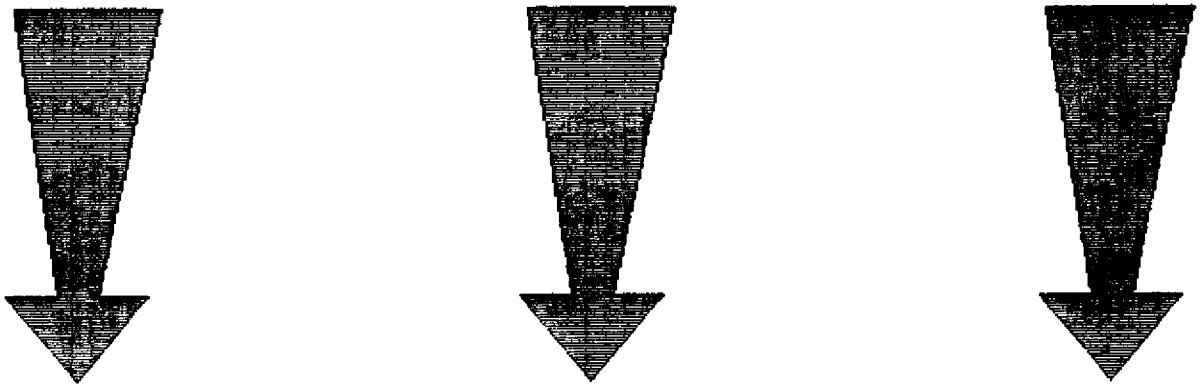
- registration chart which is filled once per person and contains basic passport data, address, the state of health before the accident, dosimetric data and some other parameters;

- documents for dynamic monitoring, which are filled-in once a year - they are dosimetric data registration and coding medical data coupons;

- sheet of changes, which serves the purpose of correcting mistakes and putting the changed data into other documents.

Fig.6


Software of AUDR
Control and Correction Subsystem
Data Base Subsystem
Data Analysis Subsystem



Control of presence of definite fields of document and necessary amount of data. Control by geographic indication glossary together with their hierarchical subordination checking. Logical control of the document. Control of personal identification.	Long-term monitoring of of every person included into the registry, collecting dynamic data on him. Obtaining timely information , prepareing files for the data analysis subsystem.	Obtaining information concerning the registry state and dynamics at the given moment. Analyzing the completeness and terms of medical monitoring. Clustering various groups of people within registry into those "close" to each other in various aspects.

Fig.7

Fig.8

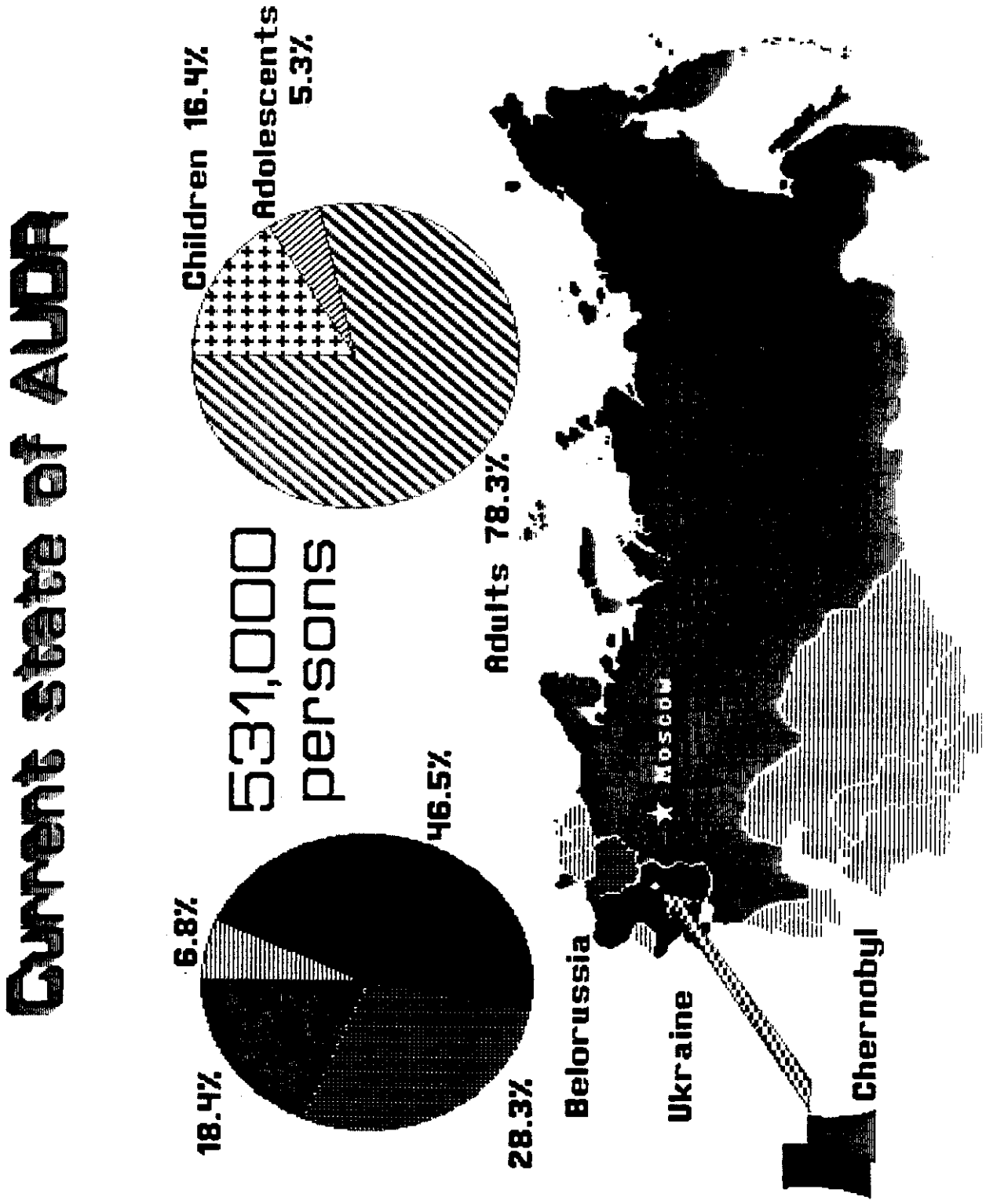

Current state of AUDR
Children 16.4%
Adolescents 5.3%
531,000 persons
6.8%
46.5%
18.4%
28.3%
Adults 78.3%
Belorussia
Ukraine
Chernobyl
MOSCOW

Fig.9

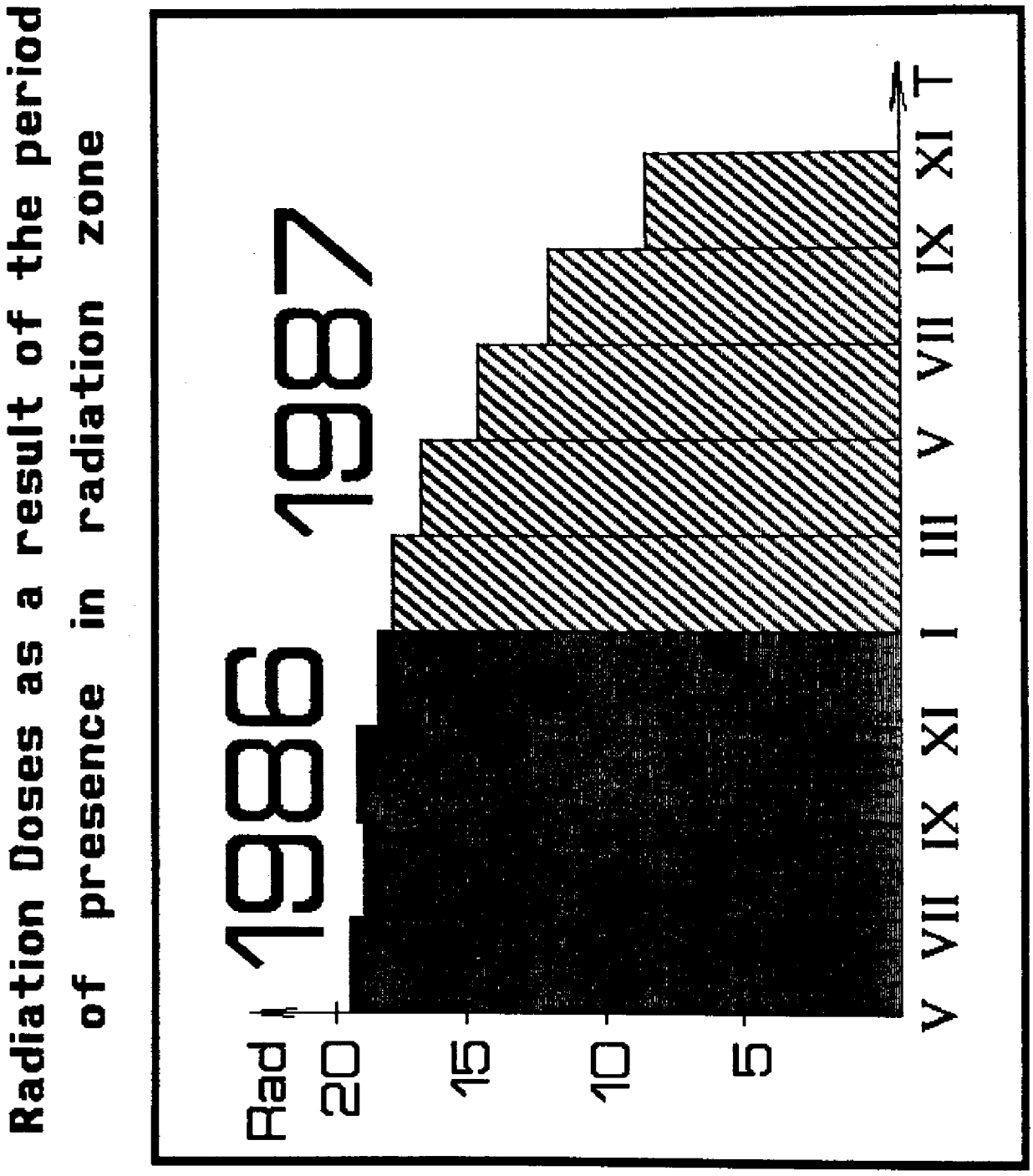
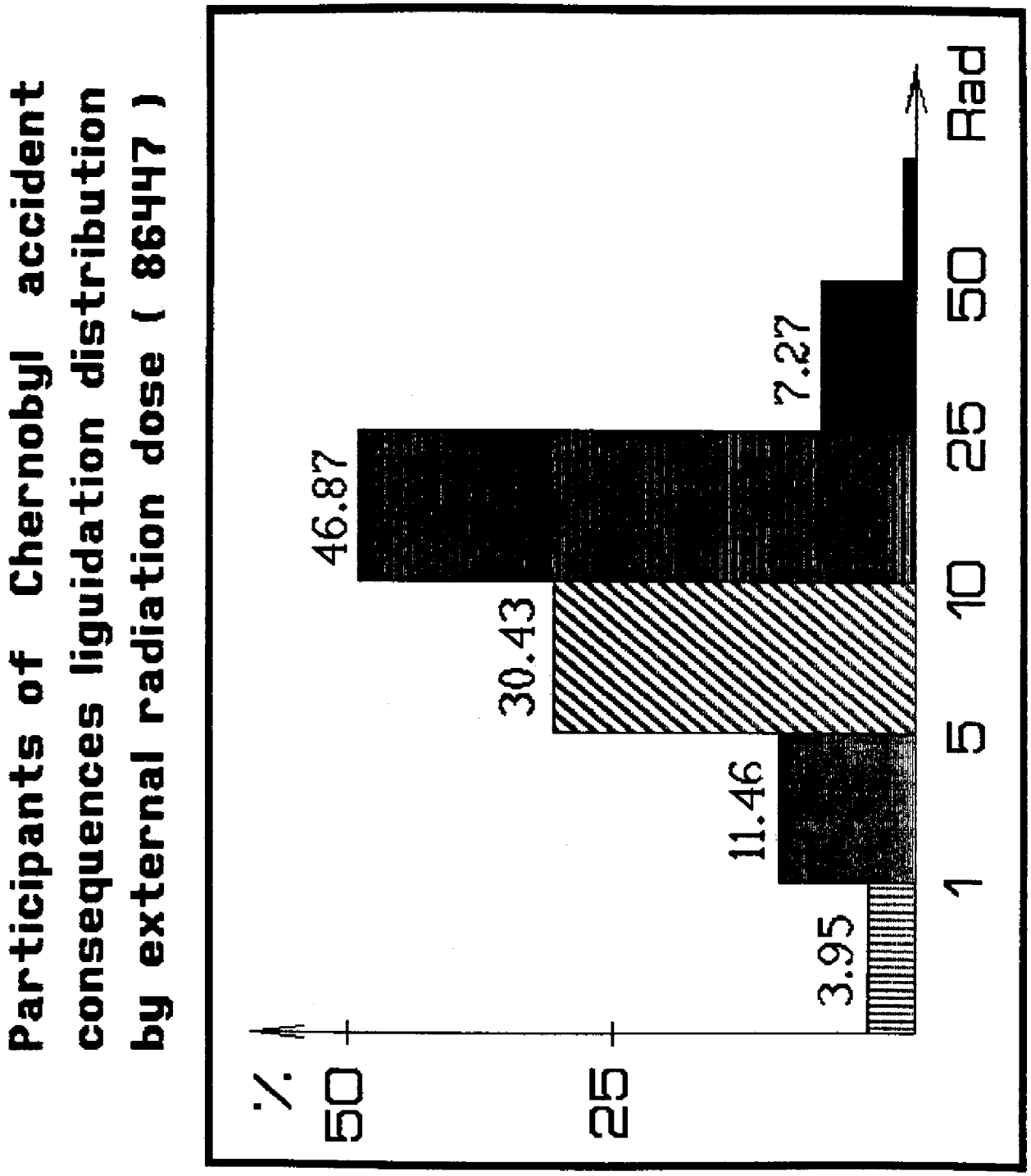

Radiation Doses as a result of the period of presence in radiation zone
Rad
20
15
10
5
1986
1987
V VII IX XI I III V VII IX XI T

Fig.10


Participants of Chernobyl accident
consequences liquidation distribution
by external radiation dose (86447)
%
50
25
46.87
30.43
11.46
3.95
7.27
1
5
10
25
50
Rad

Age Distribution of Participant of Chernobyl accident consequences liquidation AUDR (198500 persons)

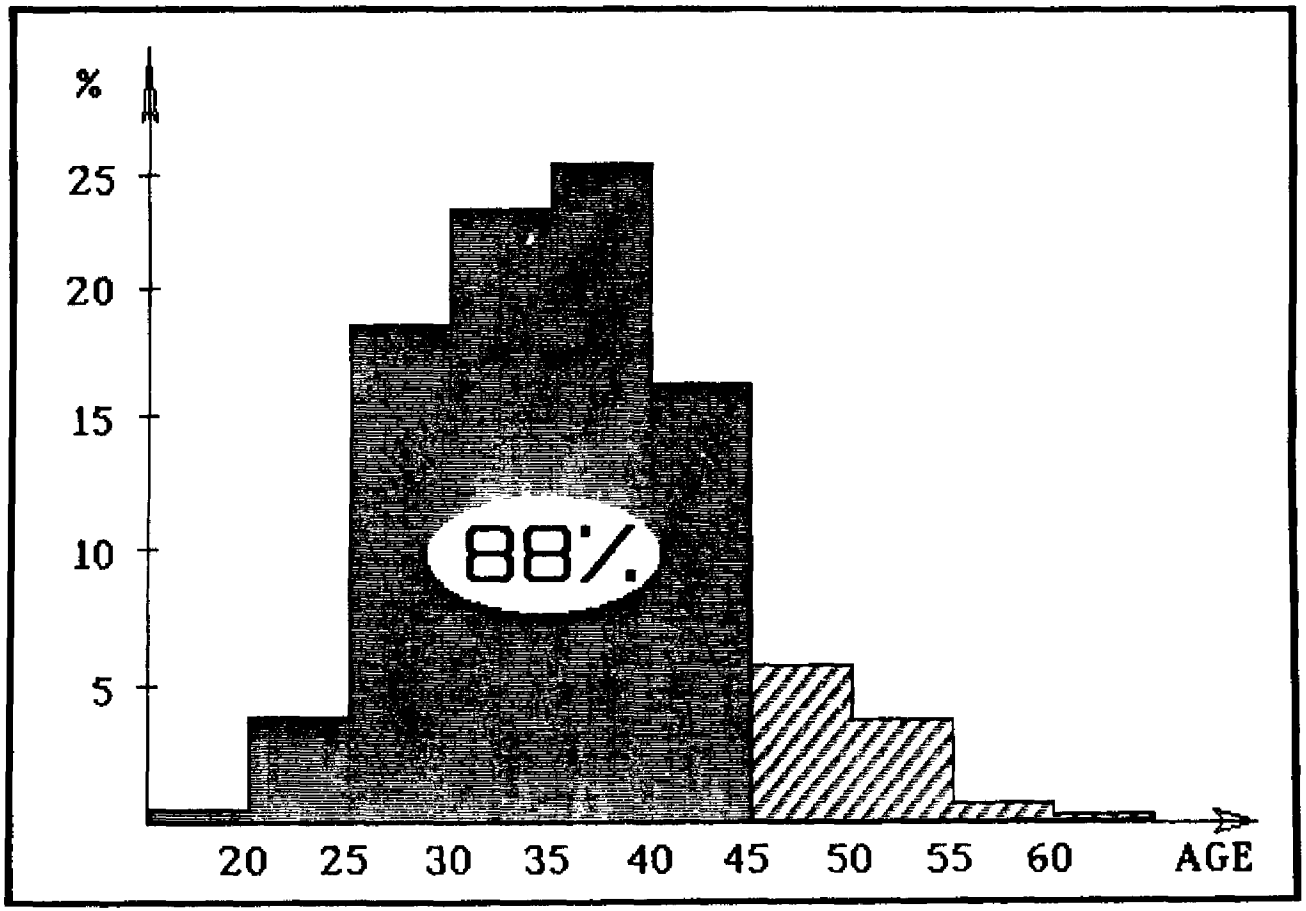


Fig.11

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Fig.12

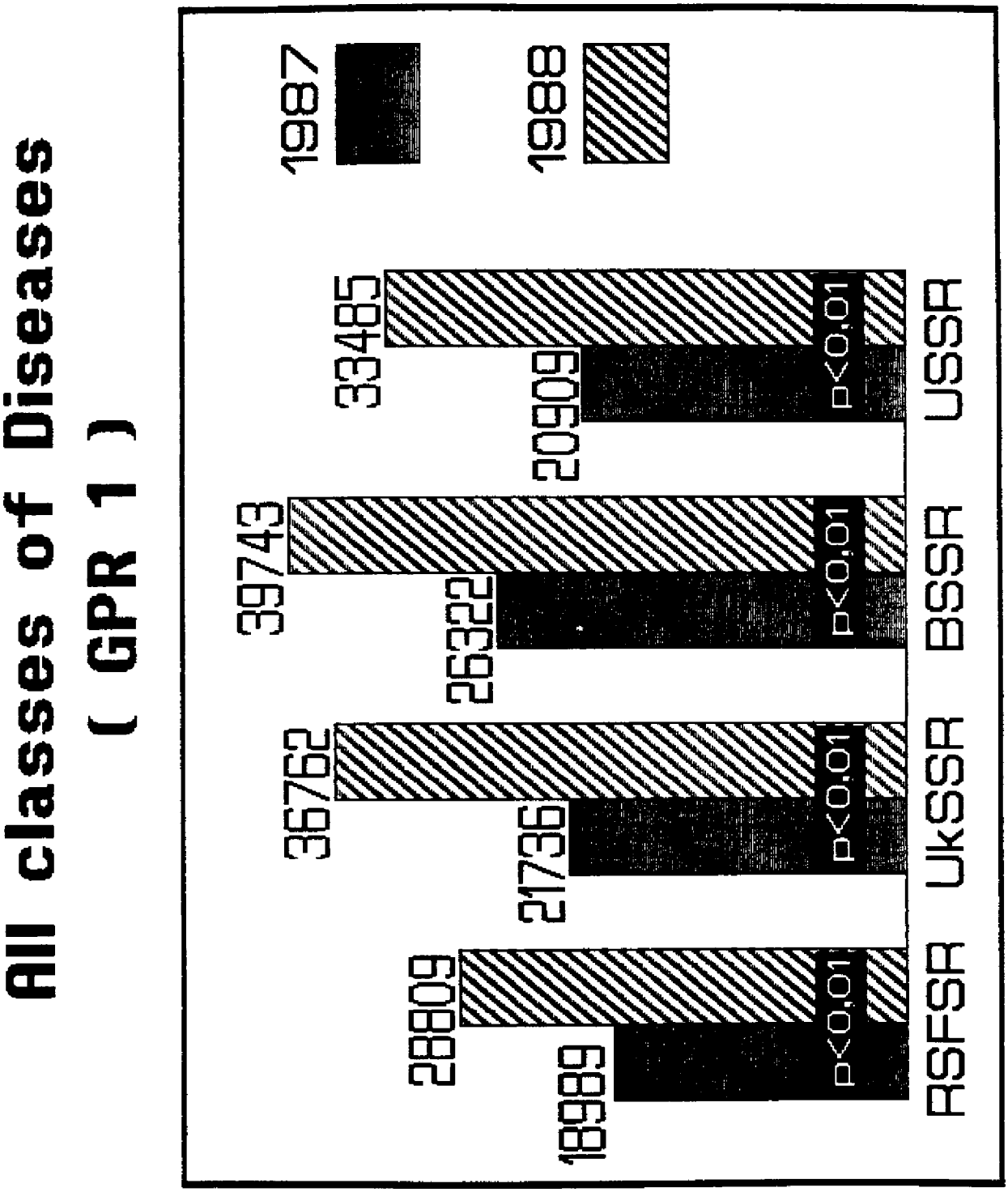

All classes of Diseases
(GPR 1)
1987
1988
RSFSR
UkSSR
BSSR
USSR
18889
28809
p<0,01
21736
36762
p<0,01
26322
39743
p<0,01
20609
33485
p<0,01

Fig.13

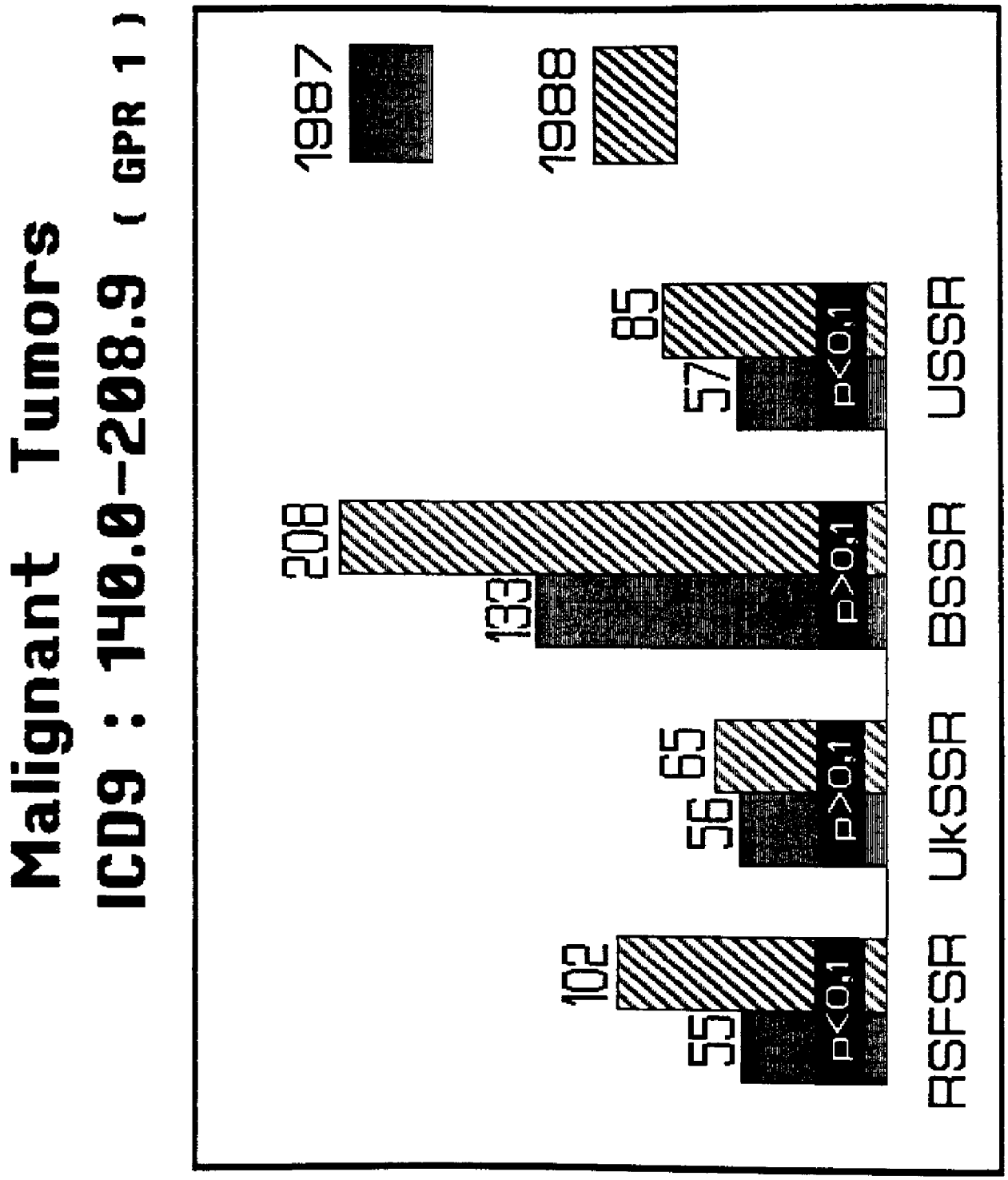
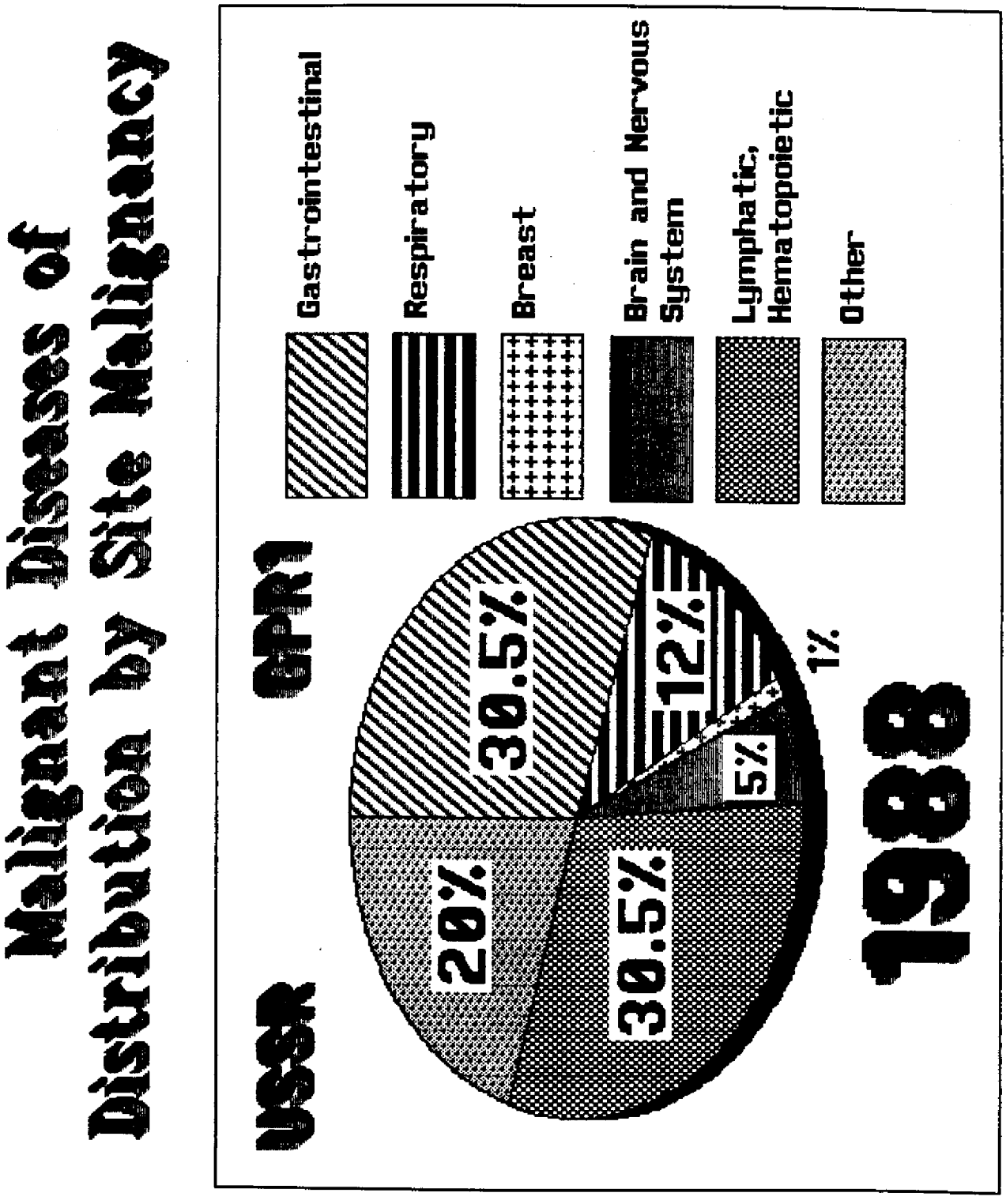

Malignant Tumors
ICD9 : 140.0-208.9 (GPR 1)
1987
1988
102
55
p<0,1
65
56
p>0,1
208
181
p>0,1
85
57
p<0,1
RSFSR
UkSSR
BSSR
USSR

Fig.14


Malignant Diseases of
Distribution by Site Maligancy
USSR
GPR1
1988
20%
30.5%
30.5%
12%
5%
1%
Gastrointestinal
Respiratory
Breast
Brain and Nervous System
Lymphatic, Hematopoietic
Other

Malignant Diseases of Distribution by Site Malignancy

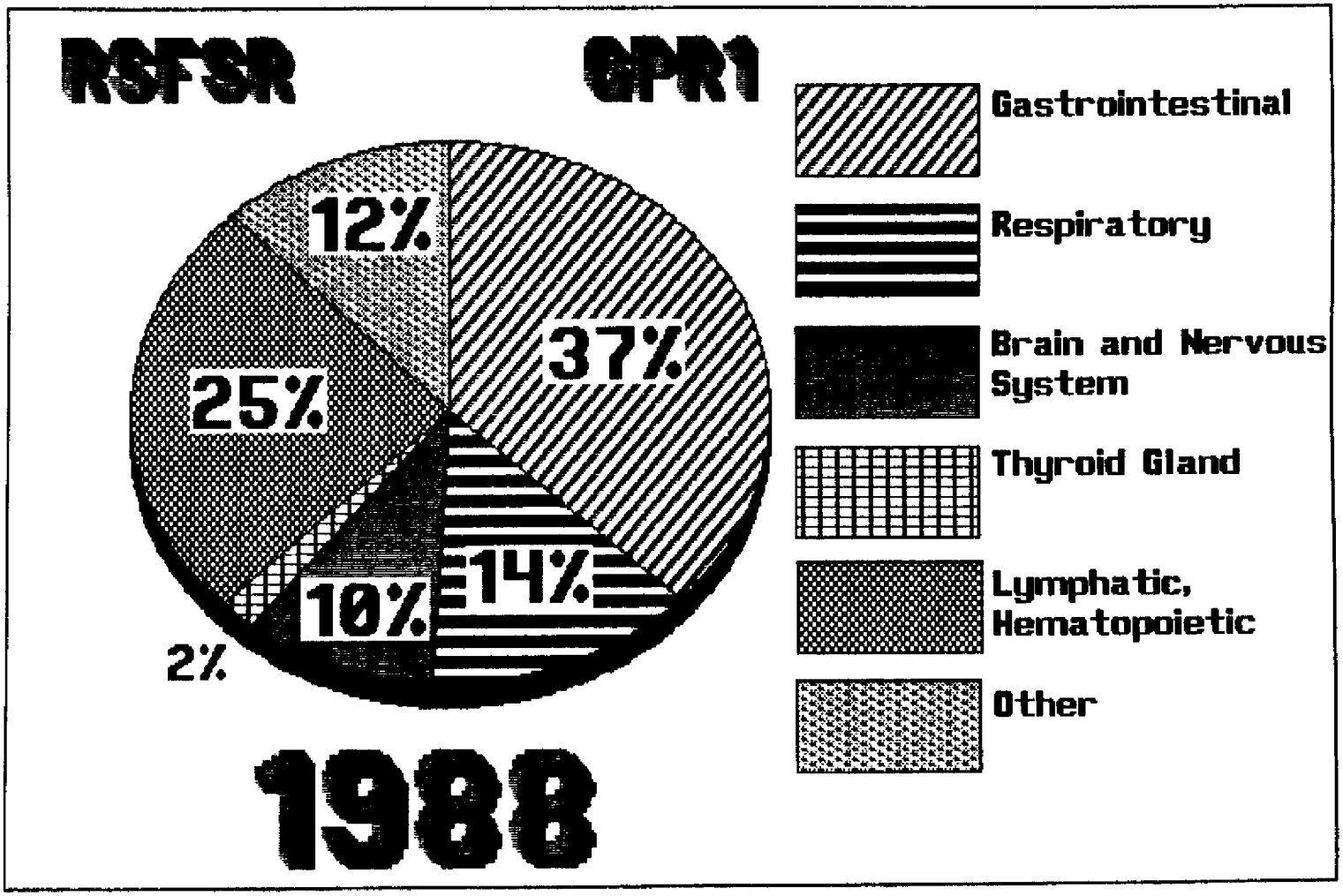
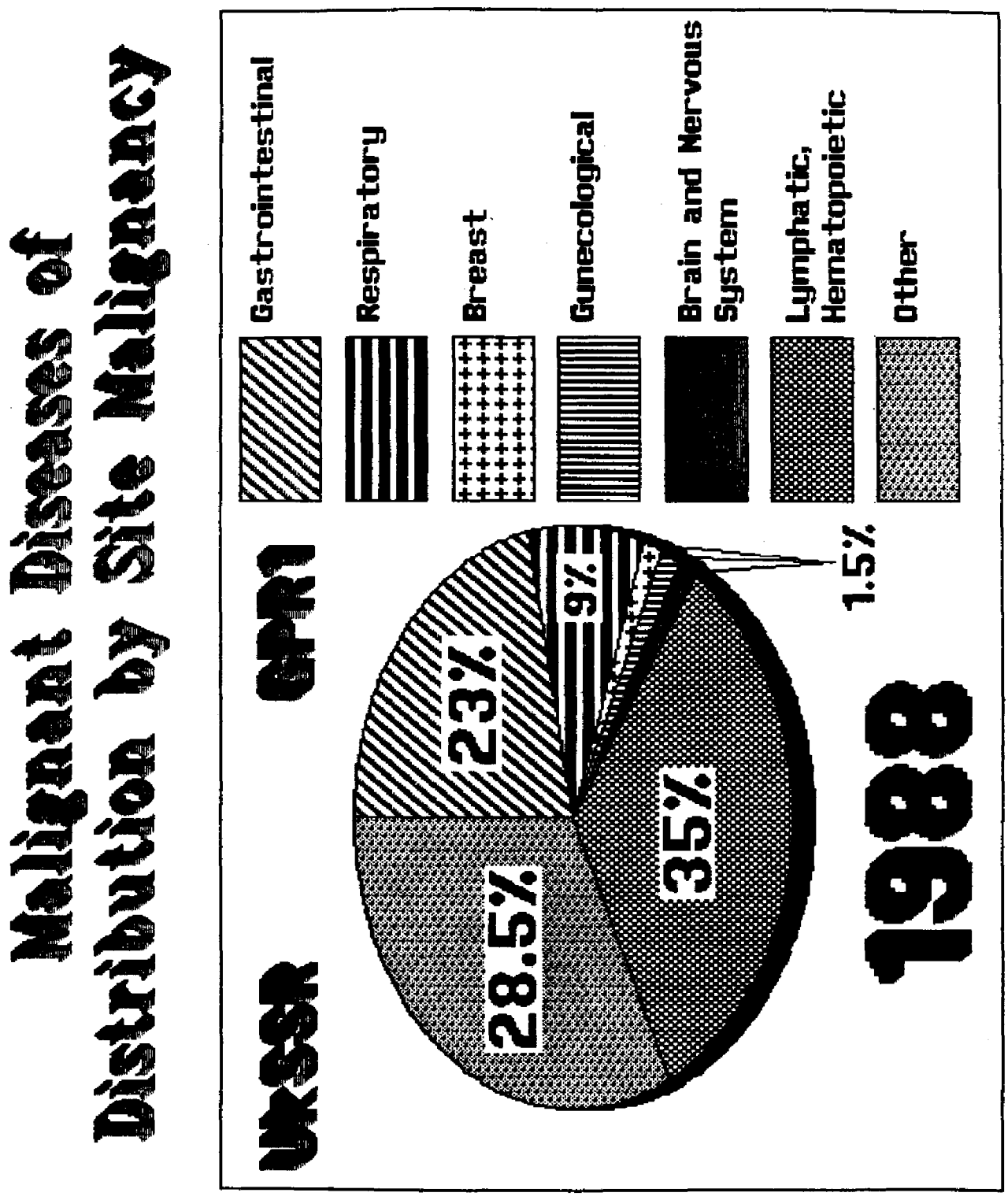


Fig.15

Fig.16


Malignant Diseases of
Distribution by Site Malignancy
USSR
GPR1
1988
Gastrointestinal
Respiratory
Breast
Gynecological
Brain and Nervous System
Lymphatic, Hematopoietic
Other
23%
9%
28.5%
35%
1.5%

Malignant Diseases of Distribution by Site Malignancy

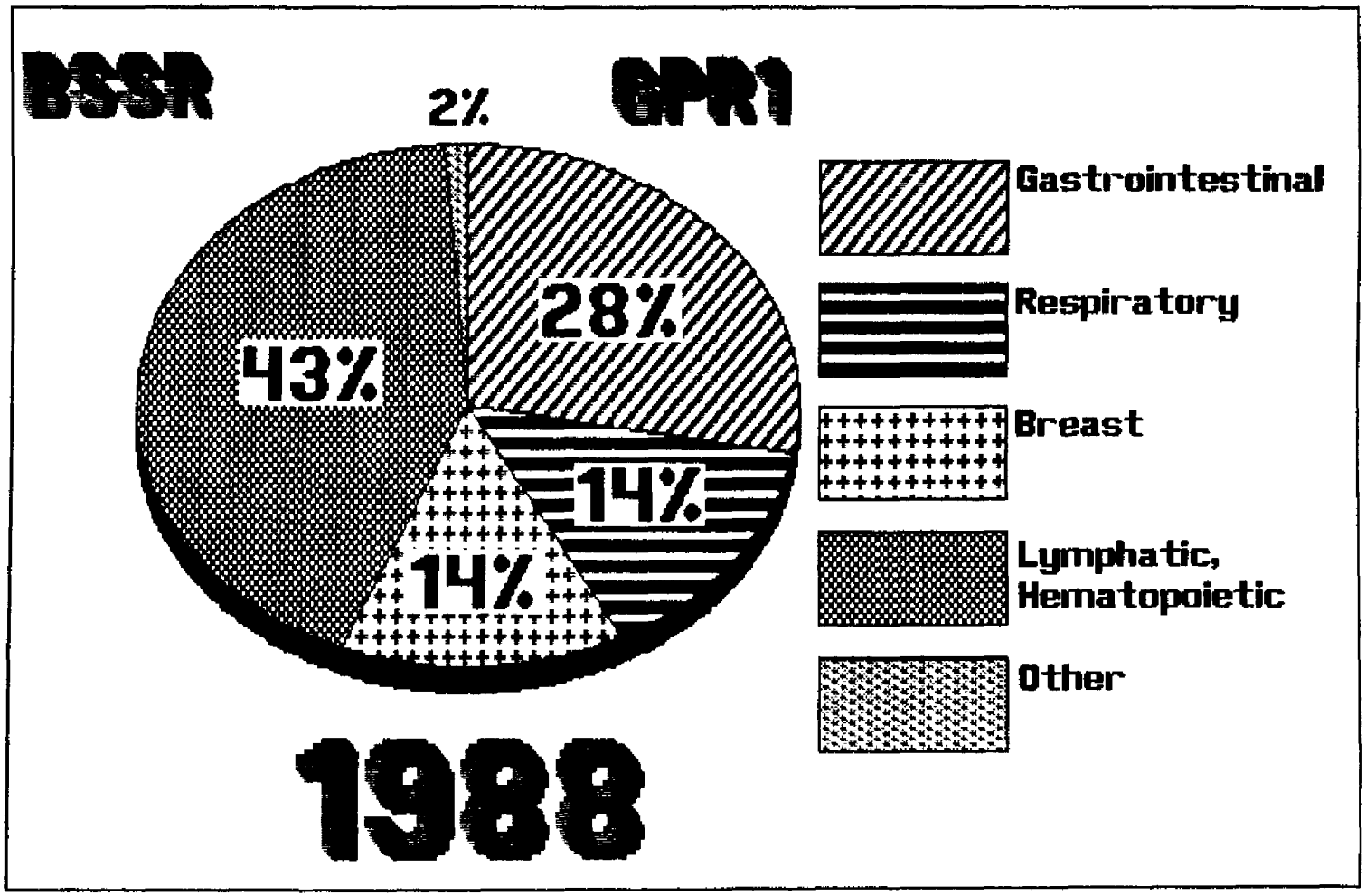


Fig.18

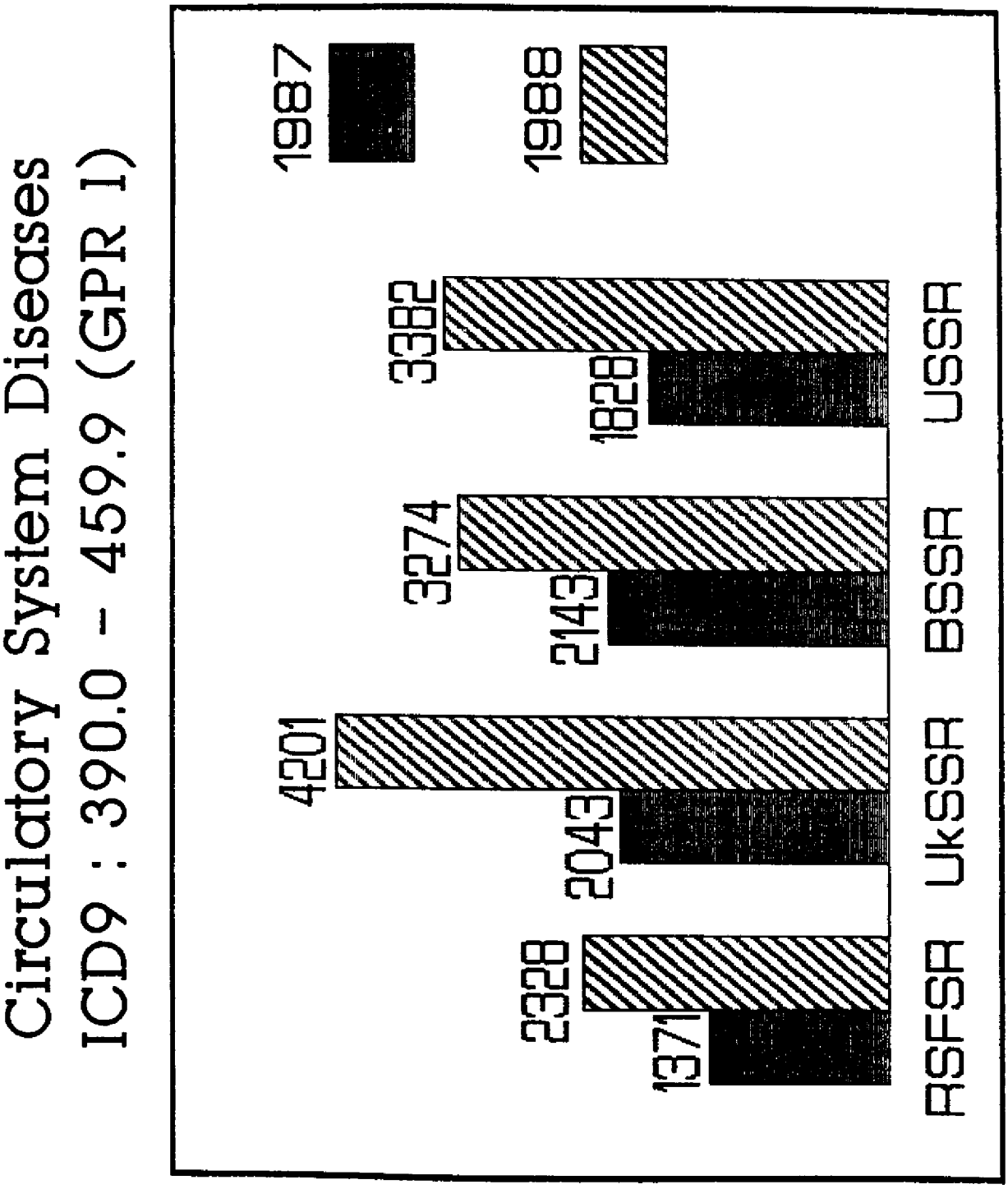

Circulatory System Diseases
ICD9 : 390.0 - 459.9 (GPR 1)
1987
1988
2328
1371
4201
2043
3274
2143
3382
1828
RSFSR
UkSSR
BSSR
USSR

Fig.19

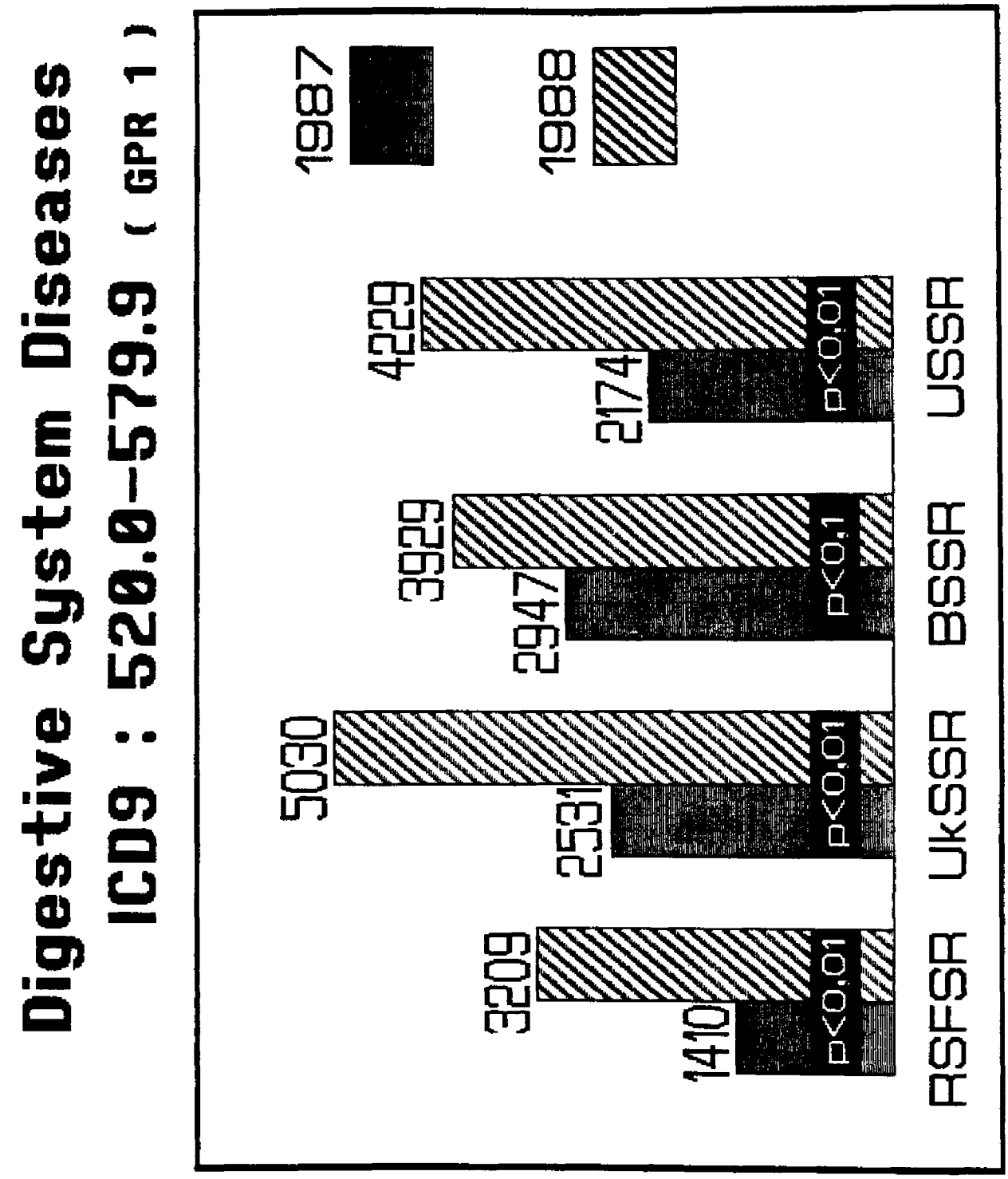

Digestive System Diseases
ICD9 : 520.0-579.9 (GPR 1)
1987
1988
5030
2531
3209
1410
3929
2947
4229
2174
p<0,01
p<0,01
p<0,01
p<0,1
p<0,01
RSFSR
UkSSR
BSSR
USSR

Fig.20

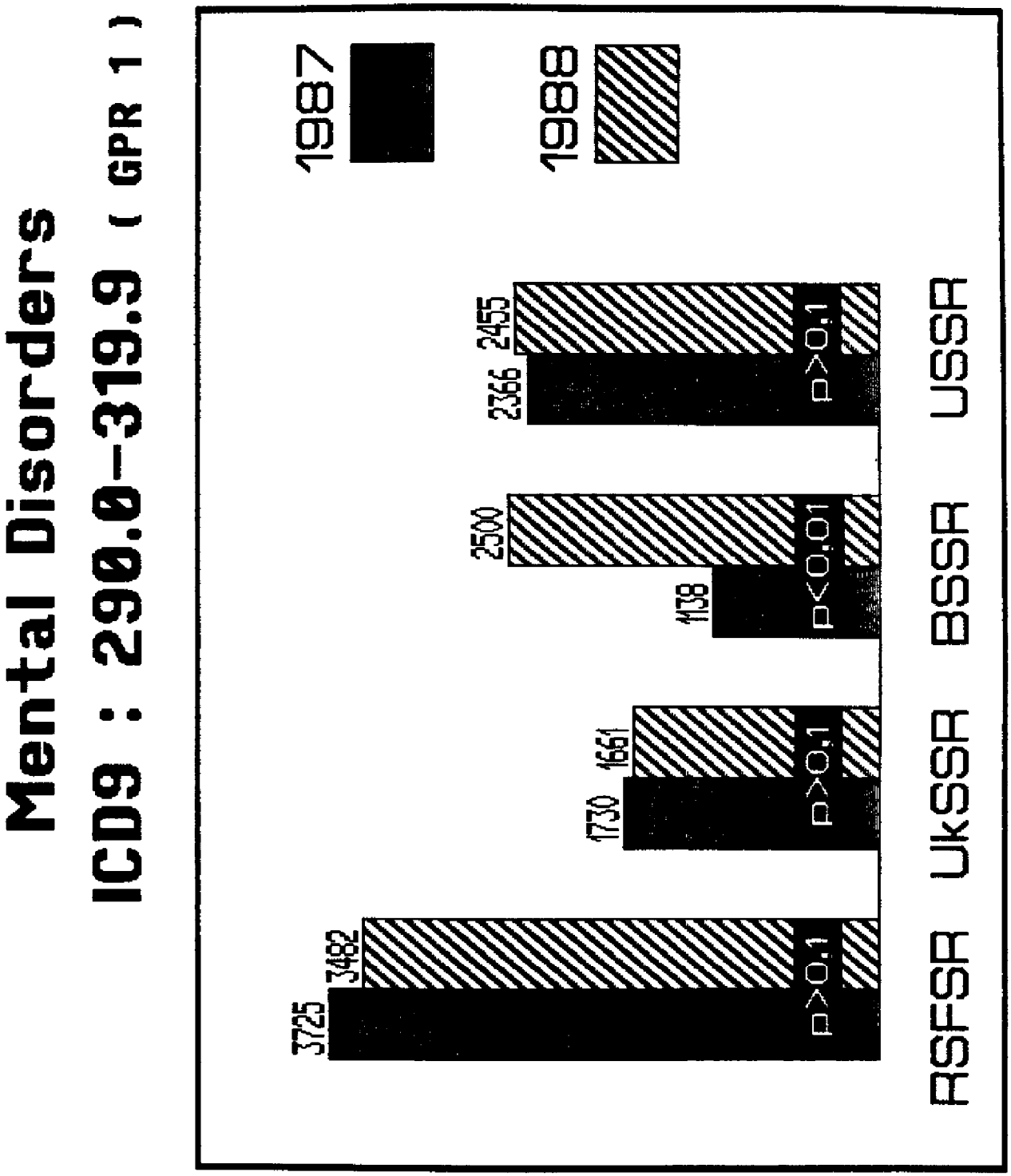

Mental Disorders
ICD9 : 290.0-319.9 (GPR 1)
1987
1988
3725
3482
1730
1661
2500
1138
2366
2455
p>0.1
p<0.01
p>0.1
p>0.1
RSFSR
UkSSR
BSSR
USSR

Fig.21

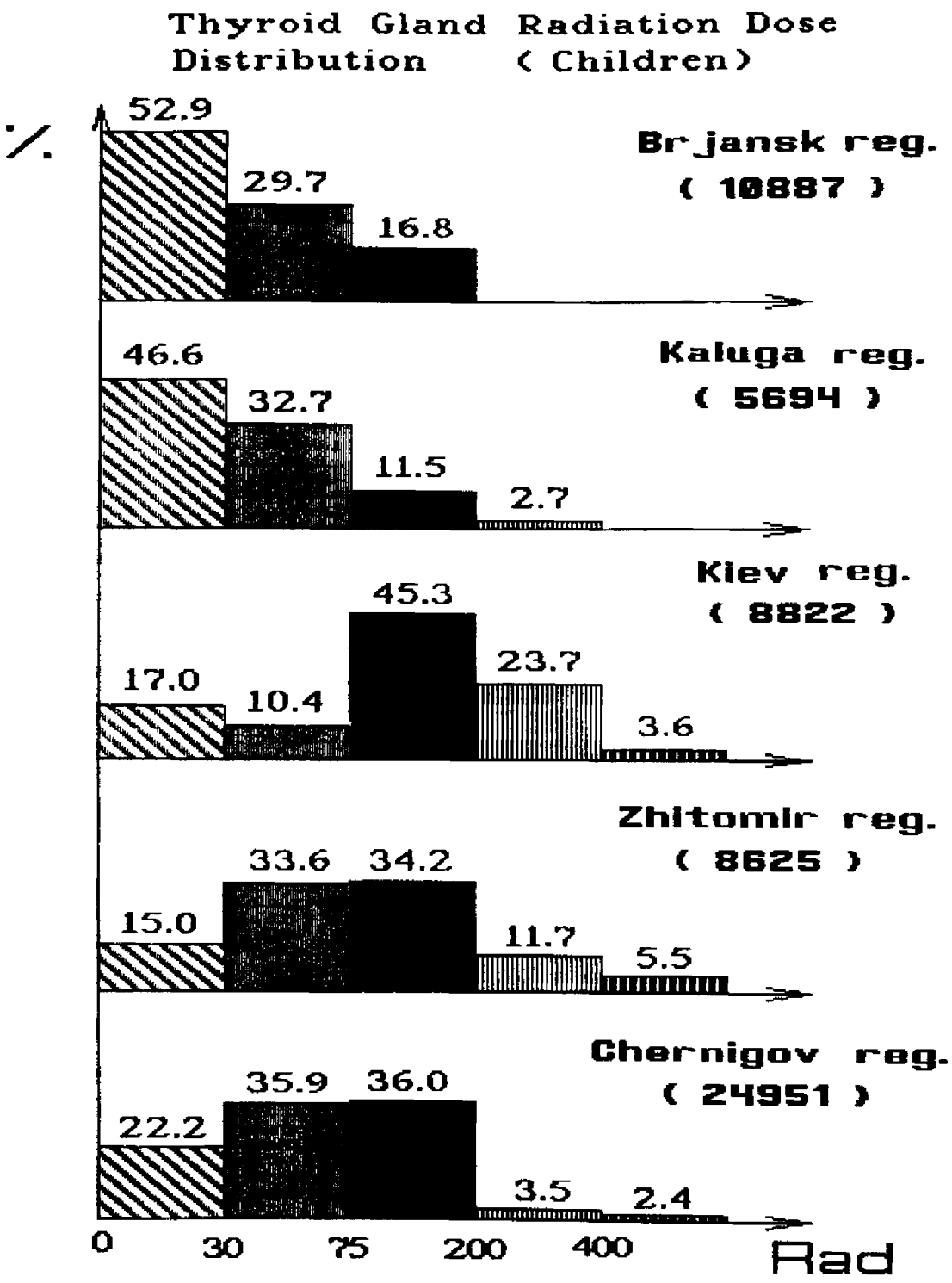
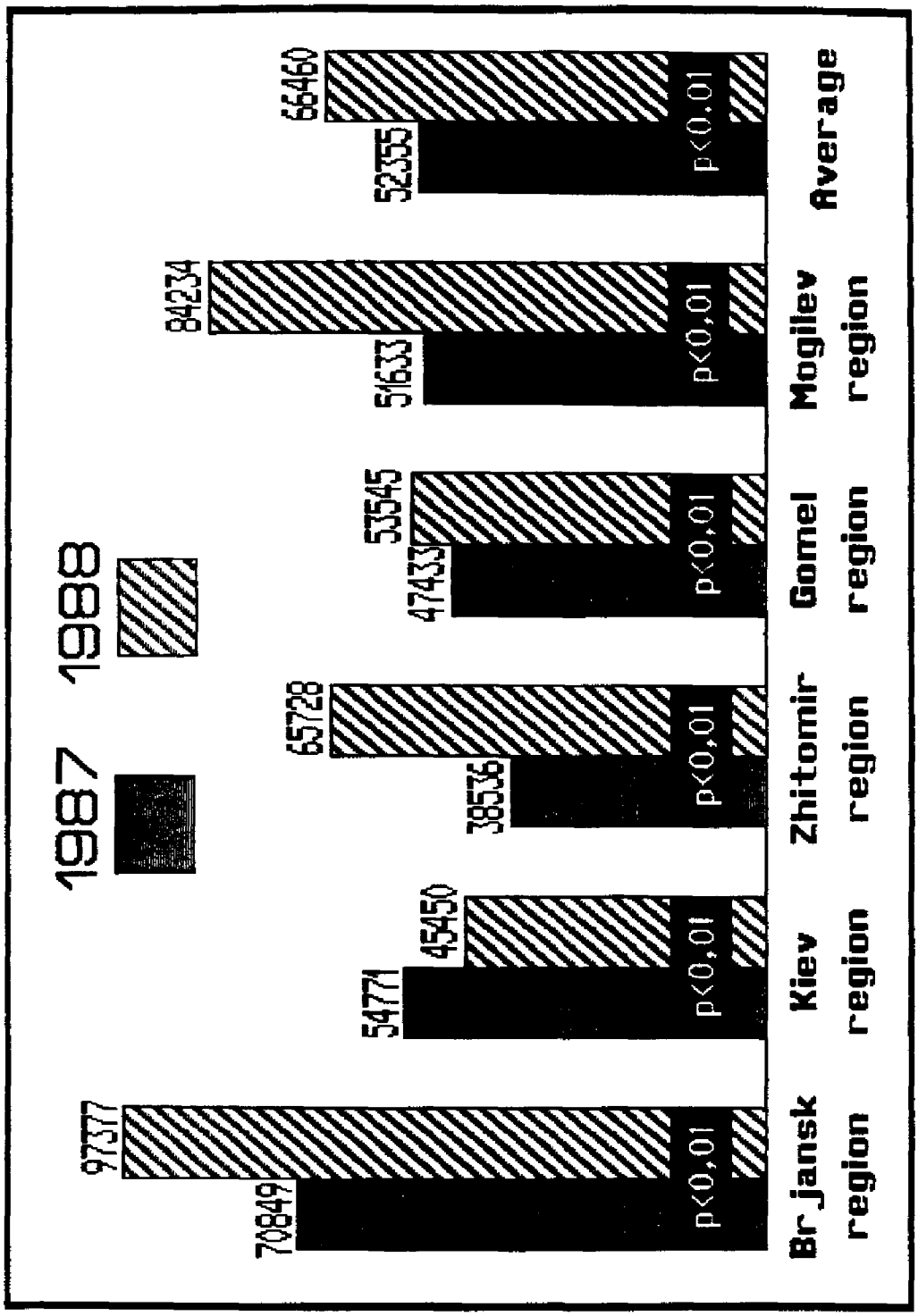

Thyroid Gland Radiation Dose
Distribution (Children)
%
52.9
29.7
16.8
Brjansk reg.
(10887)
46.6
32.7
11.5
2.7
Kaluga reg.
(5694)
45.3
23.7
17.0
10.4
3.6
Kiev reg.
(8822)
33.6
34.2
15.0
11.7
5.5
Zhitomir reg.
(8625)
35.9
36.0
22.2
3.5
2.4
Chernigov reg.
(24951)
0
30
75
200
400
Rad

Fig.22


All clases of Diseases
Children and Adolescents
1987
1988
97377
70849
p<0,01
54771
45450
p<0,01
65728
38536
p<0,01
53545
47433
p<0,01
84234
51633
p<0,01
66460
52355
p<0,01
Br jansk region
Kiev region
Zhitomir region
Gomel region
Mogilev region
Average

Thyroid Diseases
ICD9 : 240.0-246.9
Children and Adolescents

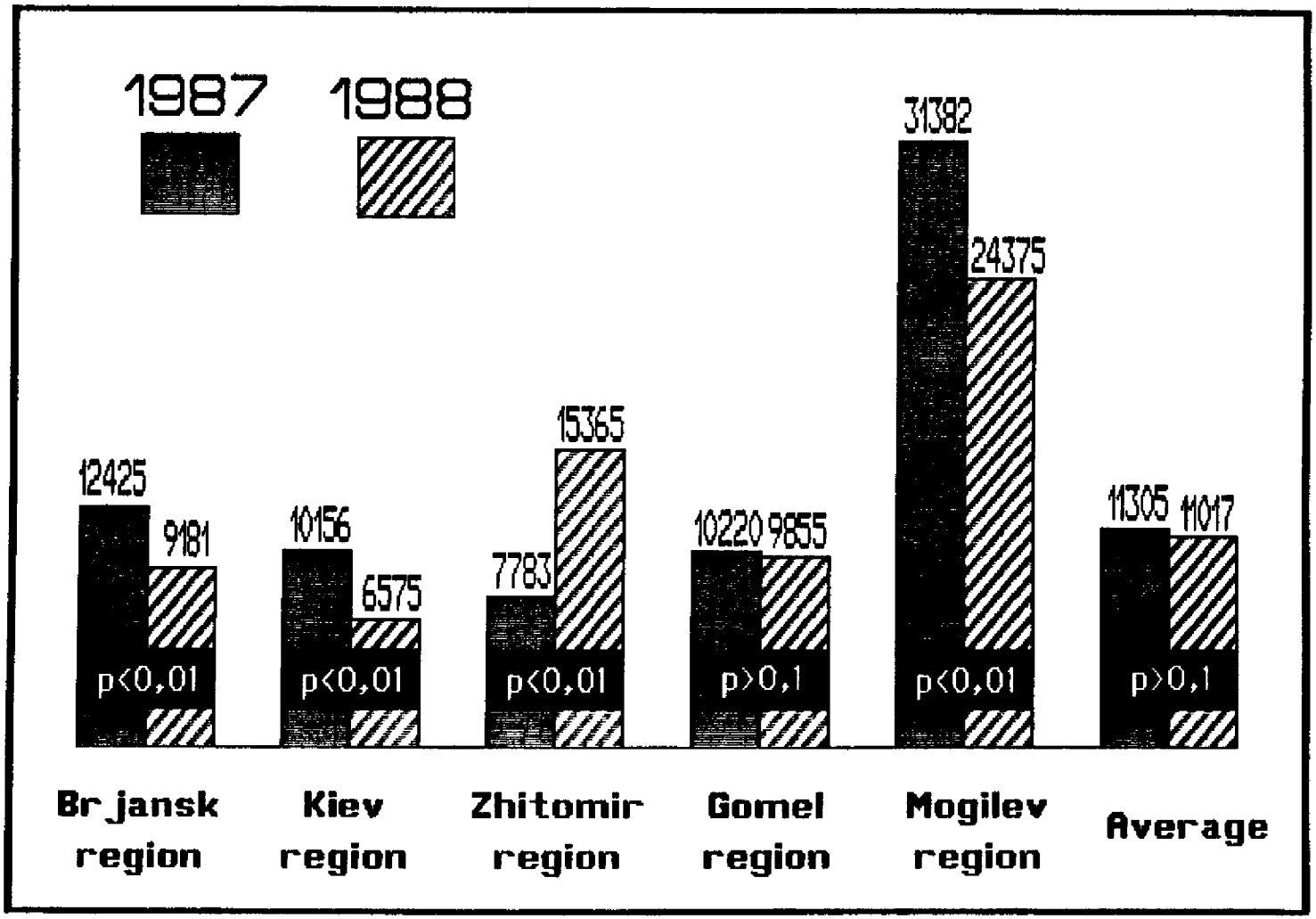
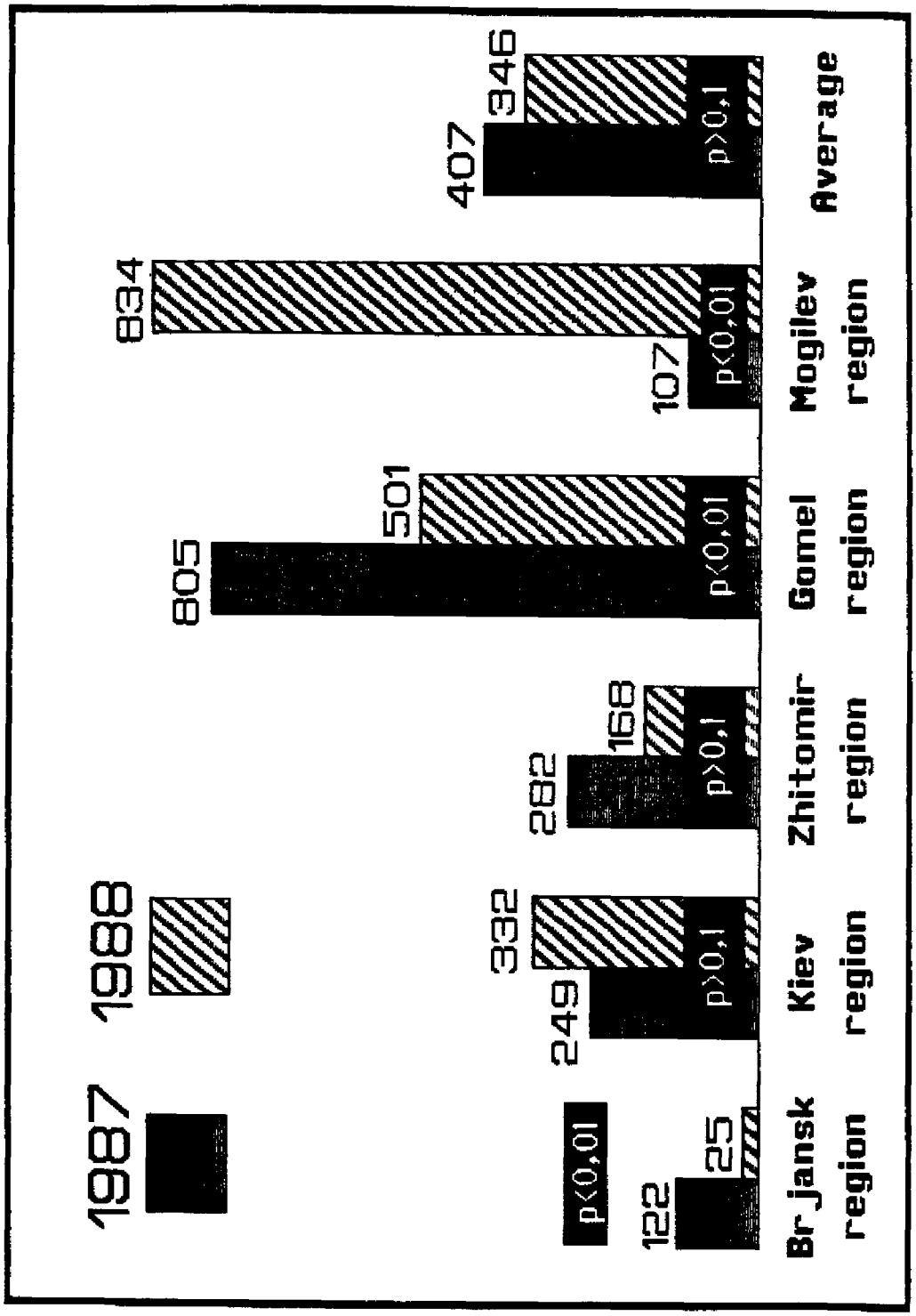


Fig.23

PEP/90.11

Fig.24


Anemia
ICD9 : 280.0-284.9
Children and Adolescents
1987
1988
122
25
p<0,01
249
332
805
834
282
168
p>0,1
501
107
p<0,01
407
346
p>0,1
Br jansk region
Kiev region
Zhitomir region
Gomel region
Mogilev region
Average