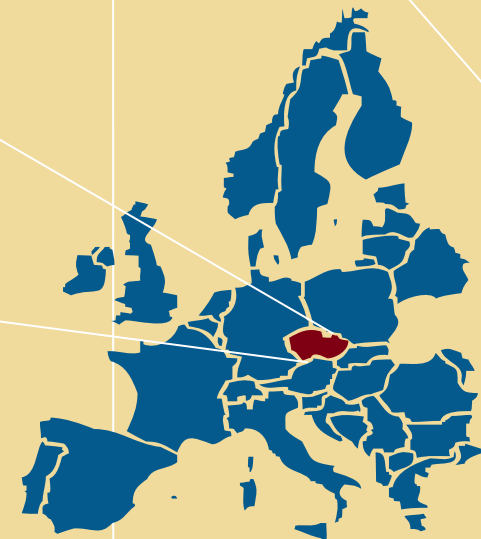




Hospital-based data in regional and local strategies optimizing CRC control and management: real-world outcomes of the Czech National Cancer Control Programme

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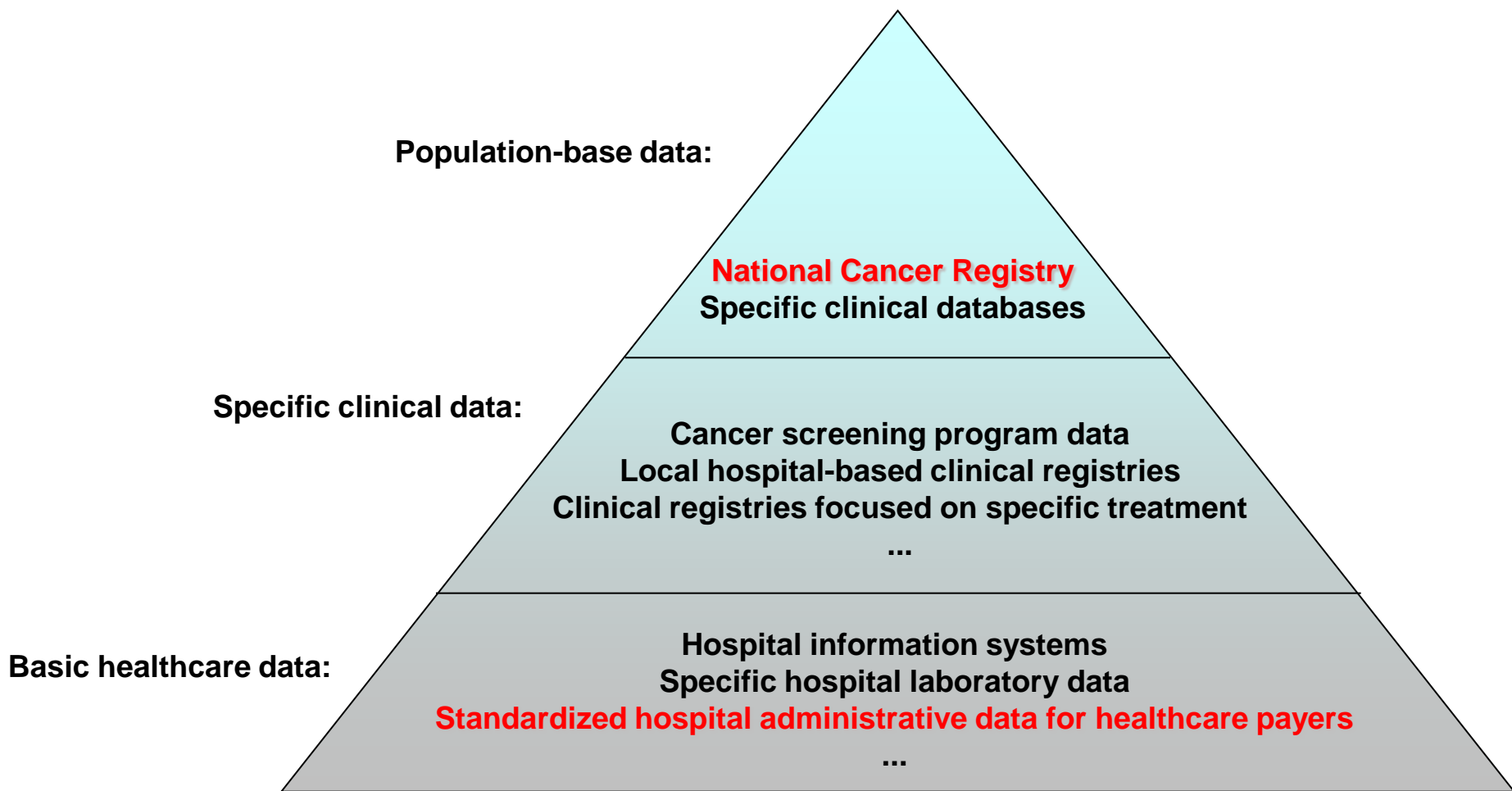
THIS PROJECT IS SUPPORTED BY THE EUROPEAN SOCIAL FUND AND THE STATE BUDGET OF THE CZECH REPUBLIC.

1) Available data



THIS PROJECT IS SUPPORTED BY THE EUROPEAN SOCIAL FUND AND THE STATE BUDGET OF THE CZECH REPUBLIC.

Available data sources for cancer care control



Current situation in Czech Republic: only two national-wide data sources with fully standardized structure.

National Cancer Registry of the Czech Republic



Available population-based data since 1977

NCR

National Cancer Registry

/1977 – 2009: > 1,7 mil. cancer records/

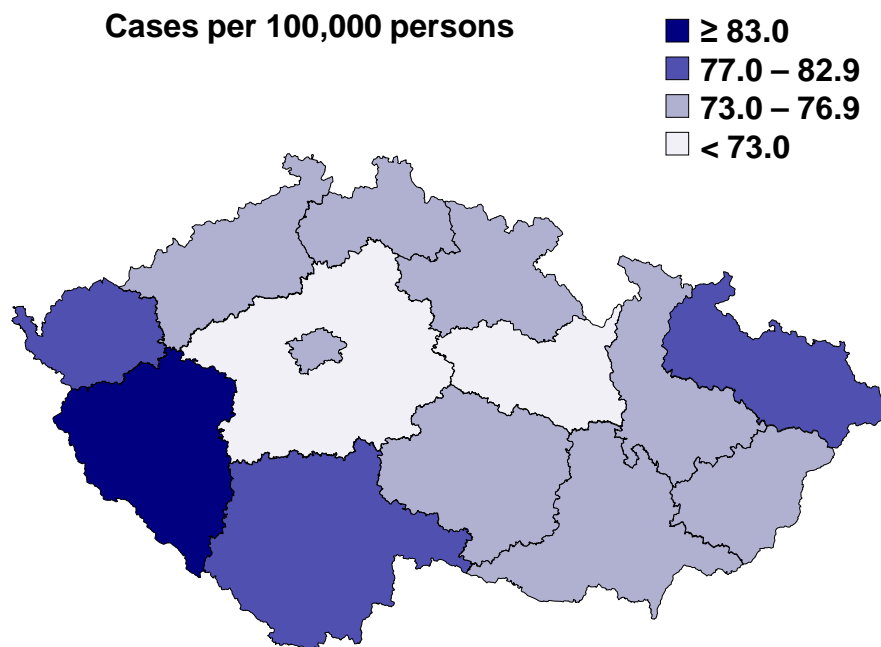
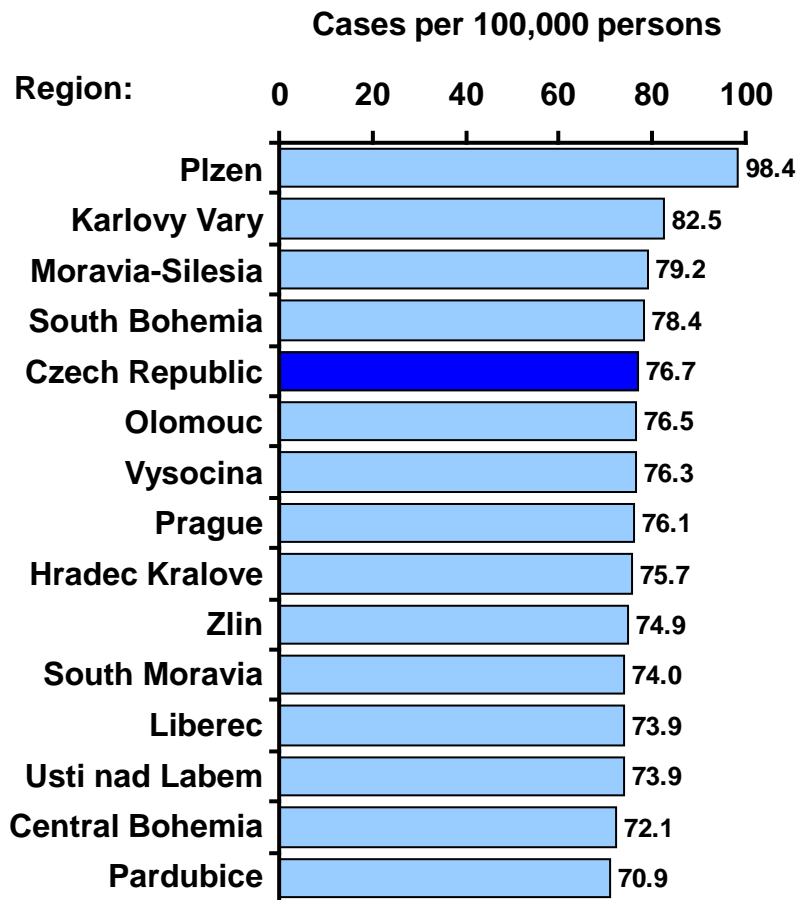
+ Demographic data

+ Death Records Database

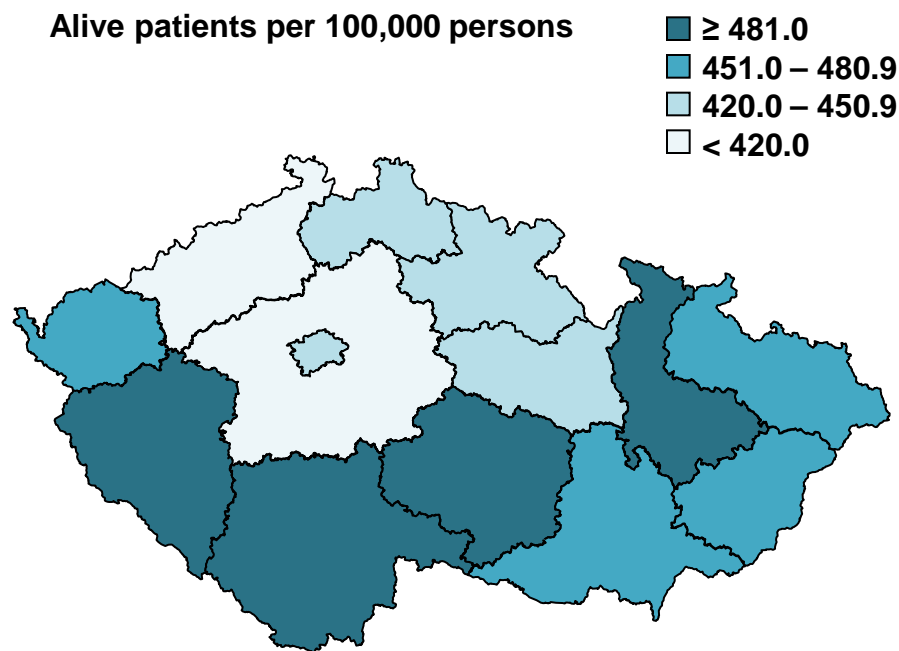
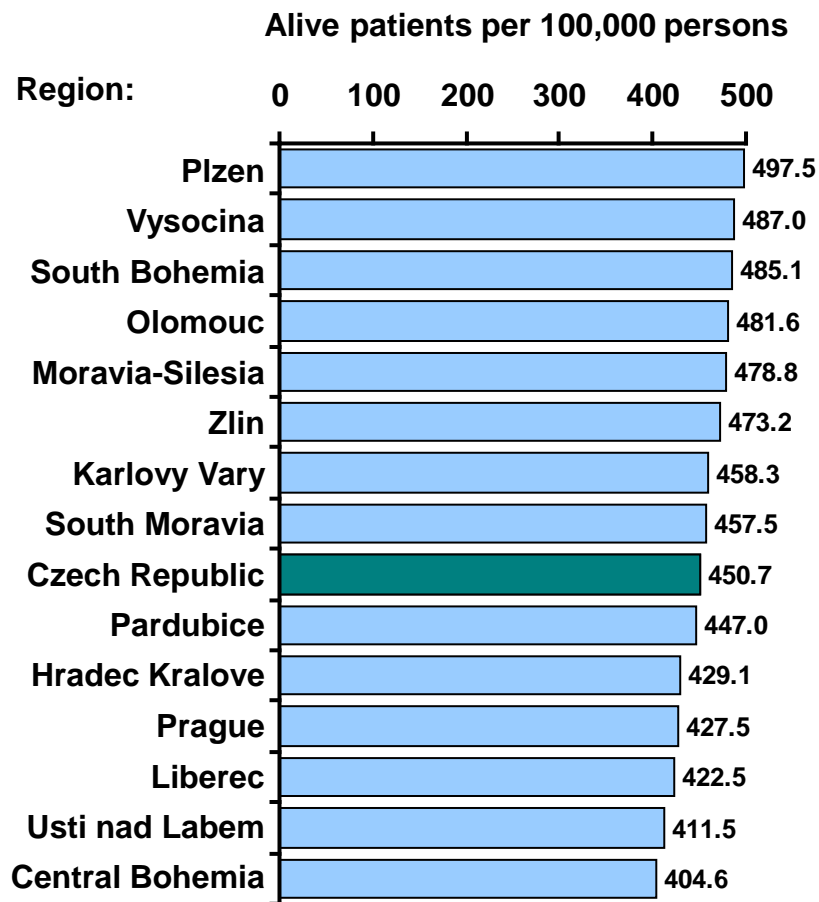
Main NCR
added value:
clinical stage
TNM classification

NCR is fully representative population-based registry with validated records on diagnostics, primary therapy and survival of all cancer patients in the Czech Republic.

National Cancer Registry: Incidence of colorectal cancer in regions of the Czech Republic in period 2005-2009

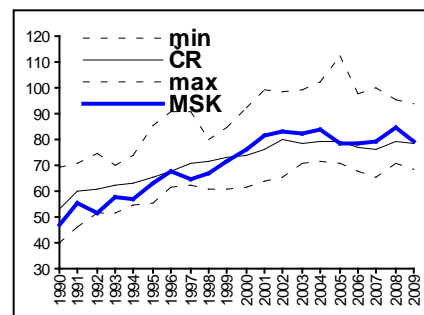
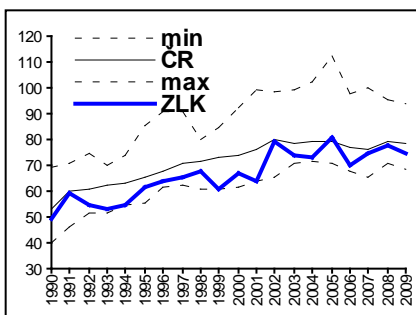
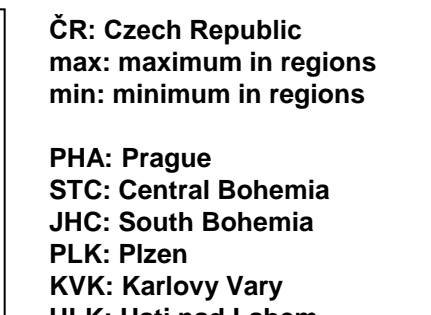
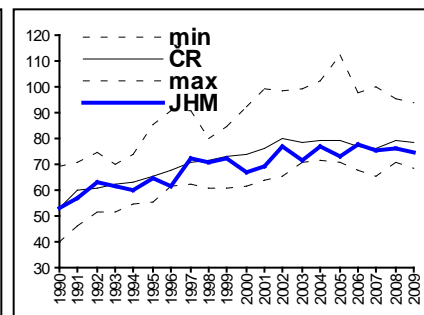
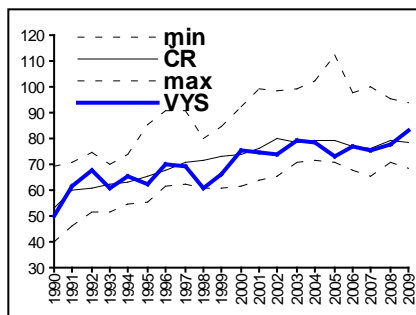
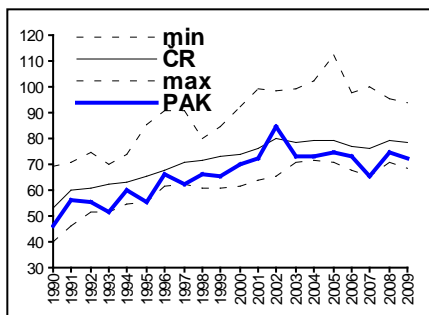
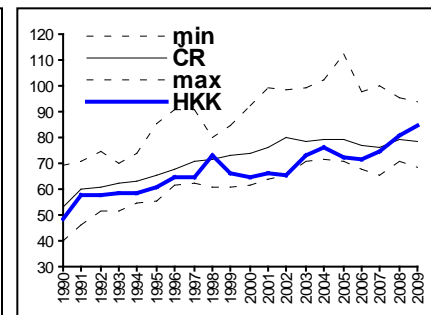
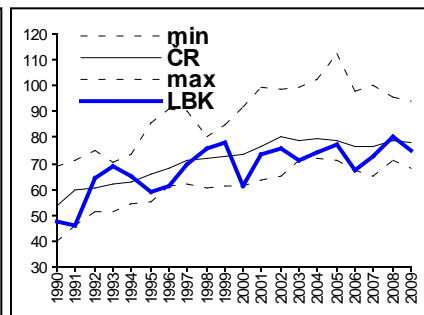
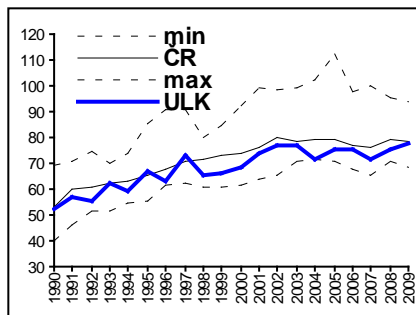
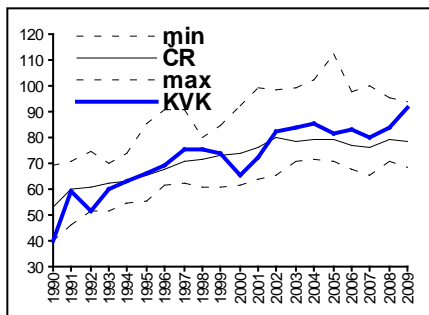
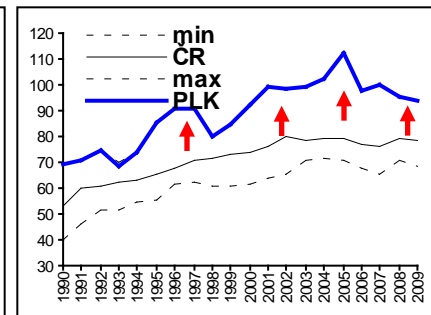
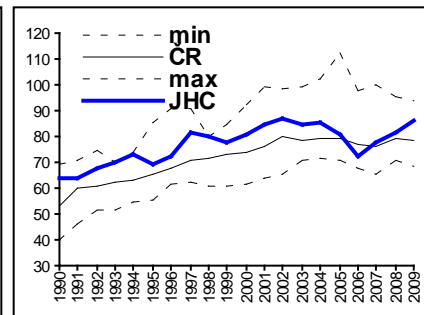
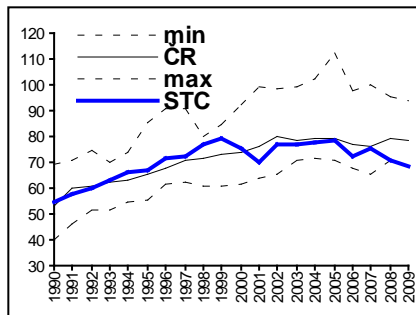
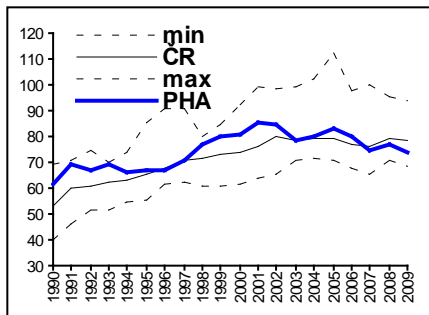


National Cancer Registry: Prevalence of colorectal cancer in regions of the Czech Republic at 31/12/2009



National Cancer Registry: Trends of incidence of colorectal cancer in regions of the Czech Republic

Cases per 100,000 persons

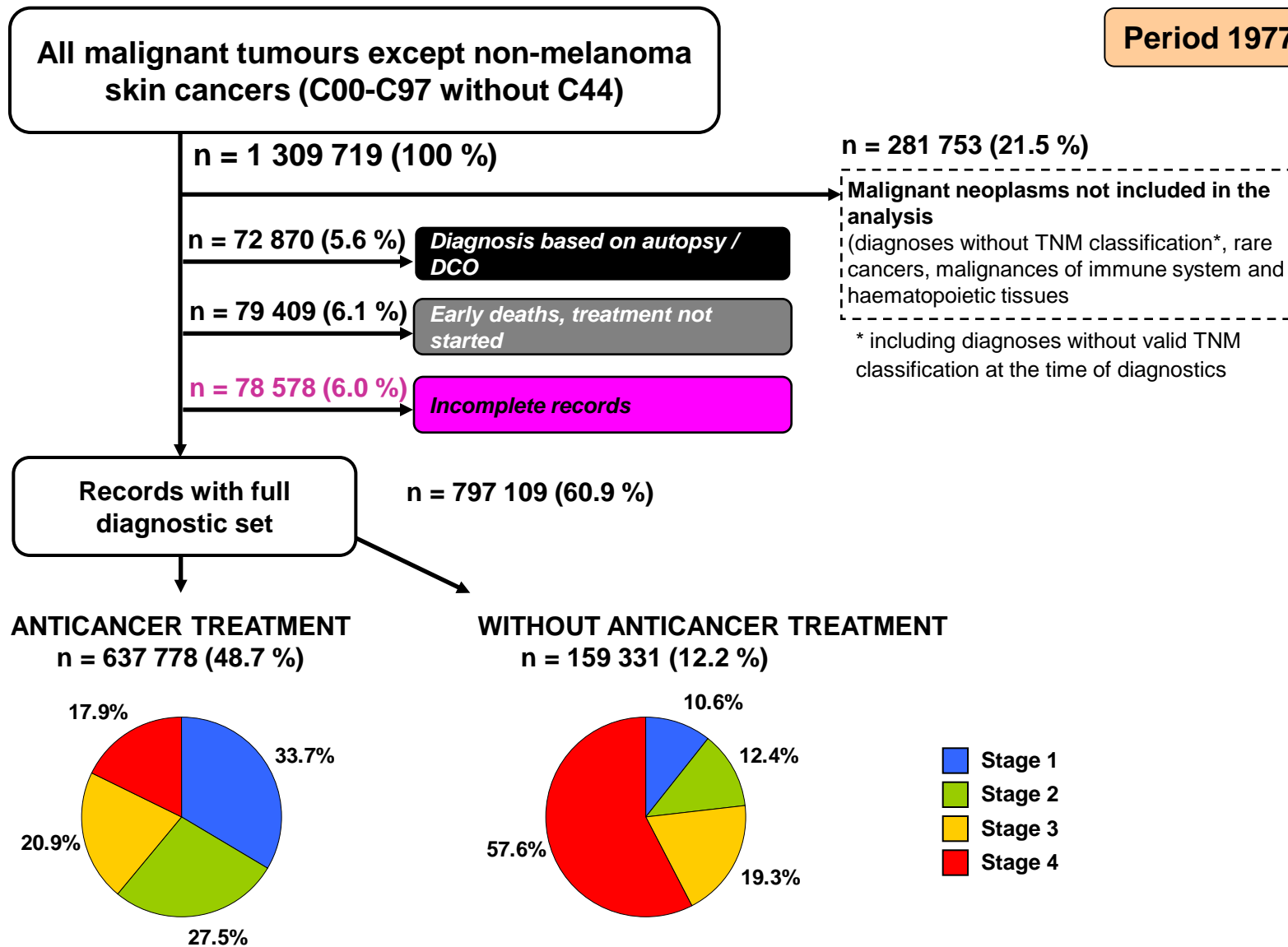


ČR: Czech Republic
max: maximum in regions
min: minimum in regions

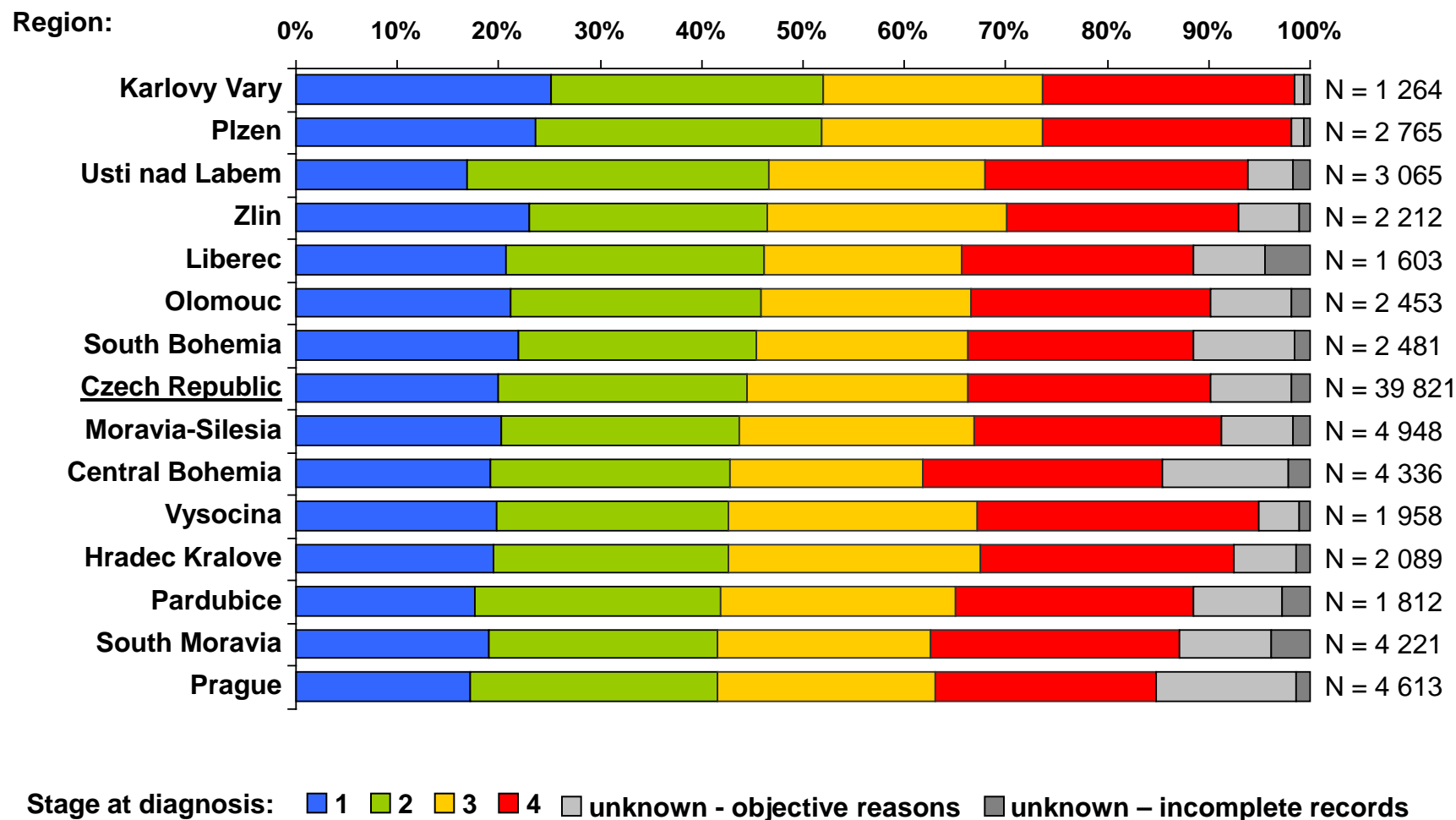
- PHA: Prague
- STC: Central Bohemia
- JHC: South Bohemia
- PLK: Plzen
- KVK: Karlovy Vary
- ULK: Usti nad Labem
- LBK: Liberec
- HKK: Hradec Kralove
- PAK: Pardubice
- VYS: Vysocina
- JHM: South Moravia
- OLK: Olomouc
- ZLK: Zlin
- MSK: Moravia-Silesia

National Cancer Registry: Quality and completeness of the diagnostic data

Period 1977 - 2008

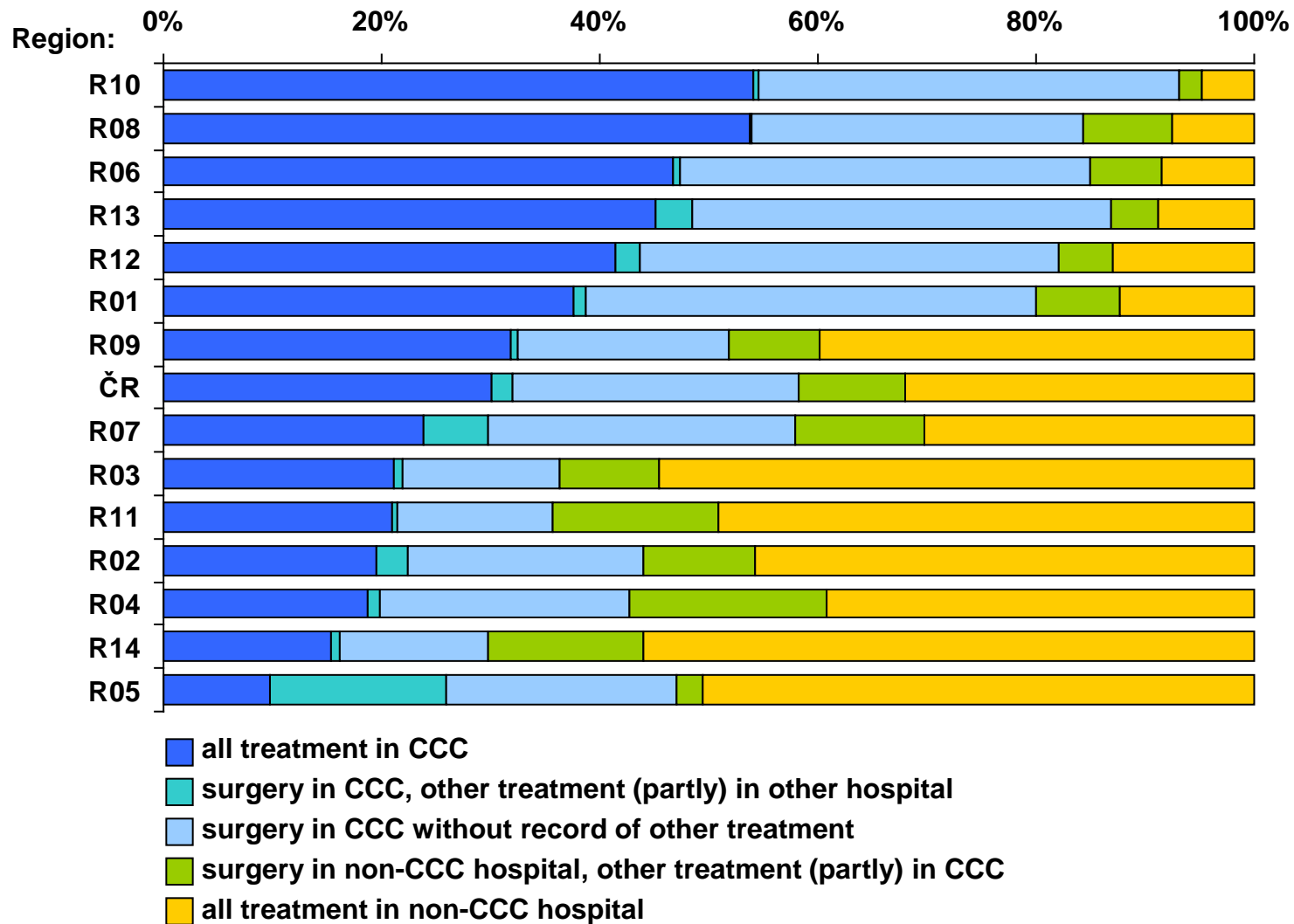


Colorectal cancer: stage at diagnosis in regions of the Czech Republic in period 2005-2009



National Cancer Registry: Mapping of primary cancer treatment

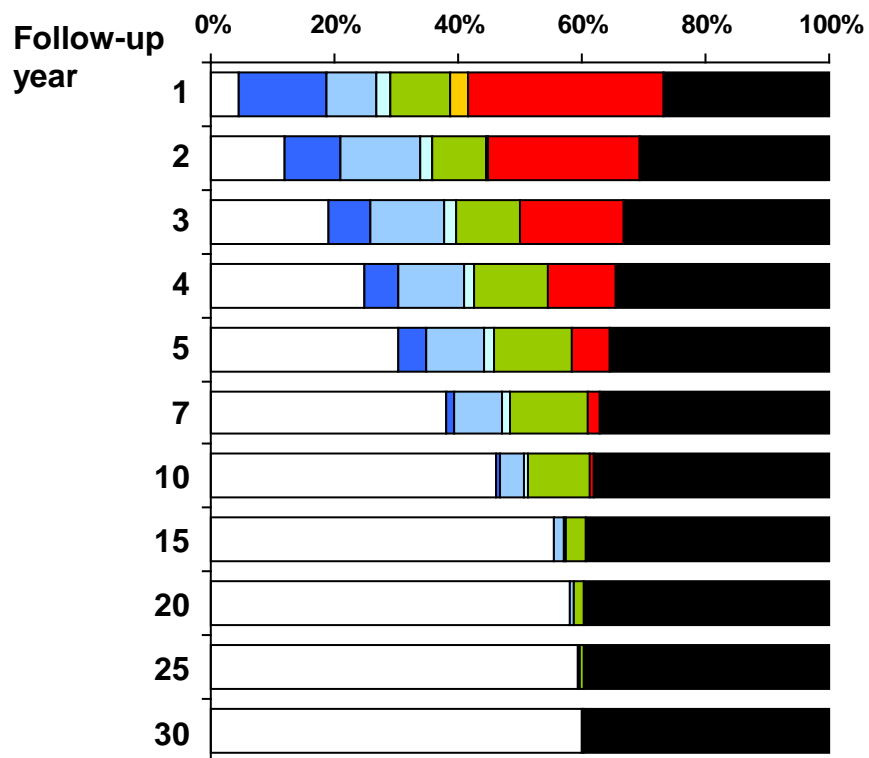
Colorectal cancer with primary therapy, period 2001-2005



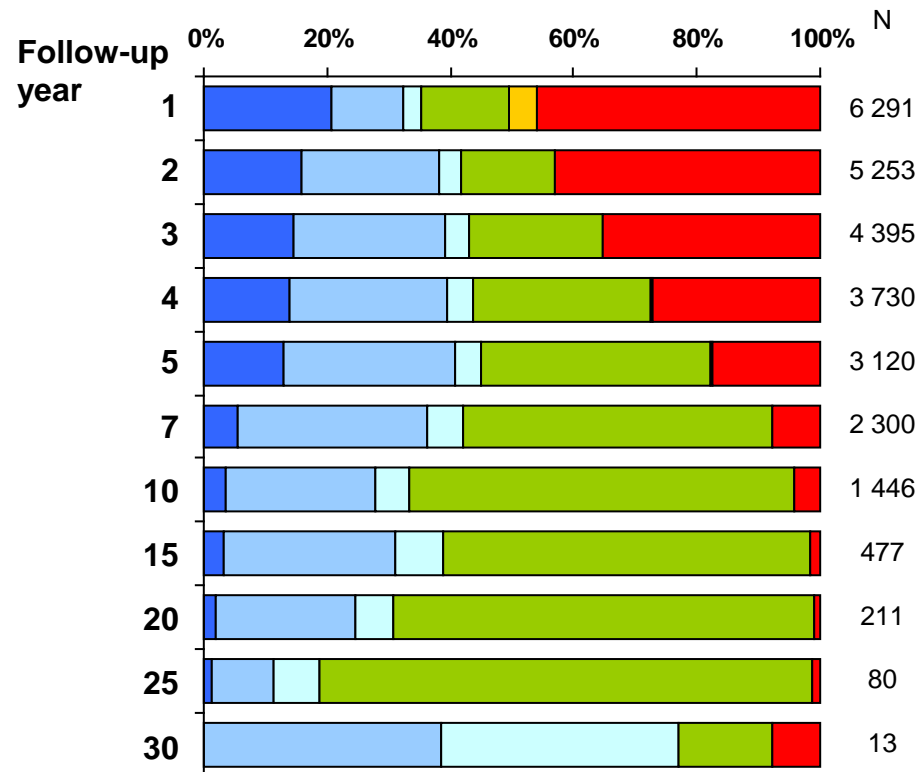
National Cancer Registry: Follow-up records

Example: all malignant neoplasms related to one hospital

All patients (N = 9 162)



Alive patients in follow-up



not in follow-up
 alive with treatment
 alive, not treated
 alive, unknown treatment status
 missing follow-up in given year
 missing follow-up responsible hospital not mentioned
 missing follow-up, status of the patient unknown
 deceased patients

SUMMARY: National Cancer Registry as a data source

ADVANTAGES

- **standardized population-based epidemiological source**
- **long term data**
- **information about residence of patients**
- **complete diagnostic information (validated diagnosis, TNM, stage, morphology...)**
- **information on primary therapy (type of treatment, hospitals)**
- **survival status of the patient (incl. death cause record)**

PROBLEMS

- **information only on primary care and only in basic form (yes/no)**
- **incomplete follow-up data, no information on subsequent cancer care**
- **no information on co-morbidities**
- **delay in accessibility of complete and validated data (about 3 years)**

Standardized hospital administrative data for healthcare payers

Intended to report healthcare events to healthcare payers for reimbursement

- diagnostic events**
- treatment events**
- administered medication**
- hospitalization other events related to healthcare**

- information on diagnosis**
- time-related information**
- information on costs**

Standardized hospital administrative data for healthcare payers

ADVANTAGES

- **standardized data structure in all healthcare facilities**
- **data in the same structure are reported to all healthcare payers**
- **information on diagnosis**
- **information on costs**
- **all these data reported into National Reference Centre**

PROBLEMS

- **without any specific information about disease**
- **limited information about patient (age, sex)**
- **diagnoses reported in healthcare events are not validated**
- **reported diagnoses are not always related to the main disease**
- **time limited data source, long-term data are not available**

Standardized hospital administrative data for healthcare payers: examples

Healthcare events reported with the diagnosis of interest (C18-C20)

Hospitalizace C18/C18	13.10.2008	51359	RESEKCE A ANASTOMÓZA TLUSTÉHO STŘEVA NEBO REKTOSIGMATU BŘÍŠNÍM PŘÍSTUPEM, KOLOMYOTOMIE
Hospitalizace Z51/C19	15.4.2009	43315	RADIOTERAPIE LINEÁRNÍM URYCHLOVAČEM S POUŽITÍM FIXAČNÍCH POMŮCEK, BLOKŮ, KOMPENSÁTORŮ APOD. (1 POLE)
Hospitalizace C19/C19	13.5.2002	12665	5-FLUOROURACIL EBEWE (Fluorouracil L01BC02)
Ambulantní ošetření C20	5.12.2007	HVLZ 0028396	AVASTIN (Bevacizumab L01XC07)

Healthcare events in patients with the diagnosis of interest (C18-C20), but events reported to other diagnosis - continuing care, diagnostic events

Ambulantní ošetření N63	29.4.2005	9532	PROHLÍDKA OSOBY DISPENZARIZOVANÉ
Ambulantní ošetření C53	10.8.1999	42023	KONTROLNÍ VYŠETŘENÍ ONKOLOGEM
Ambulantní ošetření K30	21.11.2000	81235	TUMORMARKERY CA 19-9, CA 15-3, CA 72-4, CA 125
Hospitalizace C50/C50	18.7.2002	15403	KOLOSKOPIE NEÚPLNÁ (NEBO SIGMOIDEOSKOPIE)
Ambulantní ošetření D12	30.9.2009	47302	(VZP) HYBRIDNÍ VÝPOČETNÍ A POZITRONOVÁ EMISNÍ TOMOGRAFIE (PET/CT)

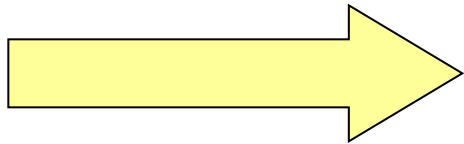
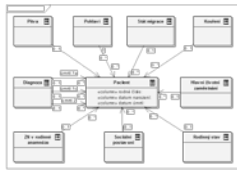
2) Combined data sources



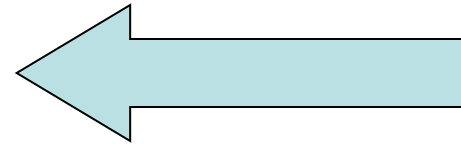
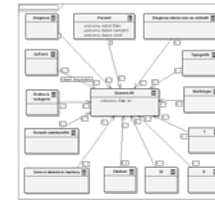
THIS PROJECT IS SUPPORTED BY THE EUROPEAN SOCIAL FUND AND THE STATE BUDGET OF THE CZECH REPUBLIC.

Basic idea: merging of data sources

National Cancer Registry (NCR)

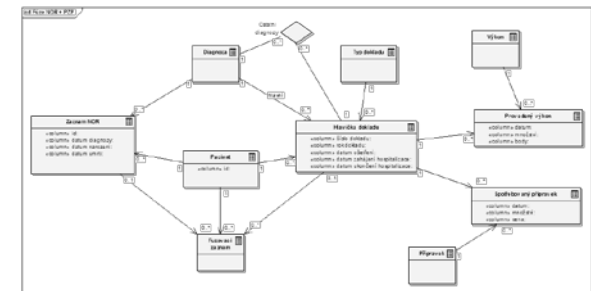
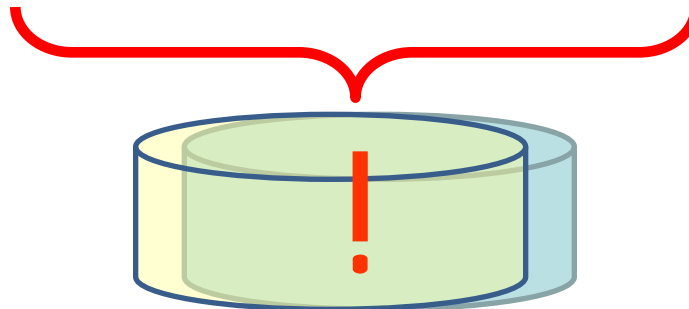


Administrative hospital records



Tumor diagnosis
TNM classification and stage
Primary tumor treatment

Patients treatment
Hospital processes and procedures
Approximate costs



New data source with new enhanced information power

Merging data of National Cancer Registry and Administrative hospital records

+ ADVANTAGES

- complete information on diagnosis
- complete information on patient
- complete information on healthcare

- PROBLEMS

- missing specific clinical and laboratory data
- legislative limitation to merging data sources on national level using personal identification

Current legislative situation in the Czech Republic enables to merge data sources only on the level of individual hospitals.

Example: Merged of data of 3 hospitals (CCCs) aggregated data, period 2004-2010

237,403 patients in total (100 %)

C: Cancer patients without treatment records

only NCR data

Patients associated with hospital in NCR data without treatment records in hospital

2,791 patients (1.2%),
2,979 cancer records

B: Other hospital patients associated with cancer treatment

only hospital data

Patients without NCR record

Cancer patients not yet reported in NCR

AX	Cancer diagnosis and anticancer treatment	7,736 patients (3.3 %)
B1	Diagnostic investigation confirming tumour	161 patients (0.1 %)
B2	Screening examination	45,331 patients (19.1 %)
B3	Other treatment or diagnostics in suspected cancers	30,007 patients (12.6 %)
B4	Other non-malignant diagnoses, other treatment	46,569 patients (19.6 %)

A: Cancer patients treated in hospital in period 2004–2008

A1: Patients of the hospital

NCR + hospital data

Patients associated with hospital in NCR and with treatment records in hospital

59,182 patients (24.9%),
72,419 cancer records

A2: Migrating patients

NCR + hospital data

Patients with anticancer treatment in hospital, not-associated with hospital in NCR data

7,509 patients (3.2%),
8,920 cancer records

NCR + hospital data

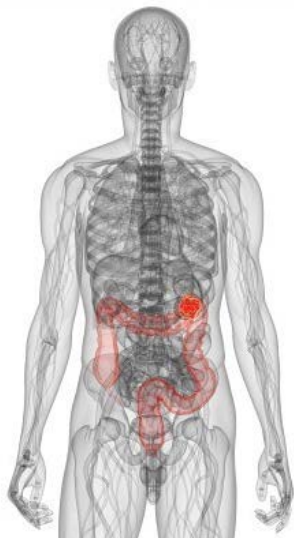
Patients with other treatment in hospital, not-associated with hospital in NCR data

38,117 patients (16.0%),
46,258 cancer records

104,808 patients (44.1%), 127,597 cancer records

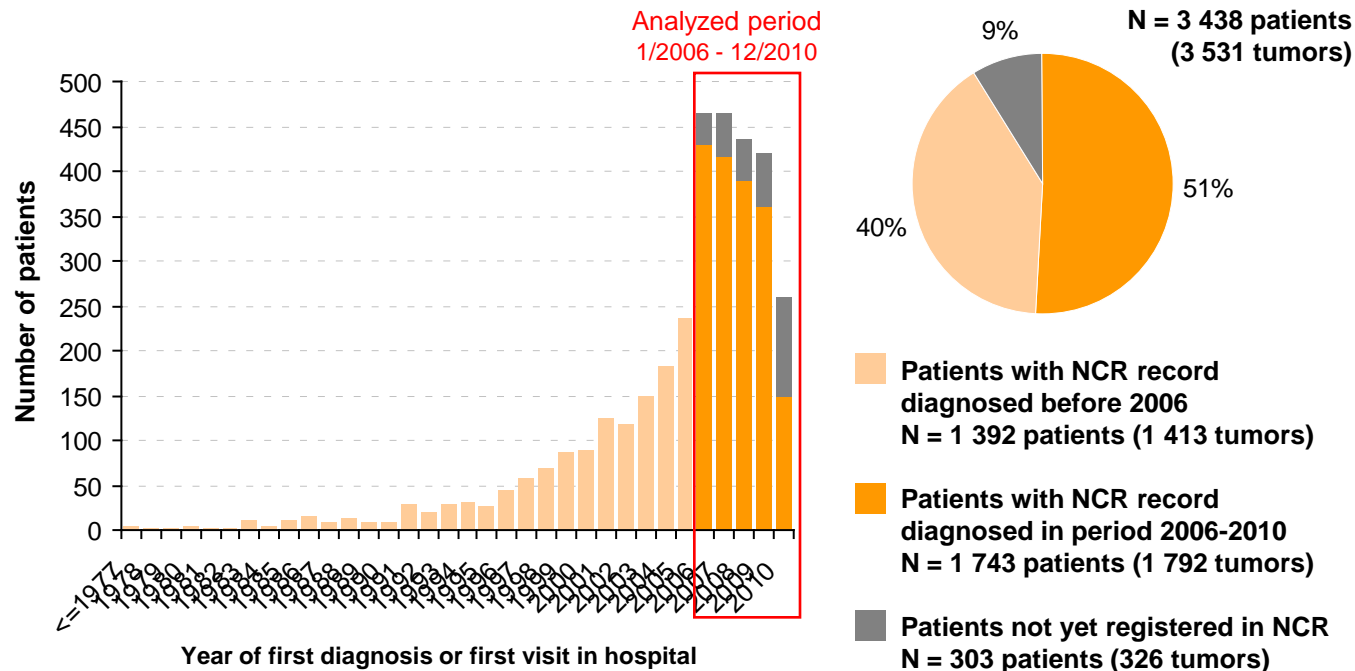
129,804 patients (54.7 %)

1. Colorectal cancer (C18-C20): available data



Overview of available number of patients and tumors in administrative hospital data (period 1/2006 – 12/2010) and in National Cancer Registry (NCR; validated data till 2009).

Available records of patients treated in hospital in period 1/2006 - 12/2010



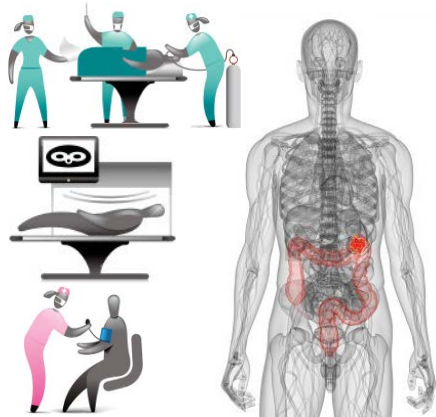
Epidemiological situation according to NCR (C18 - C20)

	<u>CR in total</u>	<u>Prague + Central Bohemia</u>	
	number	number	% CR
Incidence 1977-2009	204 747	48 201	23.5 %
Incidence 2006-2009	31 813	7 087	22.3 %
Incidence 2009	8 093	1 743	21.5 %
Prevalence 2009	47 981	10 492	21.9 %
New patients 2009	6 569	1 347	20.5 %

Patients treated in hospital in period 2006 - 2010

<u>Hospital administrative records</u>	
Patients in total	N = 3 438
Patients with anti-tumor therapy	N = 1 701
Patients with continuing care	N = 3 129
<u>Merged hospital and NCR data</u>	
Patients with NCR record	N = 3 135 (3 205 tumors)
Patients not yet registered in NCR	N = 303 (326 tumors)

2. Colorectal cancer (C18-C20): healthcare burden



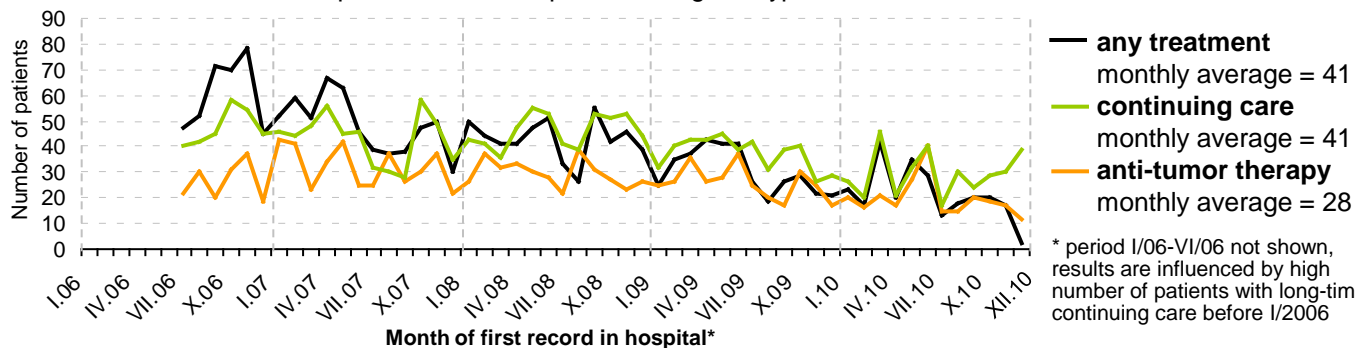
Incidence and prevalence of patients with colorectal cancer with anti-tumor or continuing treatment in hospital in period 1/2006 – 12/2010. Anti-tumor therapy is evaluated as separated type of treatment.

Prevalence of patients

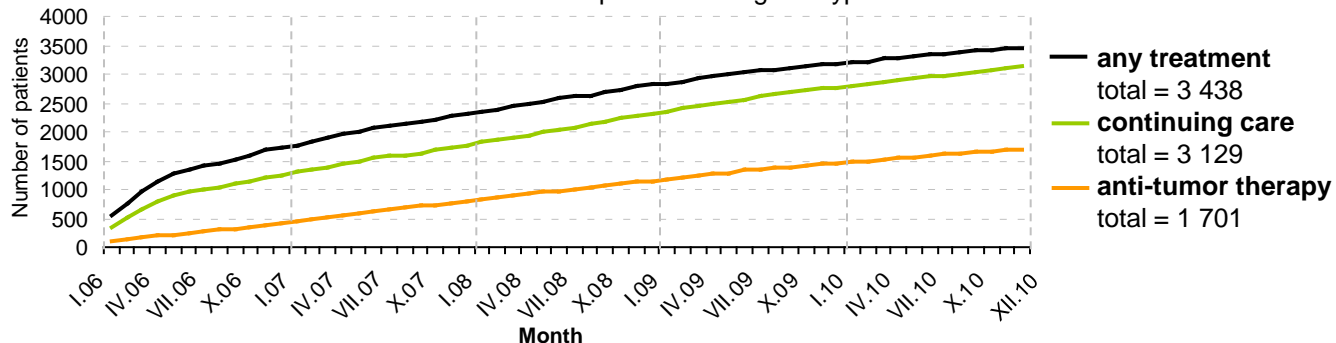
Year	Anti-tumor therapy	continuing care	Total treatment
2006	411	1 253	1 333
2007	511	1 401	1 526
2008	558	1 519	1 644
2009	531	1 538	1 659
2010	458	1 510	1 600
Annual average	494	1 444	1 552

Patients with C18 – C20 treated in hospital in period 1/2006 - 12/2010

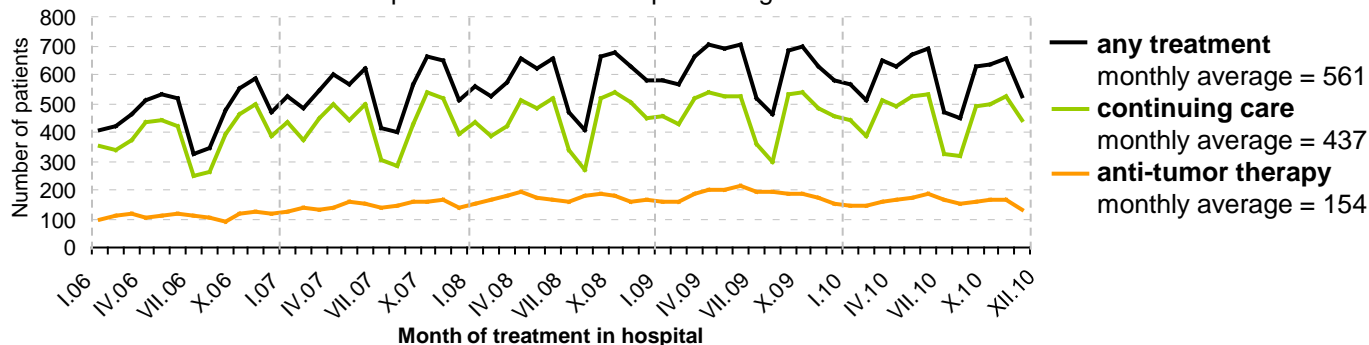
Incidence - first hospital record of the patient with given type of treatment



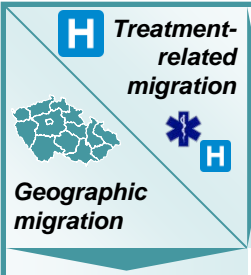
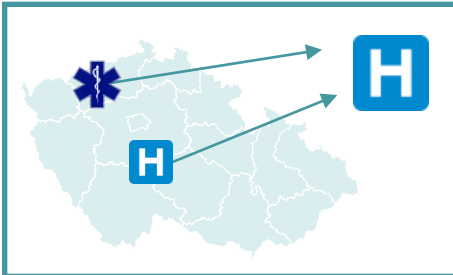
Cumulative incidence - total number of patients with given type of treatment



Prevalence - number of patients treated in hospital at a given time



3. Colorectal cancer (C18-C20): migration of patients



Patients treated in hospital in period 1/2006-12/2010

3 438 (100.0 %)

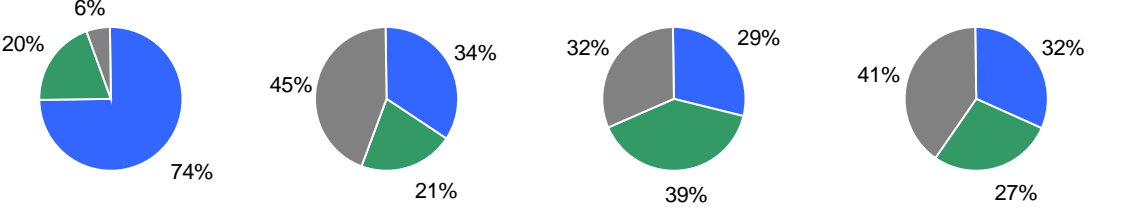
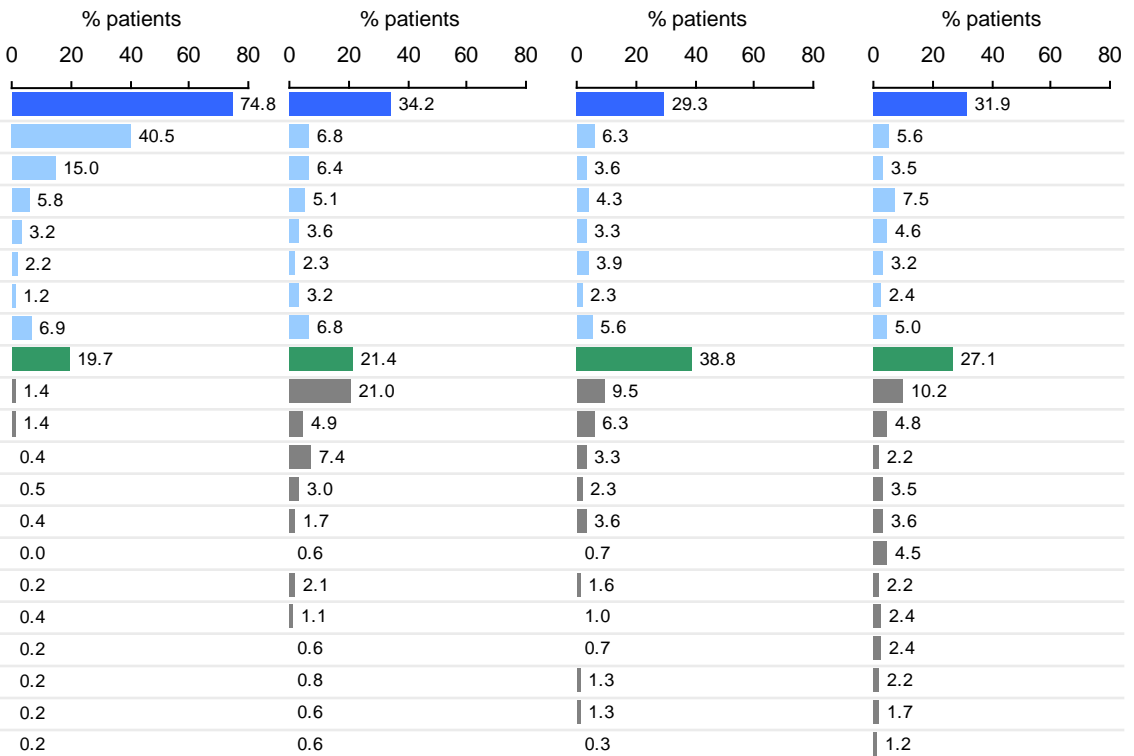
- 1 119 (32.6 %) → **A0: resident patients**
- 528 (15.4 %) → **A1: patients migrating during primary**
- 1 488 (43.2 %) → **A2: patients migrating after primary therapy**
 - AT: anti-tumor therapy 304 (8.8 %)
 - CC: only continuing care 1 184 (34.4 %)
- 303 (8.8 %) → **AX: patients not yet registered in NCR**

Identification of migrating pts
N = 3 438 (100 %)

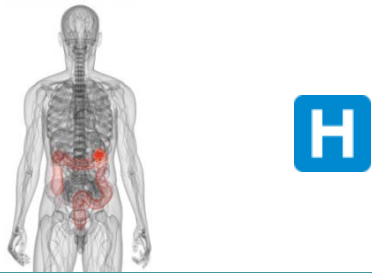
	PHA	STC	other	Total
	1 485 (43,2 %)	772 (22,5 %)	878 (25,5 %)	3 135 (91,2 %)
A0	837 (24,3 %)	220 (6,4 %)	62 (1,8 %)	1 119 (32,6 %)
A1	181 (5,3 %)	113 (3,3 %)	234 (6,8 %)	528 (15,4 %)
A2-AT	89 (2,6 %)	118 (3,4 %)	97 (2,8 %)	304 (8,8 %)
A2-CC	378 (11,0 %)	321 (9,3 %)	485 (14,1 %)	1 184 (34,4 %)
AX	unknown migration: 303 (8,8 %)			

Region of residence:

- Praha
- Praha 5
- Praha 6
- Praha 4
- Praha 10
- Praha 9
- Praha 8
- other Praha
- Středočeský
- Ústecký
- Jihočeský
- Karlovarský
- Liberecký
- Píseňský
- Moravskoslezský
- Královéhradecký
- Vysočina
- Jihomoravský
- Zlínský
- Pardubický
- Olomoucký

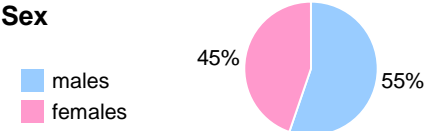


4. Colorectal cancer (C18-C20): characteristics of the patient



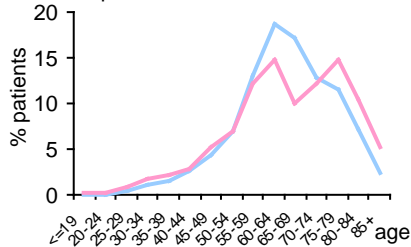
Basic typology of the patients with colorectal cancer (CRC) treated in hospital in period 1/2006 – 12/2010. Stage of disease is from NCR records.

All patients N = 3 438



Age at treatment in hospital

	males	females	total
N	1892	1546	3438
mean	65	66	65
median	65	66	66
quartiles	58-73	57-77	58-75



Stage at diagnosis

Stage 1	737 (21,4 %)
Stage 2	932 (27,1 %)
Stage 3	710 (20,7 %)
Stage 4	532 (15,5 %)
Stage unknown:	
- objective reasons	108 (3,1 %)
- incomplete records	116 (3,4 %)
- without NCR record	303 (8,8 %)

Own patients of the hospital

A0: resident patients, all primary therapy in hospital

N = 1 119

A1: patients migrating during primary therapy, part of therapy in hospital

N = 528

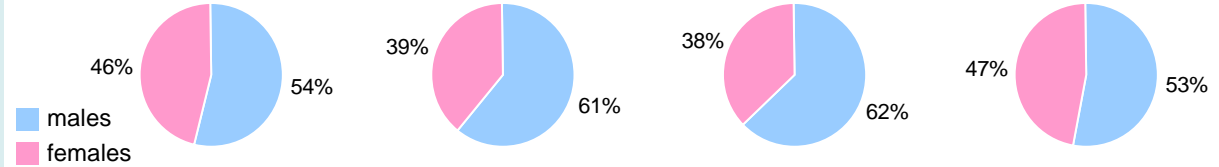
A2-AT: anti-tumor therapy in hospital, primary therapy elsewhere

N = 304

A2-CC: only continuing care in hospital, primary therapy elsewhere

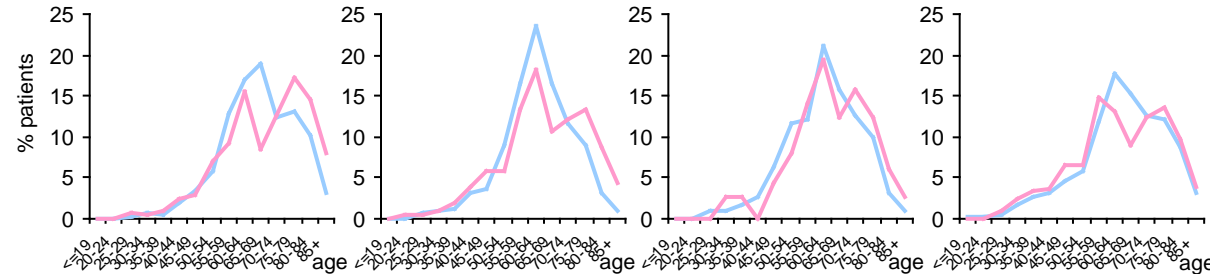
N = 1 184

Sex

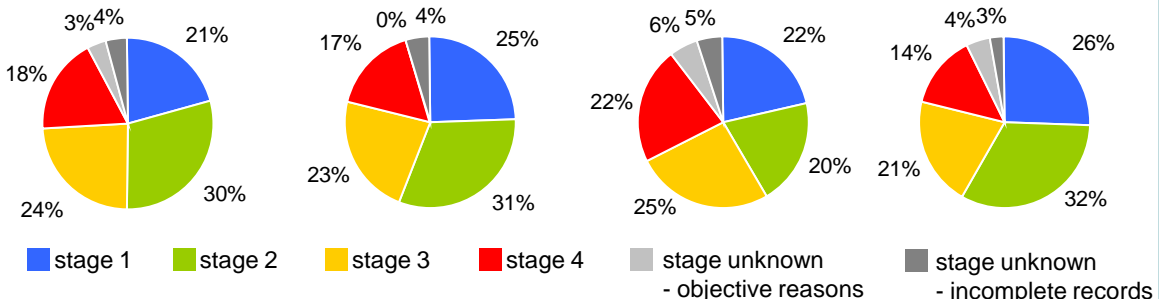


Age at treatment in hospital

	A0			A1			A2-AT			A2-CC		
	males	females	total	males	females	total	males	females	total	males	females	total
N	600	519	1119	320	208	528	190	114	304	624	560	1184
mean	67	69	68	63	65	64	63	65	64	65	64	65
median	67	71	68	63	65	63	64	65	64	66	65	65
quartiles	60-75	60-79	60-77	57-70	57-75	57-72	55-71	58-74	56-73	57-74	56-76	57-75

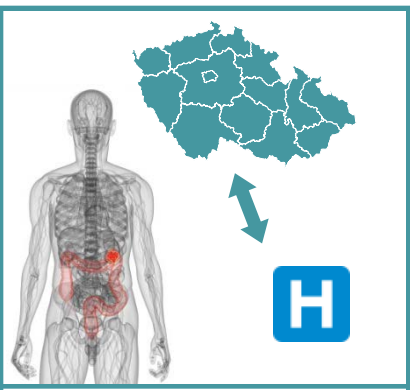


Stage at diagnosis



In patients with multiple CRC is considered the worst stage.

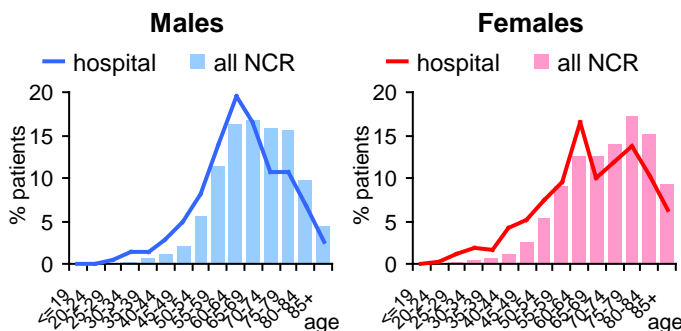
5. Colorectal cancer (C18-C20): comparison with epidemiology 2006 - 2009



Comparison of patients treated in hospital with population-based data from National Cancer Registry (NCR) was made in period 2006-2009 (most recent available data).

Age at diagnosis in period 2006 - 2009

	ZZ			NOR ČR		
	males	females	total	males	females	total
N	945	694	1 639	18 861	12 936	31 797
mean	64	66	65	68	70	69
median	64	66	65	68	72	69
quartiles	58-73	57-76	57-75	61-76	62-79	61-77



Proportion of cancer diagnoses in adults diagnosed in period 2006 - 2009

Malignant tumors without other skin	Hospital	NCR in total
trachea, bronchus and lung (C33,C34)	2 015 (11.0 %)	25 804 (12.0 %)
thyroid (C73)	1 958 (10.7 %)	3 464 (1.6 %)
female breast (C50)	1 718 (9.4 %)	24 998 (11.6 %)
colorectal cancers (C18-C20)	1 639 (9.0 %)	31 797 (14.8 %)
non-Hodgkin's Lymphoma (C82-C85)	1 420 (7.8 %)	4 856 (2.3 %)
prostate (C61)	1 180 (6.5 %)	21 649 (10.1 %)
oral cavity and pharynx (C00-C14)	712 (3.9 %)	5 268 (2.5 %)
kidney (C64)	639 (3.5 %)	11 164 (5.2 %)
oesophagus (C15)	610 (3.3 %)	2 187 (1.0 %)
stomach (C16)	609 (3.3 %)	6 638 (3.1 %)
uterus (C54-C55)	514 (2.8 %)	7 474 (3.5 %)
cervix uteri (C53)	497 (2.7 %)	4 120 (1.9 %)
leukaemia (C91-C95)	489 (2.7 %)	4 667 (2.2 %)
pancreas (C25)	478 (2.6 %)	7 824 (3.6 %)
bladder (C67)	451 (2.5 %)	10 013 (4.7 %)
ovary (C56)	336 (1.8 %)	4 488 (2.1 %)
melanoma of skin (C43)	315 (1.7 %)	7 768 (3.6 %)
larynx (C32)	299 (1.6 %)	2 101 (1.0 %)
brain, nervous system (C70-C72)	292 (1.6 %)	3 154 (1.5 %)
Hodgkin lymphoma (C81)	281 (1.5 %)	991 (0.5 %)
gallbladder etc. (C23,C24)	210 (1.1 %)	3 849 (1.8 %)
multiple myeloma (C90)	179 (1.0 %)	1 933 (0.9 %)
connective and soft tissue (C47,C49)	136 (0.7 %)	1 003 (0.5 %)
liver (C22)	134 (0.7 %)	3 450 (1.6 %)
testis (C62)	116 (0.6 %)	1 865 (0.9 %)
other malignant	1 061 (5.8 %)	12 395 (5.8 %)

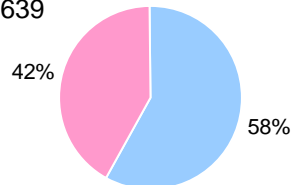
C18-C20 - proportion of the hospital in all NCR data: 5.2 %

Sex of the patients

males females

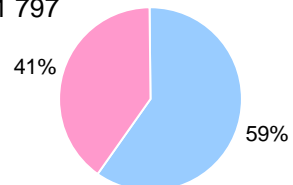
Hospital

N = 1 639



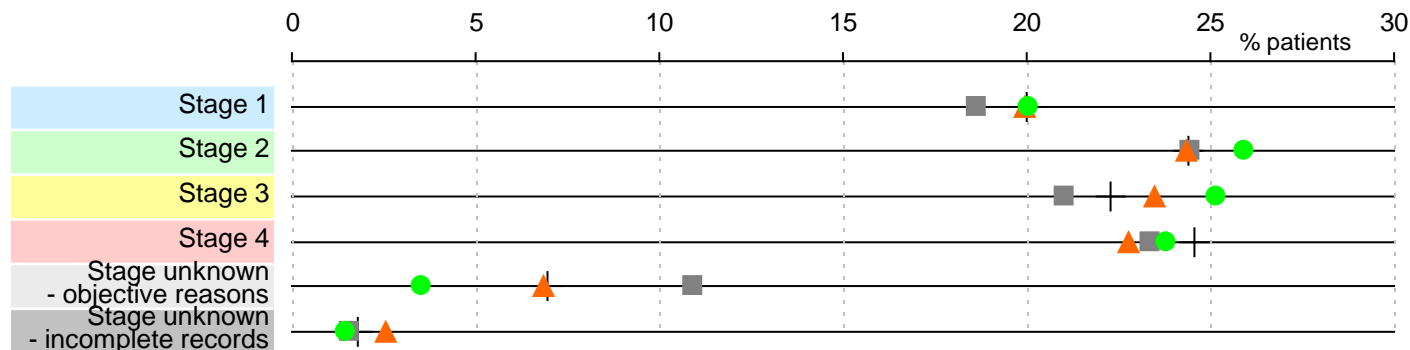
NCR in total

N = 31 797

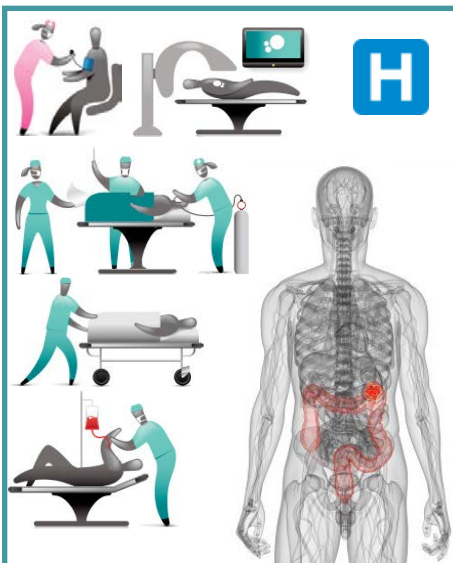


Stage of disease at diagnosis in period 2006 - 2009

● own patients of the hospital (N = 937)
 ▲ migrating patients (N = 702)
 ■ NCR - PHA+STC (N = 7 083)
 | NOR - CR in total (N = 31 797)

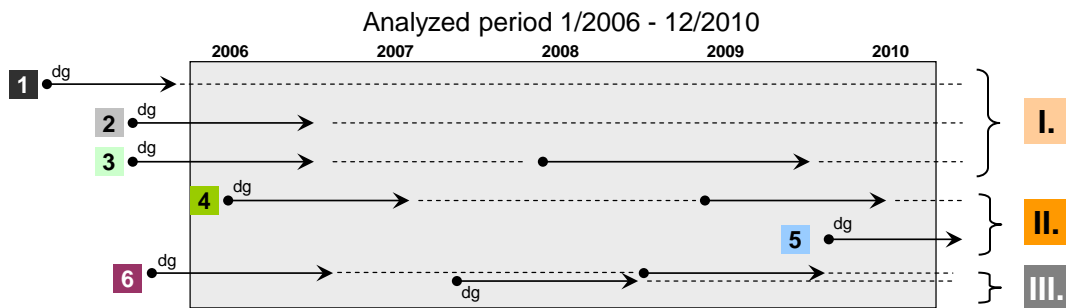


6. Colorectal cancer (C18-C20): available data about treatment in hospital



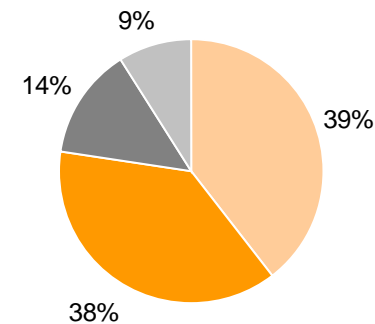
In administrative data of the hospital can be identified antitumor treatment and other treatment records of the patients. Subsequent analysis related to the time identifies phases of treatment.

Typology of patients according to availability of treatment data in time

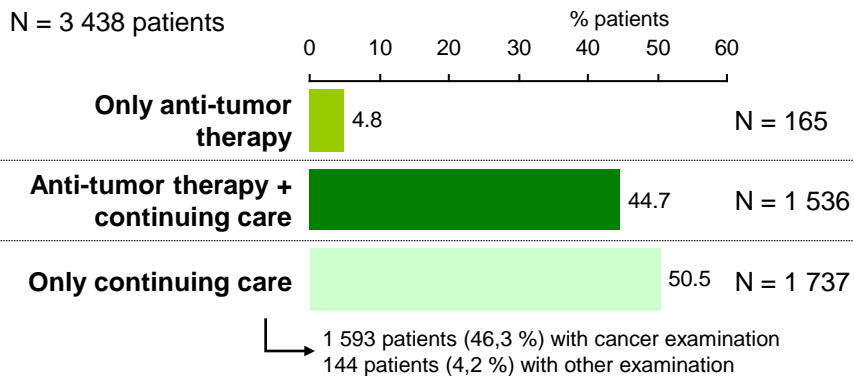


3 438 patients (100 %) in total

- N = 1 352 (39.3 %)** → **I.** patients diagnosed before 2006
- N = 1 310 (38.1 %)** → **II.** patients diagnosed in period 2006 - 2010
- N = 473 (13.8 %)** → **III.** patients with multiple tumors - requires specific analysis of records
- N = 303 (8.8 %)** → patients not yet registered in NCR, analysis is not possible



Treatment of the patients in hospital in period 1/2006 - 12/2010

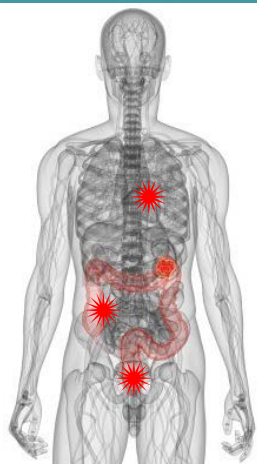


Number and proportion of treatment episodes of CRC patients treated in hospital in period 1/2006 - 12/2010

Type of treatment episode	In own patients of the hospital	In migrating patients	In total
Complete primary therapy	469 (13.5 %)	-	469 (13.5 %)
Partial primary therapy *	303 (8.7 %)	-	303 (8.7 %)
Subsequent cancer therapy	444 (12.7 %)	188 (5.4 %)	632 (18.1 %)
Terminal cancer therapy	196 (5.6 %)	56 (1.6 %)	252 (7.2 %)
Without anti-tumor therapy - only continuing care	580 (16.7 %)	1 249 (35.8 %)	1 829 (52.5 %)
Episodes in total	1 992 (57.2 %)	1 493 (42.8 %)	3 485 (100.0 %)

* primary therapy in patients with part of this treatment outside the hospital (according to NCR)

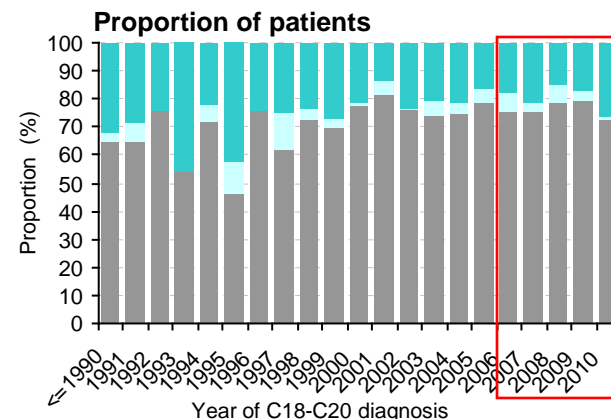
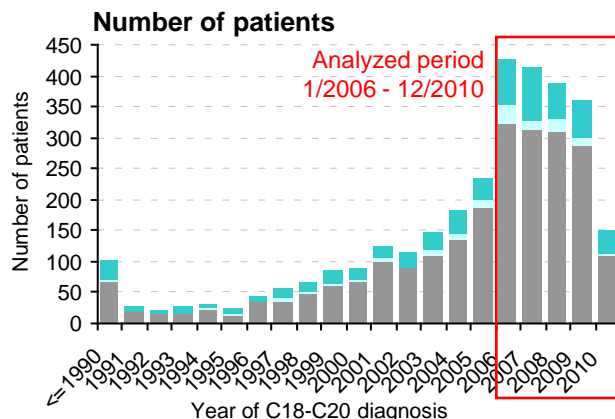
7. Colorectal cancer (C18-C20): multiple tumors according to NCR



Analysis identifies patients treated in hospital with multiple tumors where one of these tumor is colorectal cancer (C18-C20). Analyzed are patients treated in period 1/2006 – 12/2010.

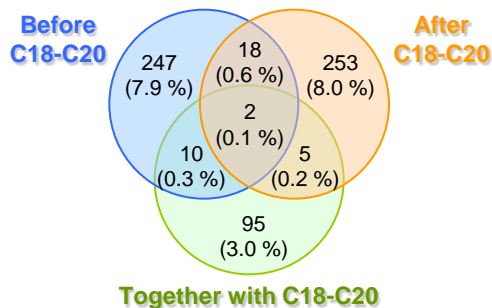
Other tumors in patients treated in hospital with C18-C20 in time (only patients with NCR record)

C18-C20 patient with NCR record in total	3 135 (100.0 %)
C18-C20 patient with other malignant tumor	630 (20.1 %)
C18-C20 patient with C44 or non- malignant tumor	149 (4.8 %)
Patients only with C18-C20	2 356 (75.1 %)

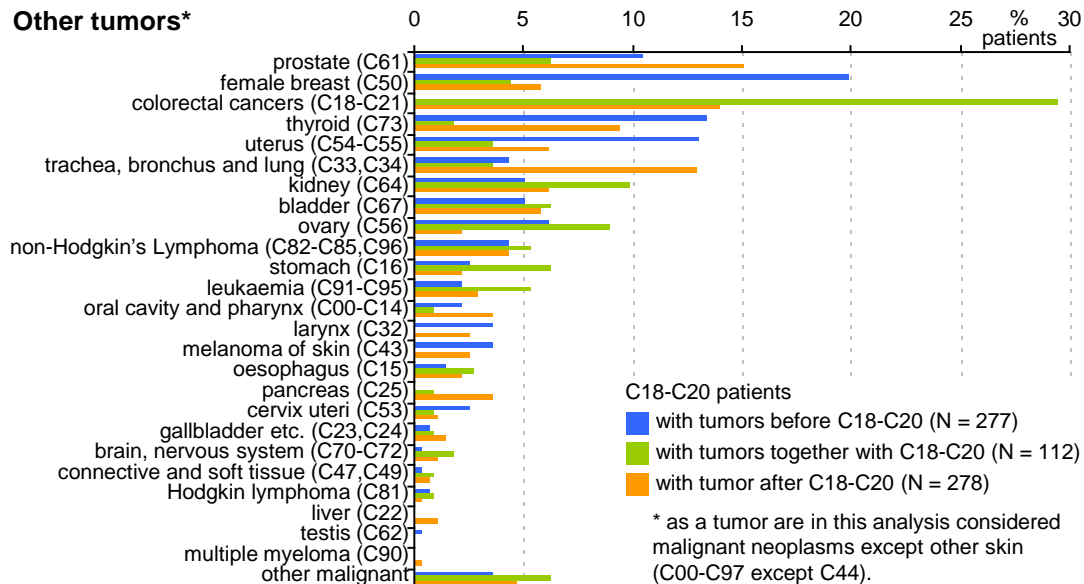


Other tumors* in patients with C18-C20

Other tumor* in relation to C18-C20	Patients	Tumors*
without other tumor*	2 505 (79.9 %)	-
with other tumor*	630 (20.1 %)	724
- before C18-C20	277 (8.8 %)	293
- together with C18-C20	112 (3.6 %)	120
- after C18-C20	278 (8.9 %)	311



Other tumors*



Other possible outputs from merged data

- detailed information about treatment (incl. costs) with respect to the disease and its stage
- detailed evaluation of recurrence of the disease
- detailed and stratified evaluation of survival of the patients on hospital level
- benchmarking of patients with given diagnosis
- automation of data processing and reporting of the results

CURRENT LIMITS

- incomplete information about treatment in migrating patients



Thank you for attention!



THIS PROJECT IS SUPPORTED BY THE EUROPEAN SOCIAL FUND
AND THE STATE BUDGET OF THE CZECH REPUBLIC.