

Appendix 2: Example summary report

Cancer control statistics using a comprehensive ICT model



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Part 1: Cancer burden in Czechia

Cancer control statistics using a comprehensive ICT model



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- The incidence of malignant neoplasms, excluding non-melanoma skin cancers (NMSC), reached 58,841 newly diagnosed cases in 2018, which is 553.7 per 100,000 population. The most common diagnoses included prostate, colon and rectum, breast, and lung cancers, which together accounted for almost half (49.0%) of all cancers diagnosed in Czechia in 2018 (excl. NMSC). Approximately 7,700 cases of colorectal cancer, 7,500 cases of prostate cancer, 7,200 cases of the breast cancer in women and 6,600 cases of the lung cancer are newly diagnosed annually.
- In 2018, a total of 27,521 people died of malignant neoplasms other than NMSC, which is 259.0 per 100,000 people. Cancer mortality accounted for 24.5% of all deaths in Czechia in 2018. The most common causes of death from neoplasms were lung, colorectal, pancreatic, breast and prostate cancers, which accounted for a total of 50.1% of cancer deaths. Approximately 5,300 people die from lung cancer, 3,400 people from colorectal cancer, 2,000 people pancreatic cancer, 1,600 women from breast and 1,400 men from prostate cancer annually.



Time trends of cancer (C00–C97) incidence, mortality, and prevalence in Czechia



Source: ¹ Czech National Cancer Registry, UZIS; ² Czech Statistical Office





Cancer incidence in Czechia in 2014–2018



Annual incidence rates of new cancer cases (absolute counts) 0 5 0 0 0 10 000 15 000 20 000 25 000 30 000 Non-melanoma skin cancer (C44) 27 625 Colorectal cancer(C18-C20) 7745 7 453 Prostate cancer (C61) Breast cancer (C50) in women 7 2 3 9 men Lung cancer (C33, C34) 6 6 3 6 women Kidney cancer (C64) 3 161 Malignant melanoma of skin (C43) 2 589 Pancreatic cancer (C25) 2 286 Bladder cancer (C67) 2 167 Endometrial cancer (C54, C55) 1 969 Head and neck cancer (C00-C14, C30-C31) 1 754 Non-Hodgkin lymphoma (C82–C86) 1 594 Gastric cancer (C16) 1 4 1 7 Leukaemia (C91-C95) 1 360 Thyroid cancer (C73) 1 127 Ovarian cancer (C56) 1 005 Liver cancer (C22) 958 Brain and spinal cancer (C70–C72) 862 Gallbladder cancer (C23, C24) 822 Cervical cancer (C53) 811 **Oesophagal cancer (C15)** 668 Multiple myeloma (C90) 600 Laryngeal cancer (C32) 516 **Testicular cancer (C62)** 502 Soft tissue sarcoma (C47, C49) 323 Hodgkin lymphoma (C81) 278 Other malignant neoplasms 3 554 In situ neoplasms (D00-D09) 8 9 3 2 Neoplasms of uncertain or unknown behaviour of other and 2 957 unspecified sites (D10-D36, D37-D48)

Source: Czech National Cancer Registry, UZIS



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Time trends of the most frequent cancers incidence in Czechia









Source: Czech National Cancer Registry, UZIS



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Age of cancer patients at diagnosis in 2014–2018



Median age at diagnosis (years)					men wome
30	40	50	60	70	80
l esticular cancer (C62)		1		1	N = 2 511
Hodgkin lymphoma (C81)	1 1		<u>.</u> 1	1	N = 790 N = 601
Thyroid cancer (C73)					N = 1 265 N = 4 371
Cervical cancer (C53)	1			1	N = 4 054
Head and neck cancer (C00–C14, C30–C31)		1		•	N = 6 159 N = 2 609
Soft tissue sarcoma (C47, C49)	1	1		•	N = 891 N = 723
Brain and spinal cancer (C70–C72)	1	1			N = 2 364 N = 1 944
Laryngeal cancer (C32)				•	N = 2 287 N = 295
malignant melanoma of skin (C43) ———	1 1 1				N = 6 866 N = 6 078
Breast cancer (C50) in women	1	1	1		N = 36 19
Ovarian cancer (C56)				•	N = 5 023
Oesophagal cancer (C15)					N = 2 737 N = 605
Endometrial cancer (C54, C55)	1	1	1		N = 9 847
Kidney cancer (C64)				-	N = 10 106 N = 5 700
Non-Hodgkin lymphoma (C82–C86)					N = 4 111 N = 3 859
Lung cancer (C33, C34)	1	1	1		N = 21 697 N = 11 48
Prostate cancer (C61)	1				N = 37 263
Gastric cancer (C16)					N = 4 210 N = 2 873
Colorectal cancer(C18–C20)			1		N = 23 166 N = 15 55
Pancreatic cancer (C25)					N = 5 838 N = 5 591
Multiple myeloma (C90)				¹	N = 1 553 N = 1 447
Leukaemia (C91–C95)	1				N = 3 886 N = 2 916
Liver cancer (C22)				· ·	N = 3 154 N = 1 634
Bladder cancer (C67)					N = 8 025 N = 2 810
Gallbladder cancer (C23, C24)	1	1	1		N = 1 659 N = 2 449
Other malignant neoplasms	1	1			N = 8 585 N = 9 184

Source: Czech National Cancer Registry, UZIS



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Cancer mortality in Czechia in 2014–2018





Source: Czech Statistical Office



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Time trends of the most frequent cancers mortality in Czechia





Czech comprehensive ICT model integrating multiple data sources



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3.9

Year

Five-year relative survival of cancer patients in Czechia (period 2014–2018)





Source: Czech National Cancer Registry, UZIS



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Part 2: Cancer screening programmes in Czechia

Cancer control statistics using a comprehensive ICT model



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Cancer screening programmes in Czechia: summary



- In the last decade, a decrease in the mortality of breast cancer, cervical cancer and colorectal cancer by tens of percent can be observed. Tumours detected in screening are found more often in early stages (breast cancer screening), or screening allows an invasive tumour to be completely prevented thanks to the detection of precancerous lesions (colorectal cancer and cervical cancer screening).
- In the case of cervical cancer and colorectal cancer, we have therefore also seen a decrease in incidence in the tens of percent in the last decade.
- In an international comparison, Czechia achieves good results with regard to the decline in mortality. Coverage by screening examinations in Czechia reaches satisfactory levels; however, higher coverage is often achieved by population programmes in Western and Northern Europe.
- The coverage of the target population by breast cancer screening is almost 60%, the coverage by colorectal cancer is almost 30% and the coverage by cervical cancer is approximately 60% (coverage at the recommended screening intervals); nevertheless, reaches almost 70%, 50%, and 80% when considering a broader (3-year) interval for screening examinations.



Breast Cancer Screening Programme

- Launch of the programme
 - Screening programme has been running since 2002
 - Programme with centralised invitations was set up in 2014
- Target population
 - Women aged over 45 years
- Screening test
 - Mammography every 2 years
- Screening process
 - Referral by GP or primary care gynaecologist
 - Screening test and diagnostics in certified screening mammography centres
 - Centralised invitation of non-attenders
- Governance and coordination
 - Breast Cancer Screening Committee of the Ministry of Health
 - Commission of Experts on Breast Diagnostics, Czech Radiological Society
 - Association of Breast Radiologists of the Czech Republic
- Monitoring and evaluation
 - National Screening Centre, Institute of Health Information and Statistics of the Czech Republic (NSC UZIS)
 - Institute of Biostatistics and Analyses, Faculty of Medicine, Masaryk University







Breast cancer burden and coverage by screening examination





In the past 10 years, the mortality rates for breast cancer have decreased while the incidence rates have been stable. Coverage by breast cancer screening examination at two-year interval reached almost 60 %, the coverage at the three-year interval reached almost 70 %.

Czech comprehensive ICT model integrating multiple data sources

Source: Czech National Cancer Registry, UZIS; Czech Statistical Office, National Registry of Reimbursed Health Services, UZIS



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Colorectal Cancer Screening Programme



- Launch of the programme
 - Screening programme has been running since 2000
 - Quality assurance guidelines were enacted in 2009
 - Programme with centralised invitations was set up in 2014
- Target population
 - Men an women aged over 50 years
- Screening test
 - 50–54 years FIT every year
 - Over 55 years FIT every 2 years
 - Alternatively, screening colonoscopy every 10 years
- Screening process
 - GP or primary care gynaecologist FIT or screening colonoscopy referral
 - Certified colonoscopy centres
 - Centralised invitation of non-attenders
- Governance and coordination
 - Colorectal Cancer Screening Committee of the Ministry of Health
 - Colorectal Cancer Screening Board, Czech Society of Gastroenterology, Society for Gastrointestinal Oncology
- Monitoring and evaluation
 - National Screening Centre, Institute of Health Information and Statistics of the Czech Republic (NSC UZIS)
 - Institute of Biostatistics and Analyses, Faculty of Medicine, Masaryk University





Colorectal cancer burden and coverage by screening examination





In the past 10 years, the incidence and mortality rates of colorectal cancer have decreased substantially. Coverage by colorectal cancer screening examinations at the two-year interval has been around 30 %, the coverage at the three-year interval by all associated examinations has been almost 50 %.

Czech comprehensive ICT model integrating multiple data sources

Source: Czech National Cancer Registry, UZIS; Czech Statistical Office, National Registry of Reimbursed Health Services, UZIS



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Cervical Cancer Screening Programme



- Launch of the programme
 - Quality assurance guidelines were implemented in 2008
 - Programme with centralised invitations was set up in 2014
- Target population
 - All adult women
- Screening test
 - Annual pap smear
 - Women aged 35 and 45 years with negative cytology: HPV-DNA detection (since 2021)
- Screening process
 - Sample collection by a primary care gynaecologist
 - Laboratory examinations in certified cytology laboratories
 - Centralised invitation of non-attenders
- Governance and coordination
 - Cervical Cancer Screening Committee of the Ministry of Health
- Monitoring and evaluation
 - National Screening Centre, Institute of Health Information and Statistics of the Czech Republic (NSC UZIS)
 - Institute of Biostatistics and Analyses, Faculty of Medicine, Masaryk University





Cervical cancer burden and coverage by screening examination





In the past 10 years, the incidence and mortality rates of cervical cancer have decreased. Coverage by cervical cancer screening examinations at one-year interval has been over 50 %, the coverage at the three-year interval reached almost 80 %.

Czech comprehensive ICT model integrating multiple data sources

Source: Czech National Cancer Registry, UZIS; Czech Statistical Office, National Registry of Reimbursed Health Services, UZIS



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Part 3: Volume of cancer treatment in Czechia

Cancer control statistics using a comprehensive ICT model



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Volume of cancer treatment in Czechia: summary



- Approximately 120,000 solid cancer patients are treated annually, almost 70% of patients are treated in cancer centres
- Decrease in the number was observed in 2020, when Czechia was hit by COVID-19 pandemic
- Almost 70,000 patients are treated annually with surgery, 30,000 with chemotherapy, and 20,000 with radiotherapy
- Approximately 8,000 patients with haematological malignancies are treated annually, mostly with chemotherapy
- Increasing number of patients have been treated with innovative pharmacotherapy



Identification of cancer patients and their treatment in NRRHS





Derived indicators of cancer patients' treatment

The algorithm defines the following health indicators for cancer patients:

- Treated cancer patients
- Cancer patients treated with surgery
- Cancer patients treated with radiotherapy
- Cancer patients treated with chemotherapy

All indicators are computed for the overall number of treated patients and newly treated patients for individual years and type of hospital (stratification by diagnosis or treatment subtypes is optional).

Identification of patients for the computation of indicators is based on lists of diagnoses and medical procedures (based on DRG definitions and discussion with experts).

The process combines data preprocessing using SQL followed by analysis of data in SPSS.



(cancer centres + outside cancer centres):

(hospitalisation/radiotherapy/chemotherapy/medical procedure)

Number of treated cancer patients in Czechia cancer centres only:

807

76

929

 ∞ ~

(hospitalisation/radiotherapy/chemotherapy/medical procedure)

291

78

Proportion of patients treated in cancer centres: 63.6% 64.3% 64.8% 64.7% 65.2% 66.6%

679

78

81

81

248

78



Source: National Registry of Reimbursed Health Services 2015–2020, UZIS; analysed diagnoses: solid tumours (C00–C80, C97)







Provided cancer care in Czechia in 2015–2020

Number of treated cancer patients in Czechia – total

Provided cancer care in Czechia in 2015–2020



Total number of cancer-related hospitalisations in individual years



Number of hospitalised patients

(a patient is included once per year)



Number of patients with a cancer-related interventional radiotherapeutic procedure (a patient is included once per year)



Number of patients with radiotherapy

(a patient is included once per year)



Number of patients with chemotherapy

(a patient is included once per year)



Number of patients with surgery

(a patient is included once per year)



Czech comprehensive ICT model integrating multiple data sources

Source: National Registry of Reimbursed Health Services 2015–2020; UZIS, analysed diagnoses: solid tumours (C00–C80, C97)



Provided blood cancer care in Czechia in 2015–2020



Number of treated patients with blood cancers in Czechia in individual years (hospitalisation/radiotherapy/chemotherapy)



Total number of blood cancer-related hospitalisations in individual years



Number of hospitalized patients (a patient is included once per year)



Number of patients with radiotherapy (a patient is included once per year)



Number of patients with chemotherapy (a patient is included once per year)



Czech comprehensive ICT model integrating multiple data sources

Source: National Registry of Reimbursed Health Services 2015–2020; UZIS, analysed diagnoses: blood cancers (C81–C96)



Innovative pharmacotherapy in the segment of solid tumours and blood cancers



Diagnosis	ATC groups with at least one substance included in the given indication	Number of patients treated in 2020
SOLID TUMOURS		
Breast can	cerL01	2 405
Colorectal can	cer L01, L02, V10	2 343
Prostate can	cerL01	1 740
Kidney can	cerL01	1 379
Lung can	cerL01	1 364
Thyroid can	cer H01, L01, V04, V10	1 065
Malignant melano	maL01	655
Ovarian can	cerL01	518
G	ISTL01	384
Ot	her L01, L03, V10, A16	794
Solid tumours to	otal A16, H01, L01, L02, L03, V04, V10	12 647
BLOOD CANCERS		
Lympho	ma L01, L04, V10	2 635
Multiple myelo	ma L01, L04	1 865
Chronic myeloid leukaer	miaL01	1 360
Chronic lymphoid leukaer	mia 01	1 243
· · · · · · · · · · · · · · · · · · ·		
Ot	her L01, L03, L04, B02, C07, V03	1 842
Blood cancers to	otal B02, C07, L01, L03, L04, V03, V10	8 945





Czech comprehensive ICT model integrating multiple data sources

Source: National Registry of Reimbursed Health Services, UZIS



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Part 4: Risk factors and primary prevention in Czechia

Cancer control statistics using a comprehensive ICT model



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Risk factors and primary prevention in Czechia: summary



- Czechia ranks among countries with high burden of lifestyle-associated risk factors, e.g., obesity, smoking, alcohol consumption
- The prevalence of obesity has been increasing continuously; almost 70% of men and 50% of women are obese or preobese according to the latest survey
- Prevalence of smoking and risky alcohol consumption is high, especially in certain regions of Czechia
- The proportion of girls vaccinated against HPV at 13 years of age is over 60%; however, the percentage has been recently decreasing



Proportion of obese in Czechia in time trend





Data source: (E)HIS 1993 - 2019

High proportion of preobese and obese people together with its increasing trend is one of important public health problems in Czechia.



Obesity in international comparison





Proportion of preobese and obese people in Czechia is one of the highest among European Union countries.





Data source: EHIS 2019

Smoking in regions of Czechia





Data source: EHIS 2019

The high proportion of daily smokers is an important risk factor in Czech population.



Risky consumption of alcohol in Czech regions

20 %

25 %

30 %

15 %



Data source: EHIS 2019

The high proportion of risky consumption of alcohol is an important risk factor in Czech population.



Proportion of people consuming at least 6 alcohol

drinks at once at least once per month

10 %

0%

5%



Coverage of the population by HPV vaccination: 13-year girls, first dose



Source: National Registry of Reimbursed Health Services, UZIS



Number of vaccinated girls in the given year relates to girls who reached 13 years in this year and were vaccinated in this or following calendar year.

Number of vaccinated girls

Proportion of vaccinated, among 13-year old girls (%)







Part 5: CZ-DRG patient classification system for hospital-based care in oncology

Cancer control statistics using a comprehensive ICT model



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• Patient classification systems for hospital-based care represent a tool for classification of hospital-based care into a limited number of so-called *Diagnosis-Related Groups* (DRGs), which are supposed to be clinically meaningful and relatively homogenous in their resource consumption patterns.

Institute of Health Information and Statistics of the Czech Republic has been developing the CZ-DRG system according to Section 41a of Act No. 48/1997 Coll. on Public Health Insurance and on Amendments to Certain Related Acts, as amended:

(1) For the sake of optimization of the public health insurance system in the inpatient care, the IHIS CR creates and annually updates the list of diagnosis related groups (hereinafter referred to as "DRGs"), their relative costs, the classification rules, and the methodology related to reimbursement process in the inpatient care.



CZ-DRG structure





First classification step sorts cases into <u>Major Diagnostic Categories</u> representing human organ systems or clinical specialties (e.g. psychiatry). Principal diagnosis coded according to ICD-10 classification system is used for this purpose (except MDC 00, 15, 25).

Classification to <u>DRG base group</u> is made according to main treatment modality (represented mainly with surgical, minimally invasive or endoscopic procedure).

Classification to <u>final DRG</u> is accomplished using selected case characteristics that are associated with costs (age, case severity, additional procedures, artificial ventilation, etc.).

Each inpatient case is assigned a relative cost weight according to DRG classification (can be subsequently modified according to the length of hospitalization and direct cost).





- CZ-DRG covers the whole range of acute hospital-based care, including cancer care.
- Our aim is to provide a methodology and tools for:
 - 1. reimbursement of the hospital-based care,
 - 2. monitoring of the hospital-based care,
 - 3. evaluating time trends in the hospital-based care,
 - 4. cost control of the hospital-based care,
 - 5. self-benchmarking of hospital-based care providers.



Main data sources for the CZ-DRG system



Reference hospital network

- covering approx. 40% of hospital-based care in CR,
- covering 25% of acute hospital-based care providers,
- including detailed information on costs.

National Registry of Reimbursed Health Services

- Data provided by all Czech health insurance funds (currently 7 HIF),
- 100 % coverage of inpatient care in CR,
- without information on costs.





complex care

Example: CZ-DRG classification system respects treatment modalities of spine tumors





* Diagnostic hospitalizations of patients with tumors and metastatic diseases of the spine are classified into DRG base group 08-K09 **Malignant neoplasm of the spinal cord, spinal meninges, bones and soft tissues** and DRG base group 08-K10 **Benign neoplasm of the spinal cord, spinal meninges, bones and soft tissues**. These are DRG base groups without a critical procedure, as most diagnostic procedures do not play the role of critical procedures with an impact on classification in the CZ-DRG system.

** Complications of the cancer patient's treatment and condition, including adverse events, may be coded in the CZ-DRG system by diagnoses outside the ICD-10 chapter C00-D48 and thus may be classified into other MDCs outside of MDC 08.

Example: CZ-DRG classification system respects treatment modalities of spine tumors







Example of total costs identified for cancer patients



DRG base groups for inpatient cases with spine tumors in CZ-DRG system 3.0 revision 1 – reference hospitals data 2019

DRG base groups in MDC 08	All cases in DRG base group			Cases with spine tumors		
Diseases and disorders of the musculoskeletal system and connective tissues	Ν	Mean costs (CZK)	Mean costs (EUR)	N, (%)	Mean costs (CZK)	Mean costs (EUR)
08-I03 Spine surgery with instrumentation	3 370	199 888	7 839	52 (2%)	315 127	12 358
08-I04 Spine surgery without instrumentation	3 591	91 684	3 595	143 (4%)	170 137	6 672
08-M02 Minimally invasive spine surgery	304	57 842	2 268	11 (4%)	53 451	2 096
08-I31 Resections and other procedures on con. tissues	1 356	39 095	1 533	115 (8%)	54 245	2 127
08-R01 Radiosurgery for MN*	3	103 560	4 061	1 (33%)	89 924	3 526
08-R02 External radiotherapy for MN*	136	108 300	4 247	19 (14%)	141 867	5 563
08-C03 Chemotherapy or targeted therapy for MN*	488	67 865	2 661	16 (3%)	52 806	2 071
08-K09 Malignant neoplasms – conservative therapy	443	54 352	2 131	308 (70%)	49 364	1 936
08-K10 Benign neoplasms – conservative therapy	264	48 718	1 911	91 (34%)	61 602	2 416

* Malignant neoplasms of spinal cord, spine, bones and soft tissues

Example of total costs in specific DRGs for cancer care



Total costs and length of hospital stay for DRG base group 08-I04 <u>Spine surgery</u> without instrumentation – reference hospitals data for 2019

DRG base group 08-I04 Spine surgery without instrumentation		Mean total costs		Length of stay (days)
		CZK	EUR	Mean
08-104-01 Spine surgery without instrumentation for neoplasms or injuries	183	169 549	6 649	12,1
08-I04-02 Spine surgery without instrumentation for other diseases – children under 16 years or patients aged 60 years and older	1 626	98 578	3 866	9,5
08-I04-03 Spine surgery without instrumentation for other diseases – patients aged 16 to 59 years	1 782	77 397	3 035	7,9
Total	3 591	91 684	3 595	8,8

