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CANCER DISEASES IN THE PUBLIC HEALTH SYSTEM FROM THE PERSPECTIVE OF THE WELL-BEING ECONOMY – THE HUMAN CAPITAL THEORY APPROACH

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ABSTRACT: Purpose: This paper explores the challenges of transitioning to well-being economy the problem of cancer diseases from the perspective of public health and human capital theory. The research question is how to achieve the standard of public health according to DET requirements, decreasing the level of cancer diseases. Methodology/Approach: The research utilises the concept of doughnut economics theory (DET) and neoclassical model consumer optimisation connected with New Public Health Theory (NPHT) and selected elements of human capital approach. Findings: Optimization of public health policy, taking into account cancer diseases, implies the optimum in accordance with Gossen's second law and requires determining the opportunity cost of expenditure on treatment and prevention in comparison with lost benefits in the form of wages and other indirect costs. Research Limitations/Implications: Due to the limited volume of the article, the American market was only analysed as the most developed one. Practical Implications: An optimisation model was created for the use in a developed public health system. Social Implications: The possibility of using the model in public health policy in the well-being economy. Originality/Value: An original calculation of the costs of cancer diseases was made based on the cost of lost wages and behavioural factors shaping their prevention and treatment costs were identified.

KEYWORDS: well-being economy, cancer diseases, human capital, public health

Introduction and an overview of the literature

The starting point of the paper is the doughnut economics theory (DET). This concept recognises that human behaviour can be shaped to be cooperative and caring, just as it can be competitive and individualistic (Raworth, 2018). The hard core of the DET is the Doughnut. The Doughnut consists of two concentric rings: a social foundation, to ensure that no one is left falling short on life's essential needs, and an ecological ceiling, to ensure that humanity does not collectively overshoot the planetary boundaries that protect Earth's life-supporting systems. Between these two sets of boundaries lies a doughnut-shaped space that is both ecologically safe and socially just: a space in which humanity can thrive according to the environmental capabilities shaping ecological footprint track within environment resilience (Figure 1).

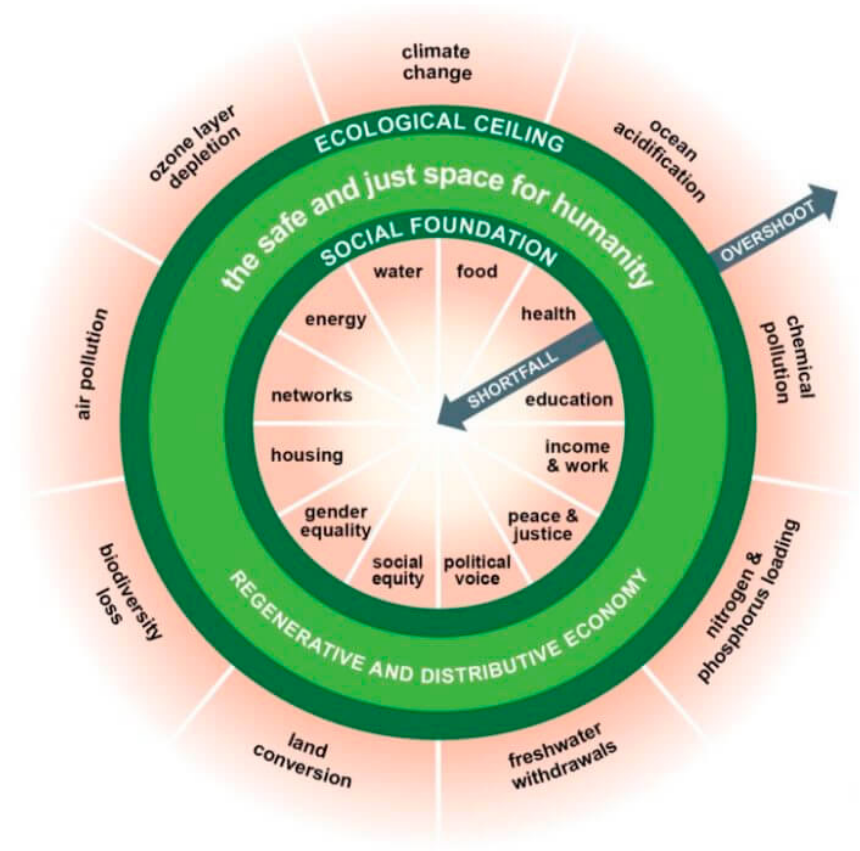

Figure 1. The Doughnut: a twenty-first-century compass. Between its social foundation of human well-being and ecological ceiling of planetary pressure lies the safe and just space for humanity

Source: Raworth, 2018, p.43.

Within the inner ring of the Doughnut there are represented the basic human needs that everyone requires, including, health, education, income and work, peace and justice, political voice, social equity, gender equality, housing, networks, energy, water, and food. The shortfall social foundation any of them will cause poverty and conflicts for our civilisation, In the same way overshoot ecological ceiling will be the start of breaking environmental resilience also causing the problems for social foundation elements. We can see that most of the elements of outer ring is connected with the health level. So the relationship between public health and DET can be considered.

The World Health Organization (WHO) defines a health system as including all organisations, people and actions whose primary intent is to promote, restore or maintain health. This includes efforts to influence determinants of health as well as more direct health-improving activities (WHO, 2007), or a set of elements networking in joint efforts to serve the health needs of the population. WHO includes six basic building blocks as fundamental for health systems: service delivery; health

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workforce; information; medical products, vaccines, and technologies; leadership and governance; and financing. A growing emphasis is placed on achieving universal access and reducing inequalities in health (Tulchinsky et al., 2023). WHO with other partners in the United Nations global program of Sustainable Development Goals for 2030 includes universal health coverage (UHC) priority on access to primary care (World Health Organization, 2022).

From the perspective of New Public Health Theory (NPHT) the public health is a major network of shared responsibility of enlightened political leadership, formal public health agencies, clinical medical care, social support systems with linkages to protect and improve health for the individual and the society with outreach to promote health equality (Tulchinsky et al., 2023). Public health works to achieve this through indirect methods, such as by improving the environment, or through direct means such as immunisation, preventive care for mothers and infants, and other at-risk groups. Clinical care focuses directly on the individual patient, mostly at the time of illness. But the health of the individual is impacted by health promotion and preventive care provided by the society, just as the well-being of a society depends on the health knowledge, beliefs, attitudes, and practices of its citizens (Tulchinsky et al., 2023). The social foundation of the Doughnut includes elements connecting with human behaviours. The problem of food, water, energy, and health depends on the health promotion focused on behaviour as the result of the process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social wellbeing, an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is a positive concept emphasising social and personal resources, as well as physical capacities (Quah, 2016). Therefore, health promotion is not just the responsibility of the health sector, but goes beyond healthy lifestyles to wellbeing including environmental care, especially ecologically ceiling of the Doughnut.

The wellbeing economy (WE) means that economic activity is not only focused on direct productivity of production factors but also includes external effects like household labour, caring for children and retired persons, prevention about health, home schooling, etc. The one of the main aims of WE is decent living. The discourse considering to the good life refers to Aristotelian and Buddhist concepts (Gough, 2015). From the perspective of ecological economics two types of well–being ideas has been developed: hedonic and eudaimonic (Lamb & Steinberger, 2017; Brand-Correa & Steinberger, 2017; Gough, 2015; Gough, 2017; O'Neill, 2008). Others have used the same ideas to highlight the hedonic-treadmill of consumption, where people constantly adapt to improved material circumstances, so that well-being stagnates despite increasing wealth. From this perspective, true happiness can only be obtained by turning away from the world of positional consumption and insatiable desires (O'Neill, 2008; Jackson, 2008). This adaptivity has also been criticised for its contrary effects: when people adapt to difficult circumstances this can leave subjective well-being measures obscuring systemic injustices (Lamb & Steinberger, 2017; Millward-Hopkins et al., 2020).

Despite the human capacity to adapt to unpredictable circumstances, few authors argue against the idea that society should be structured such that basic human needs are universally met so far as possible. This is where eudaimonic conceptions of well-being enter, which underpin prominent capabilities- and needs-based-approaches (Fanning & O'Neill, 2019; O'Neill, 2008). Broadly, these focus on providing people with the capabilities required for flourishing – physical health and safety; clean air and water and adequate nutrition; social and political participation; autonomy so far as it's possible (Greene & Cohen, 2004) cultivated through education and cognitive understanding; time and space for imagination and social play (Lamb & Steinberger, 2017; Gough, 2015). The argument that such basic needs are universal and independent of cultural context, rests on the distinction between *needs* and *need satisfiers*. *Needs* are universal; *satisfiers* culturally specific (Doyal & Gough, 1991).

The same divide refers to standards of public health. The distinction between what is really necessary and what the society can achieve within the budget constraint line. The budget line is the input on public health within Gross Domestic Product (GDP). The level of public budget expenses depends on political agreement and opportunity costs. It should be calculated as the needs although its political influence. The public health standard generates the level of utility function within the society. The utility function curve consists of indifference curve values (ICV). The ICV represents for example value of utility and preferences within the society in consumption public health system goods/services. The shape of ICV depends on marginal rate of substitution between public health system goods and service. The preferences within the ICV express both needs and need satisfiers perspective.

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One in five people worldwide develop cancer during their lifetime. Then prevention of cancer has become one of the most significant public health challenges of the 21st century. It has a critical role to play in the fight against cancer. Based on current scientific evidence, at least 40% of all cancer cases could be prevented with effective primary prevention measures, and further mortality can be reduced through early detection of tumours (Wild et al., 2020). The Table 1 presents WHO Classification of Tumours.

Table 1. WHO Classification of Tumours

	Kind of tumours
1.	Genetic Tumour Syndromes
2.	Skin Tumours
3.	Eye Tumours
4.	Haematolymphoid Tumours
5.	Endocrine Tumours
6.	Head and Neck Tumours
7.	Urinary and Male Genital Tumours
8.	Paediatric Tumours
9.	Central Nervous System Tumours
10.	Thoracic Tumours
11.	Female Genital Tumours
12.	Soft Tissue and Bone Tumours
13.	Breast Tumours
14.	Digestive Tumours

Source: author's work based on https://tumourclassification.iarc.who.int/welcome/# [10-12-2024].

The global cancer incidence and mortality were presented in the Figures 1-2 below.

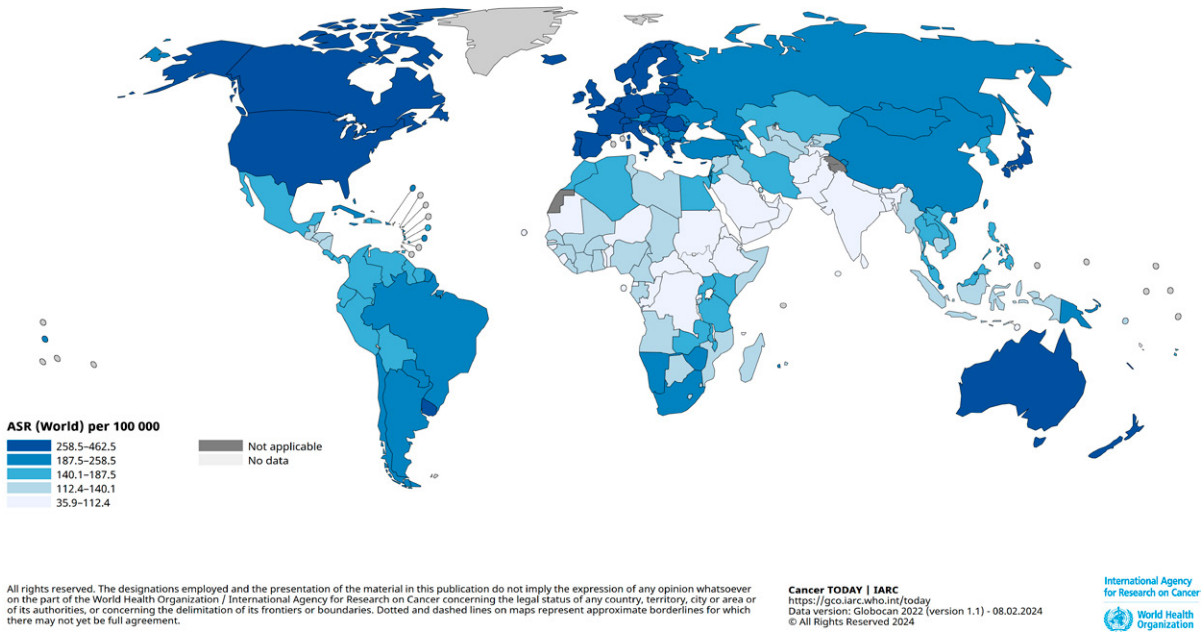

Figure 1. Age-Standarized Rate (World) per 100 000, Tumour incidence, Both sexes, All cancers in 2022

Source: author's work based on World Health Organization (2023a).

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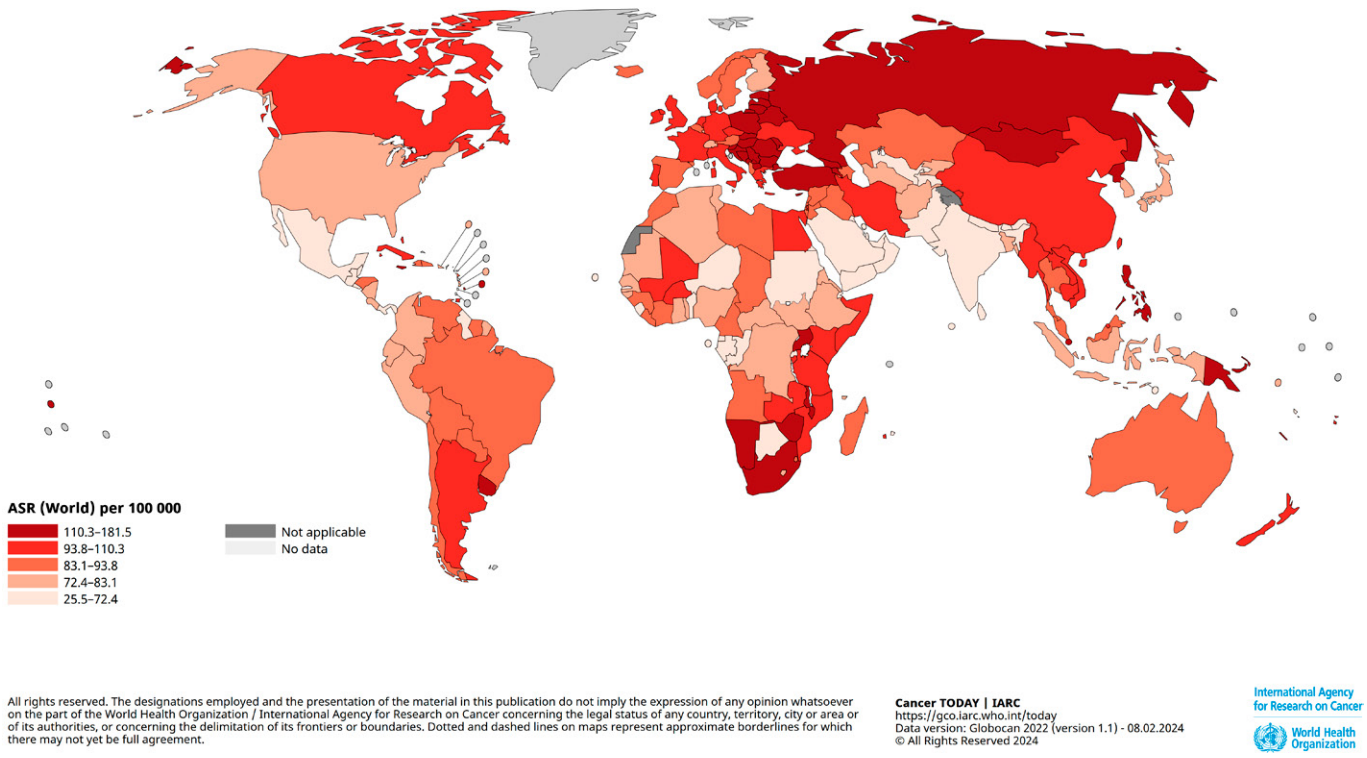

Figure 2. Age-Standarized Rate (World) per 100 000, Tumour mortality, Both sexes, All cancers in 2022

Source: author's work based on World Health Organization (2023b).

Globally in 2022 there were 19 976 499 cases of cancer incidence and 9 743 832 tumour deaths (approx. 18% global deaths), see Figures 3-4 (World Health Organization, 2023c, 2023d). Tumours and cardiovascular diseases together are responsible for almost 40% global deaths. It's a huge social and economic problem. Both medical treatments of cancer incidence and tumour mortality generate direct, indirect and opportunity costs for the global economy and priceless losses for society and people.

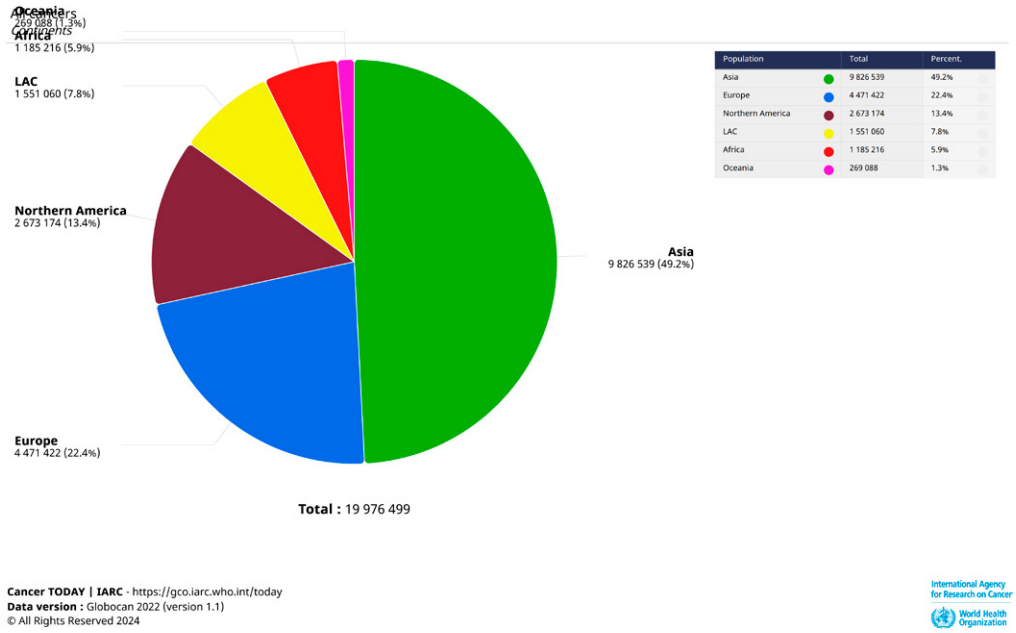

Figure 3. Absolute numbers of cancer incidents in 2022, both sexes

Source: author's work based on World Health Organization (2023c).

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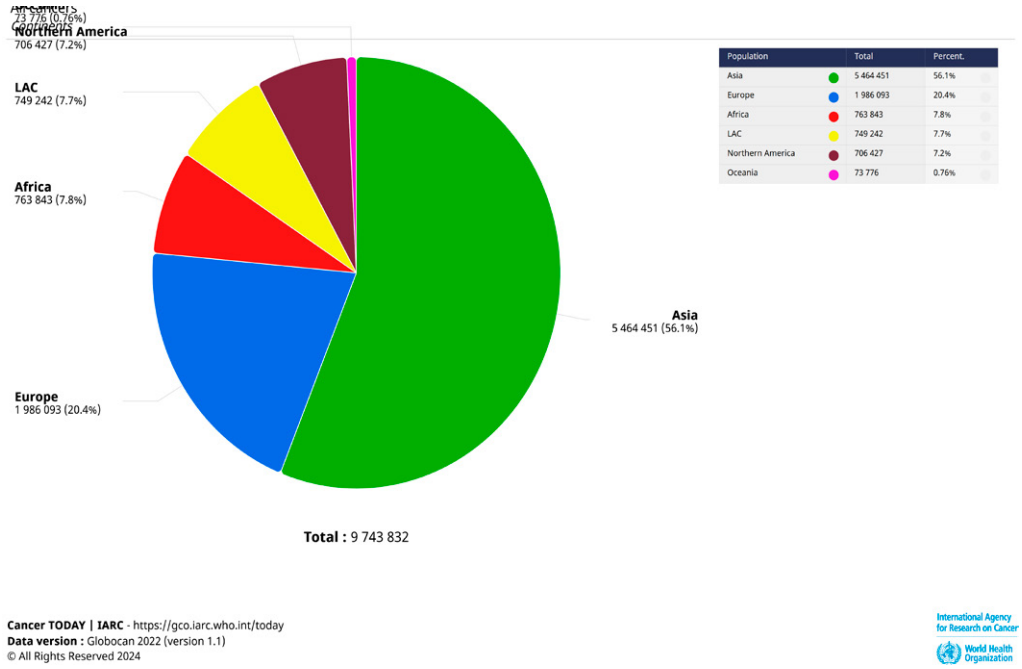

Figure 4. Absolute numbers of cancer deaths in 2022, both sexes

Source: author's work based on World Health Organization (2023d).

This paper explores the challenges of transitioning to well-being economy the problem on cancer diseases from the perspective of public health and human capital theory. Then the research question of the paper is how to achieve the standard of public health according to DET requirements decreasing the level of cancer diseases.

Research methods

Let's consider mathematical optimisation model based on neoclassical perspective but including in preferences both within the budget constraint line and utility function from wellbeing economy point of view. The budget equation is:

$$I = x_1 p_1 + x_2 p_2 + \cdots . x_n p_n, \tag{1}$$

Then we consider the aggregate basket of possible consumption in the economy as the:

$$p x^T = \sum_{i=1}^{n} p_i \, x_i, \tag{2}$$

where:
p_i – the price of good,
x_i – the amount of good.

Then utility function is represented by negatively sloped and convex to the origin indifference curves (IC). Indifference curve is the curve which has all the combinations of two goods, between which the consumer will be indifferent. All the combination of two goods in an indifference curve will be equally preferred by the consumer. The higher indifference curve represents higher satisfaction to the consumers and no two indifference curve intersects each other. IC convex character is connected with the law of diminishing marginal rate of substitution.

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On the top aggregate level of the model we can take into account Gross Domestic Product (GDP) as the measure of total income. The political rules decide about the prices in many cases then the final allocation is the result of both government and market decisions. The price contracts in National Public Health Found (NPHF) decide about location budget line based according to equation (1). Then we consider budget equation in Public Health System (PHS) as:

$$I_{PHS} = cp_1 + c_2p_2 + \cdots c_ip_i + \cdots .. c_np_n, \tag{3}$$

where:
p_i – the price of medical contract,
ci – the amount of medical contract,
i=1…n.

On the other hand of the model we consider the utility which is the degree of satisfaction one gains from the consumption of goods/medical contracts. In this respect, two laws are important. Gossen's first law also known as the law of decreasing marginal utility, and Gossen's second law, which says that utility is at a maximum if marginal utility per monetary unit in all directions has been equalised. Then we can formulate the utility function *U* for optimisation the basket of medical contracts within NPHF:

$$U = U(c_1, c_2 \ldots c_i, \ldots c_n), \tag{4}$$

where: $\frac{\partial U}{\partial ci}$>0 and *i=1,……, n.*

The model optimisation takes into account the assumption that consumer's aim is to reach maximum utility function (4) within the budget constraint (3). We can solve this problem by using the Lagrange procedure. The Lagrange function is defined as:

$$L = U(c_1, \ldots c_i, \ldots .. c_n) + \lambda(I\text{-}\ I_{PHS}), \tag{5}$$

where: $I = \sum p_i c_i$.

The first order conditions for a maximum are:

$$\frac{\partial L}{\partial c_i} = \frac{\partial U}{\partial c_i} - \lambda p_i = 0,$$

$$\frac{\partial L}{\partial \lambda} = I - I_{PHS} = 0,$$

Then:

$$\frac{\partial U/\partial c_1}{\partial p_1} = \frac{\partial U/\partial c_2}{\partial p_2} = \ldots \frac{\partial U/\partial c_i}{\partial p_i} = \lambda, \tag{6}$$

which is Gossen's second law.

The questions considering this optimisation process are: who decide about the contract prices and in what way consumer preferences are shaped? Within National Health Found (NHF) the contract price results from the government budget and production costs of medicine services delivered by suppliers. Besides, the demand for medical contracts also shapes the prices. The structure of this demand results from the public health policy (PHP) and its priorities. It depends on the country. When the government knows priorities then can decide about allocation of the budget between con-

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tracts for medical services according to preferences resulting from the type of utility function which is called the Cobb-Douglas function. If the budget share of each medical contract is known, the Cobb-Douglas utility function can be constructed like for example in the case if consumers spend their budgets on medical goods/services c_1, c_2, c_3, c_4, ..c_n, and the relative budget shares are $\alpha, \beta, \gamma, \delta$ .....(1- α, β, γ, δ) respectively, then the Cobb-Douglas utility function is:

$$U = c_1^{\alpha} c_2^{\beta} c_3^{\gamma} c_4^{\delta} \ldots\ldots c_n^{(1-\alpha-\beta-\gamma-\delta\ldots)}, \quad (7)$$

The shares of variable c_1, c_2, c_3, c_4,.. c_n, express political preferences in public health policy (PHP) referring to diseases like cardiovascular, cancer, communicable diseases or another ones. As it's noted the contract prices p_1, p_2, p_3, $p_{4\ldots}$ p_n, in such budget equation entail the point where Gossen's second law is achieved according to the mathematical identity (6).

The general criteria of PHP are: longevity in health and the risk of death and medical complications referring to clinical treatment. Then within PHP it must be considered opportunity cost of medical services referring to efficiency in spending public money. The same refers to the private medical insurance market.

Results of the research

In the economic analysis referring to the optimisation model presented in the paper, the costs of medical treatment are crucial to achieve economic optimum maximising social utility function within budget constraint. In the tables 2-4 there were presented average annualised cancer – attributable costs in US both for medical services and oral prescription drugs. The data were presented for US from National Cancer Institute as the one of leading word centre in tumour treatment based on cutting – edge medical technologies and scientific knowledge.

Table 2. Average (per patient) annualised 2007-2013 cancer-attributable costs in 2020 US dollars for medical services related to cancer care by cancer site and phase of care

Cancer Site	Initial care	Continuing care	Last year of life	Total costs
All Sites	**43 516**	**5 518**	**109 727**	**158 761**
Bladder	26 443	6 350	95 985	128 778
Brain	**139 814**	**17 386**	**176 355**	**333 555**
Breast	34 980	3 540	76 101	114 621
Cervix Uteri	58 716	3 956	97 026	159 698
Colorectal	66 524	6 246	110 144	182 914
Esophagus	89 947	9 786	120 034	219 767
Hodgkin Lymphoma	75 373	9 786	128 987	214 146
Kidney	41 122	8 537	95 985	145 644
Leukemia	47 264	12 701	169 588	229 553
Acute Myeloid Leukemia	**190 305**	**21 758**	**249 125**	**461 188**
Chronic Lymphocytic Leukemia	25 506	12 076	94 112	131 694
Chronic Myeloid Leukemia	34 875	13 950	122 428	171 253
Liver	62 776	18 219	92 134	173 129
Lung	68 293	12 389	110 248	190 930
Lung: Non-small Cell Carcinoma	67 148	12 285	109 103	188 536

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Cancer Site	Initial care	Continuing care	Last year of life	Total costs
Lung: Small Cell Carcinoma	85 367	14 783	118 056	218 206
Melanoma	8 537	2 707	78 912	90 156
Myeloma	77 038	28 525	123 365	228 928
Non-Hodgkin Lymphoma	75 164	12 805	144 707	232 676
Oral Cavity	58 716	5 934	110 040	174 690
Ovary	79 120	14 158	112 018	205 296
Pancreas	108 166	18 427	125 031	251 624
Prostate	28 109	2 603	74 227	104 939
Stomach	79 120	7 079	122 012	208 211
Thyroid	24 881	4 060	107 437	136 378
Uterus	39 040	3 019	93 591	135 650

Source: author's work based on https://progressreport.cancer.gov/after/economic_burden [13-12-2024].

Table 3. Average (per patient) annualized 2007-2013 cancer-attributable costs in 2020 US dollars for oral prescription drugs related to cancer care by cancer site and phase of care

Cancer Site	Initial care	Continuing care	Last year of life	Total costs
All Sites	**1 874**	**1 041**	**4 372**	**7 287**
Bladder	625	521	1 353	2 499
Brain	2 394	1 353	1 874	5 621
Breast	1 145	833	2 707	4 685
Cervix Uteri	0	0	526	526
Colorectal	416	208	1 353	1 977
Esophagus	1 562	833	937	3 332
Hodgkin Lymphoma	2 811	521	2 603	5 935
Kidney	2 290	1 874	11 764	15 928
Leukemia	6 871	6 871	6 038	19 780
Acute Myeloid Leukemia	9 057	4 164	4 893	18 114
Chronic Lymphocytic Leukemia	729	729	2 915	4 373
Chronic Myeloid Leukemia	32 481	46 743	15 304	94 528
Liver	8 849	7 600	12 180	28 629
Lung	3 644	2 707	4 581	10 932
Lung: Non-small Cell Carcinoma	3 748	2 811	4 997	11 556
Lung: Small Cell Carcinoma	2 290	1 145	1 874	5 309
Melanoma	625	312	3 956	4 893
Myeloma	29 878	26 443	24 985	81 306
Non-Hodgkin Lymphoma	1 562	625	2 603	4 790
Oral Cavity	521	0	937	1 458
Ovary	1 041	104	937	2 082
Pancreas	5 518	3 852	5 830	15 200

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Cancer Site	Initial care	Continuing care	Last year of life	Total costs
Prostate	312	312	5 830	6 454
Stomach	3 436	2 499	1 770	7 705
Thyroid	937	937	5 518	7 392
Uterus	104	0	1 145	1 249

Source: author's work based on https://progressreport.cancer.gov/after/economic_burden [13-12-2024].

Table 4. Average (per patient) annualised 2007-2013 cancer-attributable costs in 2020 US dollars for total medical services and oral prescription drugs related to cancer care by cancer site and phase of care

Cancer Site	Initial care	Continuing care	Last year of life	Total costs
All Sites	**45 390**	**6 559**	**114 099**	**166 048**
Bladder	27 068	6 871	97 338	131 277
Brain	**142 208**	**18 739**	**178 229**	**339 176**
Breast	36 125	4 373	78 808	119 306
Cervix Uteri	58 716	3 956	97 552	160 224
Colorectal	66 940	6 454	111 497	184 891
Esophagus	91 509	10 619	120 971	223 099
Hodgkin Lymphoma	78 184	10 307	131 590	220 081
Kidney	43 412	10 411	107 749	161 572
Leukemia	54 135	19 572	175 626	249 333
Acute Myeloid Leukemia	**199 362**	**25 922**	**254 018**	**479 302**
Chronic Lymphocytic Leukemia	26 235	12 805	97 027	136 067
Chronic Myeloid Leukemia	67 356	60 693	137 732	265 781
Liver	71 625	25 819	104 314	201 758
Lung	71 937	15 096	114 829	201 862
Lung: Non-small Cell Carcinoma	70 896	15 096	114 100	200 092
Lung: Small Cell Carcinoma	87 657	15 928	119 930	223 515
Melanoma	9 162	3 019	82 868	95 049
Myeloma	106 916	54 968	148 350	310 234
Non-Hodgkin Lymphoma	76 726	13 430	147 310	237 466
Oral Cavity	59 237	5 934	110 977	176 148
Ovary	80 161	14 262	112 955	207 378
Pancreas	113 684	22 279	130 861	266 824
Prostate	28 421	2 915	80 057	111 393
Stomach	82 556	9 578	123 782	215 916
Thyroid	25 818	4 997	112 955	143 770
Uterus	39 144	3 019	94 736	136 899

Source: author's work based on https://progressreport.cancer.gov/after/economic_burden [13-12-2024].

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The average total costs for all sites of cancer is 166 048 US. But we can see the highest one referring to Acute Myeloid Leukemia in the amount of 479 302 US per person. From the economic point of view in the optimisation model the crucial problem is the marginal utility of spent money according to Gossen's second law. This is the solution offered by public health policy which must be focused on different diseases. Then the result of this solution is the calculation of lost years due to cancer diseases, then the direct economic costs of human life based on opportunity costs of lost wages. The reference national average wage index (NAWI) for 2023 is 66 622 USD (United States Government, 2024). The result of this calculation were presented in Table 5.

Table 5. Person-years of life lost in 2022 by cause of death, total U.S., all races, both sexes

Cause of death	Years of life lost (in thousands)	Total direct economic costs based on lost wages (NAWI 2023) in billions (E+09)USD
Malignant Cancers	8 637	575,41
Heart Disease	8 010	533,64
Accidents	6 312	420,52
Chronic Lung Disease	1 703	113,46
Cerebrovascular	1 695	112,92
Suicide & Self-Inflicted Injury	1 586	105,66
Diabetes Mellitus	1 472	98,07
Cirrhosis	1 195	79,61
Homicide	1 034	68,89
Alzheimers Disease	783	52,17
Nephritis & Nephrosis	689	45,90
Septicemia	589	39,24
Pneumonia & Influenza	577	38,44
Aortic Aneurysm & Dissection	139	9,26
HIV	123	8,19
Atherosclerosis	35	2,33
All Other Causes	12 364	823,71

Source: author's work based on https://progressreport.cancer.gov/end/life_lost [19-12-2024].

Both cancer and heart disease deaths have the highest direct economic costs based on lost wages. Each of them has about 2 % participation in Gross Domestic Product (GDP). They should have the great impact for public policies especially in public health and insurance domains. Then the annual cancer medical treatment including medical services and drugs implies about 210 billions USD. It's about 0,7% of GDP in USA.

Conclusions

Annually in USA, cancer mortality include 605 761 persons. It means that every cancer death shortages human life about 14 years. The direct economic value this lost time based on opportunity cost of lost wages is 933 268 USD per person. Comparing this value to the patient cancer treatment costs of any kind of tumour from table 4 leads to the conclusion that direct economic value of lost life is much more higher than cancer therapy care. Taking into account both direct and indirect other economic values of human life we can agree that developing the system of public health should be

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priority in developed economies as the alternative for increasing GDP. The question consider the problem of increasing budget line in public health. It requires the increasing of taxes or insurance. Then in public policy we have a problem of opportunity costs medicine inputs to another useful uses generating economic added value like education, safety, housing, environment and others. The same problem refers to private sector of economy. In this area marginal rate of substitution (MRS) is generating the solution according the second Gossen rule. The value of MRS is also variable and depends on social preferences based on psychological feeling and experience of economic scarcity which is relative. The DET pays attention to the public health as the priority so the increasing of inputs can be expected in this area. The another problem refers to prices of goods within budget constraint. The technology development still decrease unit prices enabling increasing the volume of goods within the same budget constrain. Then the changes of relative prices results the change of MRS changing market value. The awareness of health value increases the level of well -being economy and generates the development of medical services and drugs industry. It improves the public health system capacity enabling longevity according the WBE and DET priorities. As it was mentioned in the introduction of the paper from the perspective of New Public Health Theory (NPHT) the public health is a major network of shared responsibility of enlightened political leadership, formal public health agencies, clinical medical care, social support systems with linkages to protect and improve health for the individual and the society with outreach to promote health equality (Tulchinsky et al., 2023). Public health works to achieve this through indirect methods, such as by improving the environment, or through direct means such as immunisation, preventive care for mothers and infants, and other at-risk groups. Clinical care focuses directly on the individual patient, mostly at the time of illness. But the health of the individual is impacted by health promotion and preventive care provided by the society, just as the well-being of a society depends on the health knowledge, beliefs, attitudes, and practices of its citizens. The social foundation of the Doughnut includes elements connecting with human behaviours. The problem of food, water, energy, and health depends on the health promotion focused on behaviour as the result of the process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social wellbeing, an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is a positive concept emphasising social and personal resources, as well as physical capacities. Therefore, health promotion is not just the responsibility of the health sector, but goes beyond healthy lifestyles to wellbeing including environmental care, especially ecologically ceiling of the Doughnut. Increasing inputs on public health and environment connected with improving their efficiency enable decrease the level of cancer diseases (Becker, 2007).

The human life is substantive part of human capital, so the longevity in health enables the maximisation the personal utility function based on both direct and indirect benefits like wages, leisure time, social contacts and other external benefits. These factors shape the quality of life, especially in knowledge -based economy (Dokurno, 2017; Ehrlich, 2000).

The last but not least problem refers to opportunity cost of inputs in the area of other cause of death enumerated in table 5. The economists must take into account the economic efficiency treating the value of human life in the same way in each area from column 1 of the table, especially in the public policies sectors. The general rule refers to improving technologies in each area decreasing the costs of combating of all death causes.

Limitation and future research

The scope and volume of the paper resulted the analysis only US cancer market. The research results confirm that investments in medical security in public health is much more effective than opportunity cost of lost life years based on direct costs of lost wages. The indirect external lost benefits are more precious and could be expressed as psychological values based on capabilities and utility function. The calculated results confirm that inputs on medical/drug cancer treatment are about three times lower than lost wages in GDP. As it was pointed the problem of investments in public health always refers to opportunity costs/benefits in other social areas. The calculation based on proposed model will be probably much more different in the less developed countries not using cutting – edge technologies in the medicine. In the future research it should be done comparative analy-

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sis based on relative costs the same cancer treatment in different countries. Such studies could be very useful and effective for UE area based on the same economic level of development. But this method could be also use for less developed country, where other factors do matter like diets, sport, genetic background and the environment quality.

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Zbigniew DOKURNO

CHOROBY NOWOTWOROWE W SYSTEMIE ZDROWIA PUBLICZNEGO Z PERSPEKTYWY GOSPODARKI DOBROSTANU – PODEJŚCIE OPARTE NA KAPITALE LUDZKIM

STRESZCZENIE: Cel: Artykuł przedstawia problem chorób nowotworowych w gospodarce dobrostanu z perspektywy system zdrowia publicznego oraz teorii kapitału ludzkiego. Pytanie badawcze dotyczy tego w jaki sposób osiągnąć standard zdrowia publicznego zgodny z wymogami ekonomii obwarzanka obniżając poziom zachorowań na nowotwory. Metodyka: Przedstawione badania wykorzystują koncepcję "ekonomii obwarzanka" oraz neoklasyczny model optymalizacji konsumpcji z wykorzystaniem funkcji typu Cobba-Douglasa, nowej teorii zdrowia publicznego, teorii kapitału ludzkiego. Sposób rozwiązania problem badawczego: Optymalizacja polityki zdrowia publicznego, uwzględniająca choroby nowotworowe, polega na wyznaczeniu optimum zgodnego z drugim prawem Gossena oraz wymaga określenia kosztu alternatywnego nakładów na leczenie i prewencję w zestawieniu z utraconymi korzyściami w postaci wynagrodzeń oraz innymi kosztami pośrednimi. Ograniczenia badawcze: W artykule z uwagi na ograniczoną objętość dokonano analizy rynku amerykańskiego, jako najbardziej rozwiniętego. Wdrożenia praktyczne: Stworzono model optymalizacyjny do wykorzystania w rozwiniętym systemie zdrowia publicznego. Zastosowania społeczne: Możliwość wykorzystania modelu w polityce ochrony zdrowia publicznego w gospodarce dobrostanu. Oryginalność/wartość dodana: Dokonano autorskiej kalkulacji kosztów chorób nowotworowych w oparciu o koszt utraconych wynagrodzeń oraz określono czynniki behawioralne kształtujące ich prewencję oraz koszty leczenia.

SŁOWA KLUCZOWE: gospodarka dobrostanu, choroby nowotworowe, kapitał ludzki, zdrowie publiczne

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