

STATISTICAL ESTIMATION OF THE DEMAND FOR CLINICAL LABORATORY SERVICES IN THE REGIONS OF UKRAINE

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Soboliev V. M., Korepanov O. S., Sobolieva M. V., Chernenko D. I. Statistical Estimation of the Demand for Clinical Laboratory Services in the Regions of Ukraine

The aim of the article is to identify the structure of the demand for clinical laboratory services (CLSs) in Ukraine in the regional context for its statistical estimation. The CLS market is seen as the demand for CLSs secured by payments of consumers. The author's segmentation of the CLS market has been suggested. At the highest level of segmentation the two main structural elements having specific forms of supply and meeting the demand of consumers have been distinguished: 1. The CLSs offered for the purpose of medical diagnostic for the health recovery, restoration and preservation of a certain level of ability to work at its temporary loss. This market segment is conventionally called the medical and diagnostic one. The services provided with the purpose of detecting the disease, determining the diagnosis are prescribed by the doctor. 2. The CLSs offered for the preventive diagnostic in order to preserve and maintain a healthy body condition. This segment was characterized as preventive and diagnostic. The services are provided with the purpose of preventing diseases, usually initiated by the consumer (patient). The demand for CLSs of the first segment is determined on the basis of the data of the primary disease rate. The demand for CLSs of the second segment is determined on the basis of the age structure of consumers of the relevant services and medical recommendations on prescription of tests.

Key words: clinical laboratory services, demand, Ukraine, statistical estimation, segmentation, CLSM.

Fig.: 2. **Tabl.:** 1. **Bibl.:** 35.

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Соболев В. М., Корепанов О. С., Соболева М. В., Черненко Д. И. Статистичне оцінювання попиту на лабораторні медичні послуги в регіонах України

Метою статті є виявлення структури попиту на лабораторні медичні послуги (ЛМП) (англ. – Clinical Laboratory Services Market – CLSM) в Україні в регіональному розрізі для його статистичного оцінювання. Ринок ЛМП (CLS) розглядається як потреби у ЛМП (CLS), платоспроможні забезпечені споживачами. Запропоновано авторську сегментацію ринку ЛМП. На найвищому рівні сегментування виділено два основні структурні елементи зі специфічними формами пропозиції та задоволення попиту споживачів послуг: 1. ЛМП (CLS), що пропонуються з метою лікувальної діагностики для повернення здоров'я, відновлення та збереження певного рівня працездатності при її тимчасовій втраті. Цей сегмент ринку умовно названо лікувально-діагностичним. Послуги, що надаються з метою діагностики захворювання, встановлення діагнозу, призначаються лікарем. 2. ЛМП (CLS), що пропонуються для профілактичної діагностики, з метою збереження і підтримки здорового стану організму. Цей сегмент визначено як профілактично-діагностичний. Послуги, які надаються з метою профілактики захворювань, зазвичай ініціюються споживачем (пацієнтом). Потреби в ЛМП першого сегмента визначено на основі даних щодо первинної захворюваності. Потреби в послугах ЛМП другого сегмента визначено на основі вікової структури споживачів відповідних послуг та лікарських рекомендацій щодо призначення аналізів.

Ключові слова: лабораторні медичні послуги, попит, Україна, статистичне оцінювання, сегментація, CLSM.

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Соболев В. М., Корепанов О. С., Соболева М. В., Черненко Д. И. Статистическая оценка спроса на лабораторные медицинские услуги в регионах Украины

Целью статьи является выявление структуры спроса на лабораторные медицинские услуги (ЛМУ) (англ. – Clinical Laboratory Services Market – CLSM) в Украине в региональном разрезе для его статистического оценивания. Рынок ЛМУ (CLS) рассматривается как потребности в ЛМУ (CLS), платежеспособно обеспеченные потребителями. Предложена авторская сегментация рынка ЛМУ. На самом верхнем уровне сегментирования выделены два основных структурных элемента со специфическими формами предложения и удовлетворения спроса потребителей услуг: 1. ЛМУ (CLS), которые предлагаются с целью лечебной диагностики для возвращения здоровья, восстановления и сохранения определенного уровня трудоспособности при ее временной потере. Этот сегмент рынка условно назван лечебно-диагностическим. Услуги, предоставляемые с целью диагностики заболевания, установления диагноза, назначаются врачом. 2. ЛМУ (CLS), которые предлагаются для профилактической диагностики, с целью сохранения и поддержания здорового состояния организма. Этот сегмент определен как профилактически-диагностический. Услуги, которые предоставляются с целью профилактики заболеваний, обычно инициируются потребителем (пациентом). Потребности в ЛМУ первого сегмента определены на основе данных о первичной заболеваемости. Потребности в услугах ЛМУ второго сегмента определены на основе возрастной структуры потребителей соответствующих услуг и врачебных рекомендаций относительно назначения анализов.

Ключевые слова: лабораторные медицинские услуги, спрос, Украина, статистическая оценка, сегментация, CLSM.

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It is not always that the existing economic and statistical measurements give adequate idea of the level of social efficiency of one or another national economy. One of the substitutes for the traditional GDP is the Human Development Index, which integral part is life expectancy in the country, determined, first of all, by the population state of health, most indicators of which reflect the results achieved in the functioning of the national health care system and at the same time indicate its current state.

In terms of economic science, the health sector is a subsystem of the economic system providing medical and related services. Within its structure there act market mechanisms and, therefore, it can be studied and is successfully studied by traditional tools of economic analysis with the help of such basic categories as supply and demand, their entities, price, quality, market equilibrium, submarkets, etc.

However, despite the fact that the health care market has some certain common features with any other local market, it is characterized by quite substantial specificity, one manifestation of which is a rather complex structure – both on the side of the demand and supply, as well as their interaction and pricing mechanisms. The range of its entities is not limited to the direct suppliers and consumers of health services but includes specific agents such as pharmaceutical companies, state, health insurance companies and so on. Also models of individual segments on the market of medical and related services are by no means always competitive, and often burdened with quite different influence of institutional factors, which adds certain uniqueness to them, transforming the national health system in the equally unique phenomenon. But taking into account that the population is aging on a global scale, which results in large disequilibrium in the mechanism of functioning of the health care market and its structure, it becomes clear that the mechanism for statistical estimation of conditions and dynamics of the market should be sufficiently adapted to these changes and respond to them in due time, so that the state as an active participant of this market could have effective levers of influence on its development and prevent emerging threats owing to the use of appropriate statistical tools.

In recent years the number of publications devoted to studying the role and dynamics of the market of medical services has increased considerably. Significant scientific contribution to profound rethinking of the nature and structure of the market in condition of new Ukrainian realities was made by scientific works and doctoral thesis by Prof. T. Kamins'ka [9, 11], whose scientific adviser was Prof. V. Soboliev [10]. The study of this problem is continued by such scholars as O. Bobrysheva [2], Ye. Gaponova [4], A. Danyliv [5], K. Platonova [21], I. Togunov [28], I. Shejman [25, 31], S. Shyshkin [25], A. Shomnikova [33] and others. In addition to studying the general problems of the market of medical services recently two relatively independent directions concerning it have formed: the first one is the study carried out to investigate the active development of new problems related to the functioning and development of the market economy as such in conditions of globalization and virtualization of economic activity. Among the most interesting works of this wide range of studies there should be noted the papers by such authors as Ya. Kornaj, who put

forward the idea that the market economy is not an economy of equilibrium but a system of surplus (as opposed to the economy of deficiency of the Soviet type [15, pp. 101 – 272]), and A. Grytsenko and Ye. Pesots'ka, who found paradoxical effects of the changes in the supply and demand behavior in the modern networked economy [8, pp. 163-175].

The second direction is connected with analyzing certain issues of the health care market development. Many works by Ukrainian scientists and experts are dedicated to studying the aspects of health services: medico-actuarial science [30], pricing [14], private medicine [16, 20], etc. [17]. Consideration is given to a significant increase in the attention of domestic and foreign authors to the analysis of such segment of the health care market as the clinical laboratory services market (CLSM) [12, 13, 19, 23]. This is stipulated by the fact that it is developing at a super high speed throughout the world. It is worth noting that in due time in Ukraine there were taken attempts to draw attention to this problem at the Cabinet level, specifically, in 2010 the Ministry of Health of Ukraine developed the Draft Concept of the State Earmarked Program of Development of Laboratory Services in 2011 – 2016 [22], but it did not come not only to the program itself, but even to the approved concept of this program.

Despite the significant amount of scientific literature and market surveys on development of the clinical laboratory services market (CLSM), there are still many issues, which are not solved properly. The main problem is that almost the majority of the publications were written by representatives of medicine [1, 6, 24, 32], who are not aware enough of underlying economic issues and can not always give an objective assessment of the market development trends. A false view of the CLSM as the only one associated with activities of private companies and ignoring the market (though in specific forms) principles for activity of public providers of these services is still commonly held. One of the factors contributing to the stability of such conservatism is a long-term preservation of embryonic level of the health insurance development in Ukraine. Besides, the statistical scientific research of the market is almost never carried out and the corresponding surveys and analytical studies, which sometimes appear mainly in the media, are of unsystematic and random nature, and the estimation figures of the market extent vary by times. Thus, according to one of the marketing research conducted during 2010-2014, the global market for clinical trials increased from 25 to 28.5 billion dollars. [See 3, p. 43] and, according to another study, in 2012 the market was estimated to be 162.7 billion dollars with the forecast further growth up to 241.3 billion dollars in 2019 [35].

Consequently, despite the rapid development of this segment of the market of medical services both in the world and Ukraine, in our country, unlike all others, its significance is obviously underestimated, and its development is spontaneous, uncontrolled and lacking proper regulatory actions from the side of the state.

This situation is unacceptable taking into account the objectives of the social and economic development of Ukraine declared after the Revolution of Dignity and requires fast and efficient correction, first of all, in the context of creating a science-based system of statistical study and

monitoring the CLS market development. Proceeding from the above mentioned, we formulate the *aim of the article* as revealing the pattern of the demand for CLSs in Ukraine in the regional context and making its statistical evaluation.

In our analysis we, sharing approach of T. Kamins'ka [9, pp. 59 – 112], proceed from the fact that the market of clinical services, in terms of their suppliers (producers), is represented by public and private entities. Accordingly, the CLS market is also represented by private and public segments (*Fig. 1*).

Combination of the manufacturer and seller in one entity is explained by the peculiarity of services, which lies in the fact that their production, trade and consumption are the same.

The condition for transformation of the CLS producer into the market entity is acquisition of either the proprietary right for factors of production to provide services or individual rights. Those producers who have the legal status of the company, their own rules, the current account, financial statements act as sellers of CLSs. Their partners in economic activity can be financial and credit institutions, other health care organizations, government agencies and services.

The question of the CLSs buyers is even more complicated. The end buyer is certainly the consumer (the patient) himself. However, he can perform the function both directly and indirectly. The mediator as a rule is the insurance orga-

nization, which is delegated the buyer's functions. It differs from the traditional mediator in the fact that buying CLSs from the producers it sells the consumers a different kind of services – the insurance ones, that is, it does not sale the same product that buys.

CLSs in Ukraine are provided by laboratories – the public (mainly part of the public health care institutions) and private ones.

For the purposes of our analysis the CLS market can be logically divided into segments. At the highest level of the CLS market segmentation it is justified to determine two main directions with specific forms of service supply and satisfaction of wants (it is quite understandable that the boundaries between these segments of the market are to a certain extent relative):

1. The CLSs offered with the purpose of medical diagnostic for the health recovery, restoration and preservation of a certain level of ability to work at its temporary loss. This market segment we'll conventionally call the medical and diagnostic one. The services provided with the purpose of detecting the disease, determining the diagnosis are prescribed by the doctor.

2. The CLSs offered for the preventive diagnostic in order to preserve and maintain a healthy body condition. This segment we characterize as preventive and diagnostic. The services are provided with the purpose of preventing diseases, usually initiated by the person.

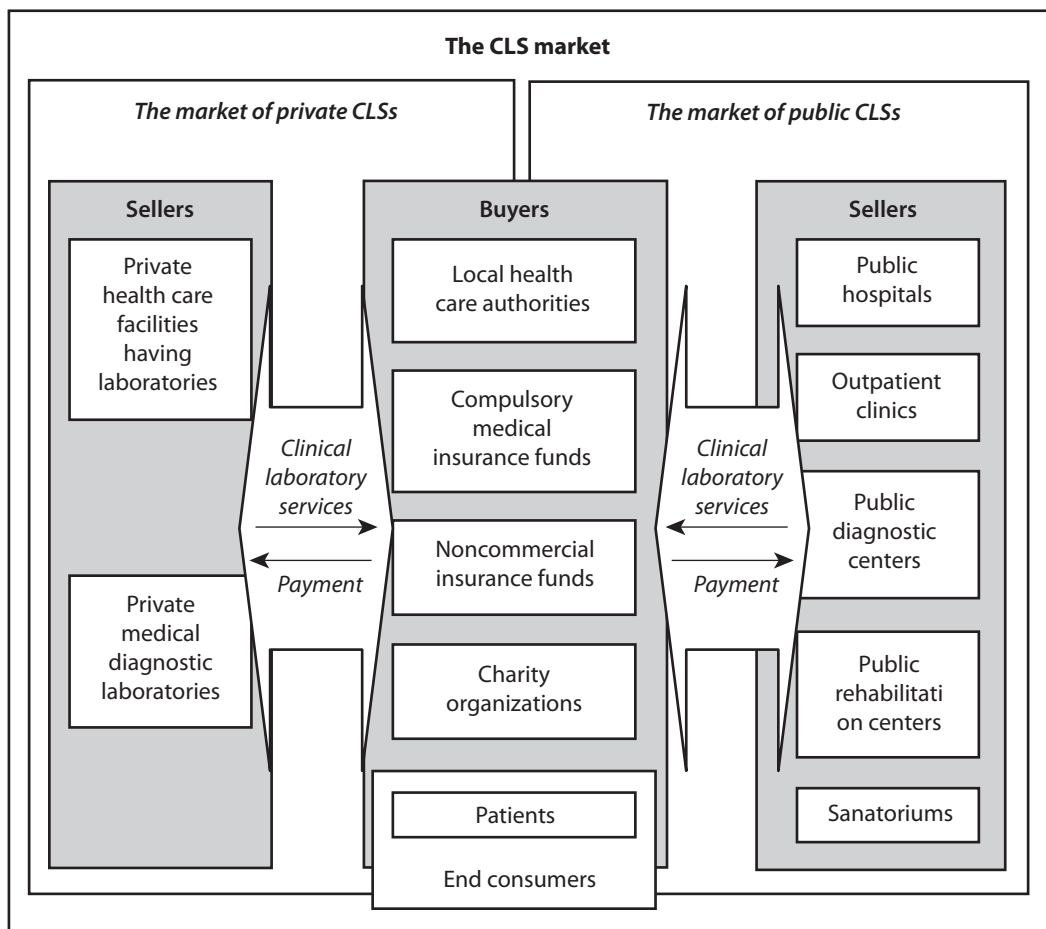


Fig. 1. Sellers and buyers on the CLS market

Source: developed by Chernenko D. I.

This segmentation of the health care market is reasonable from the point of view of economic expediency (Fig. 2).

One of the CLS market characteristics is irregular and unpredictable occurrence of demand for diagnostic services. A person can not predict when in the future he needs medical and, accordingly, clinical laboratory services, can not predict changes in the health status, the severity of future diseases, type of the necessary CLSs and their cost.

The demand for preventive and diagnostic services can be more predictable. Within the designated directions the suggested approach to principles of the CLS market segmentation permits: to conduct further statistical research; study and make statistical estimation of the demand for certain types of laboratory services in each of the segments; determine the size, growth and attractiveness of the segment on the market on the basis of objective criteria using traditional health statistics, comparing them with the economic characteristics of the doctor-patient relationship.

Proceeding from this approach, we consider that statistical estimation of the demand in the medical diagnostic segment in the regions of Ukraine should be based on the data on the primary case rate, because laboratory tests are often carried out to identify and confirm the diagnosis. According to our calculations, the number of newly registered cases by disease classes on the average per year in Ukraine in 2009-2013 was 32.1 million. At that the six most common groups of diseases (those of the circulatory system of the respiratory apparatus, skin and subcutaneous tissue; genitourinary system, traumas, intoxication and consequences of external causes, pregnancy, childbearing and postpartum period) accounted for 23.1 million cases, or 71.1% of the total primary case rate. For the Kharkiv region, the figure made up 67.5% [calculated by: 7].

In our opinion clinical laboratory tests should be a part of a unified system supplementing each other logically.

The survey begins with the routine analysis of blood, urine, and only after that it is advisable to use sophisticated high-tech methods. The range of mandatory tests is regulated by diagnostic methods (i.e., there is a list of procedures required for the diagnostic of a certain disease). The approximate number of the required laboratory tests for a single case with the outlined above 6 classes range from 17 to 30 [summarized by: 7, 18, 22, 29].

On this basis the potential demand for the services of medical and diagnostic segment in the regions of Ukraine was estimated, the results are presented in Table 1.

We consider it appropriate to make statistical estimation of the demand for the preventive and diagnostic segment services on the basis of the age structure of consumers of certain services [7, 29] and the doctor's recommendations on prescription of the tests.

According to the Order of the Ministry of Health of Ukraine from August 27, 2010 № 728 "On Clinical Examination of the Population", the following groups subject to medical examination were distinguished: the children of the first and second year of life; preschool children from 3 to 6-7 and children, who do not attend pre-school institutions; pupils under the age of 15; children from 15 to 18; adults [18].

Taking into account the planned population contingents subject to health survey, we identified three age groups for which it is advisable to carry out preventive laboratory tests: the first – children 0 – 15 years old, the second – those aged 16 – 59, and the third – persons older than 60. For the first age group the provision is made for 5 annual tests, for the second – 8 tests, for the third – 12 tests.

Besides the basic two tests, which are common to all three groups – the blood and urine examination, in our opinion, in order to prevent diseases it is appropriate for the second group to make a coagulogram, biochemical analy-

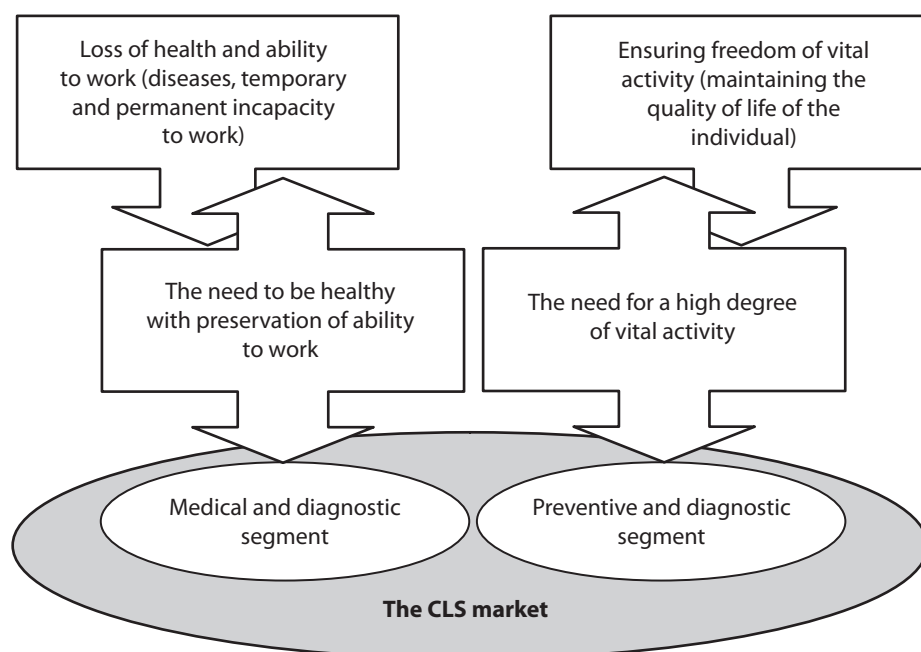


Fig. 2. The CLS market segmentation

Source: developed by Chernenko D. I.

sis of blood, blood examination for cancer-specific marker (for women – of the breast and ovaries, for men – of the prostate), and for people over 60, in addition, a blood test for markers of osteoporosis (4 tests) and some others. This choice can be explained by the fact that on the average up to 86% of all deaths in Ukraine falls on the three main classes of death causes: cardiovascular diseases (66.3% of the deaths), neoplasms (13.9%) and external causes of death (5.9%). Therefore, it is important to make preventive laboratory blood tests for cancer-specific markers to detect the diseases in time. Annually neoplasms cause 15 – 17% of all deaths of people of the active working age. In the structure of death causes for the population over the active working age the leading classes of diseases are those of the circulatory system, neoplasms, respiratory diseases, those of the digestive system, infectious and parasitic diseases. Almost 80% of the

total number of deaths in Ukraine at the age of over 60 accounts for these diseases [generalized by 18, 22, 26].

The results of the statistical estimation of each segment and evaluation of the overall size of the demand for CLSs are shown in *Table 1*.

Thus, the potential national demand for CLSs with medical purposes is 2439.72 millions tests per year, the demand for CLSs advisable to be made with preventive purposes is 379.62 millions tests per year, and the total demand in both segments accounts for 2819.34 millions tests, whereas, according to the CMS, only in Ukraine in 2013 there were carried out 865.56 tests. [29]. Consequently, in 2013 the potential demand exceeded the realized demand for CLSs 3.26 times, which indicates the great prospects in development of the market under study. The

Table 1

The potential demand for clinical laboratory services (CLS) advisable to be carried out with medical purposes and for prevention of diseases by the regions of Ukraine, millions tests

Region	The potential demand for CLSs, millions tests		
	With medical purposes	With preventive purposes	Total
Autonomous Republic of Crimea	75.49	16.40	91.89
Vinnitsya	103.29	13.60	116.88
Volyn	58.12	8.41	66.53
Dnipropetrovs'k	221.30	27.71	249.01
Donets'k	209.47	37.03	246.50
Zhytomyr	58.11	10.56	68.67
Transcarpathia	65.31	10.08	75.38
Zaporizhzhya	75.27	15.04	90.32
Ivano-Frankivs'k	96.17	11.33	107.50
Kiev	83.36	14.38	97.74
Kirovohrad	45.46	8.32	53.78
Luhans'k	91.45	19.08	110.53
L'viv	159.49	20.85	180.34
Mykolayiv	55.80	9.78	65.58
Odessa	132.10	19.85	151.94
Poltava	61.01	12.34	73.35
Rivne	75.63	9.31	84.94
Sumy	44.59	9.64	54.23
Ternopil'	56.01	8.91	64.91
Kharkiv	169.94	23.08	193.01
Kherson	55.68	8.94	64.63
Khmel'nyts'kyy	70.85	10.96	81.81
Cherkasy	74.01	10.72	84.73
Chernivtsi	48.61	7.45	56.06
Chernihiv	54.66	9.10	63.76
Kiev City	183.54	23.51	207.05
Sevastopol' City	16.81	3.24	20.05
Ukraine	2439.72	379.62	2819.34

Source: calculated by [7, 29] and the Center of Medical Statistics of the Ministry of Health of Ukraine.

need to stimulate this demand is stipulated by the fact that if people look after their health and regularly make laboratory tests, most diseases can be detected at an early stage and cured in a short-time period. The world experience shows that the increase in expenditures on laboratory tests by 1% reduces expenditures on treatment by 5% [27, 34].

But in this case it should be taken into account that there is a fine line between a reasonable prevention of a disease and over diagnosis (false conclusion about the presence of a disease, which can be done accidentally or intentionally to get extra money from the consumer) and cause a lot of harm.

CONCLUSIONS

The conducted study allows to draw the following conclusions.

Statistical estimation of the demand for CLSs involves primarily identification of its structure and adequate segmentation. There have been suggested to distinguish two segments of demand for CLSs – medical and diagnostic and preventive and diagnostic. Its potential value in each segment and the total size in Ukraine as a whole and its each region has been estimated as well as.

Cost estimate of the demand involves analyzing the system of the demand creation factors, first of all, the level of income of different population groups, and assessment of the supply – evaluation of the composition and structure of the providers of these services, studying the mechanism of pricing for CLSs, revealing their features and making the corresponding calculations, and is the subject of our further research. At that it is required to use the results of recent theoretical developments of problems of supply and demand in conditions of the network economy expansion, the global tendency of population aging and the faster growth of health spending compared with the rate of economic growth in the statistical analysis. ■

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