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## IDEOLOGY OF THE INTEGRAL MEASUREMENT OF PUBLIC HEALTH IN HEALTH CARE PRACTICE

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### **Abstract**

*The paper presents the logic of starting the health assessment in terms of time — days, months, years of a person's life (generation of peers, groups of people — population) using the "longevity scale". The latter is based on the mortality of the population data. We studied the survival - "through the looking glass" of mortality, life expectancy, their causes, taking into account gender, age and territory of residence.*

**Keywords:** *system analysis, health dynamics, longevity scale, survival.*

When training future doctors, it is necessary to draw the attention of listeners in the educational process to the fact that health management of the population cannot rely in their health programs on countless individual manifestations of human health. According to the WHO requirements, the information and methodological system of the healthcare should have (or form) a minimum set of integral indicators available for managing people's health that can be obtained from a traditional database, taken on the basis of the found patterns, suitable for use in any territories while solving both "vertical" and "horizontal" tasks in the health care management system, regardless of the current economic models in the healthcare and, at the same time, necessarily aimed at improving public health and their own activities.

While system research of population health matching of two main components of public health: biological and social was considered and searched.

The first component reflects the quality of the innate (biological, genetically laid) health, the second one shows acquired resistance to preserve this health (and therefore life) on the whole cycle of existence taking into account changes in the quality of the living environment.

In this case the integral evaluation of the observed population health (external evaluation) is carried out using the methods of mathematical statistics. And to assess the "internal" health the simple transfer of the dimensionless characteristics of the "external" is conducted. Thus, when "external" is measured in specific units the "internal" is measured in the same units, and vice versa, when measuring the "internal" in its own units a transfer allows measuring the "external" in the same units.

In order to coordinate the "external" and "internal" parameters of the health of the population the following postulates (axioms) have been used:

1. There exists a maximum resource of life (or viability) of populations. It has a temporal equivalent termed by us the age-limit or the maximum specific (biological) life span.

2. In time (with age) this resource of viability (the social aspect of this concept – life stableness) is used, exhausted, according to a linear law, at that, described in the theory of aging of Strehler – S.Mildvan. Its expenditure is determined by the quality of the habitation environment.

3. An interaction of populations with the environment, in which their life proceeds (life activity, existence), cannot be realized without losses, ruining health that are determined (characterized and described) by a unique power function of their age for each group of people (as the parameters of the inner program of activity and the speed of using the congenital health resources).

We fixed an agreement of many characteristics under the concept "the resource of health":

- the specific (biological) characteristics of the life span;
- congenital (biological) specific steadfastness for the preservation of life;
- congenital (biological) viability of generations acquired from the parents;
- congenital resistance of generations to negative environmental (socio-ecological) factors of their historical and geographical motherland.

Thus, "the resource of health" is an internal parameter of the existence of an object (population). The demographic processes (the birth rate, mortality rate) traditionally appear in the role as its external manifestation. Health and its resource are found inside; these are the internal parameters of the population. A coordination of the two concepts – "health" and its "resource" is expressed in the concept – "vital capacity" – as a biological characteristic ("internal"), on the one hand, and, on the other hand, in the concept – synonym "life steadfastness" – as a sociologic characteristic of manifestations of the "internal" upon an external consideration.

A dual quality of the concept "viability/life fortitude" made it possible to reflect the conformity of the biological and social in an object in the best possible way. At the same time, it enabled to span (like a foot bridge) and show a complete interdependence of the concepts "health" and "survival". Their interconnection is the following.

A generation of newborns lives a life until death coming. Life appears as a temporal interval between the dates of birth and death. Functionally, the definiteness of this internal is registered by the concept "existence". The latter has one or another quality which is fixed externally by the notion "survival".

In other words the concept "existence" via its qualitative characteristics designates practically its own

spatial – temporal characteristics in the concept “survival” and from this point of view both these concepts are conformably equivalent.

Outside the “existence” of an object (a human, population, generation) the concept “the health of an object” cannot exist. Health, as a concept becomes definable, when it is “bound” to an object, in the presence, appearance of the latter. And it may be defined, observed, fixed, evaluated, measured only in the process of the “existence” of an object: it is absent until the “birth”, the appearance of an object, it is also absent after “death”, the disappearance of an object.

Taking this into account an interpretation that the concept of “health” is closely associated with the presence of an object becomes an axiom. This object is observed and characterized by the duration (a period of time) of its existence the, duration of their lives – for the population (a human).

“Health” depends on the quality of life, hereat, (the quality of the habitation environment) and its derivatives of qualitative (temporary and others) survival parameters.

Hence, fixing the interval from the date of birth till the date of death of the last deceased member of a concrete generation, one can register the length of his life (the age of death) as a temporal index used by this generation of the “life reserve” (intended for it “the life resource of health”).

From this point of view the “generation health” becomes a spatial – temporal parameter in the light of which the traditional, well-known for a long time index of the average life span for newborns obtained on the basis of processing mortality tables reflects and represents in a measured form a real already used average characteristic of the total “generation health” throughout the entire spell of its life. That is, the index of the life span reflects the situation of an “interaction” (the level of “harmony” or “conflict”) of prescribed biosocial characteristics of the population itself and the environment of its existence.

One can arrive at a conclusion on this basis that the basic characteristics of the population include the specific age limit of life intrinsic to it, as a specific biological “resource of health” as well as congenital viability/life endurance, as internal, acquired from the parents steadfastness to survival, the preservation of the species. This is one aspect of an interaction. Another aspect is the environment of habitation, its quality from the positions of external conditions for the preservation of a species, its health, its survival, as a condition of its “benevolence” or the ability of the environment to preserve health and life of its members.

The said parameters at all the stages of life, being in coordination or in a state of a “conflict” determine the state of health of the population at any period of time of its existence, the integral dynamics of health and the time of its preservation (the survival rate). They have only to be measured.

A morphological aspect of the survival rate of the population is fixed in the pattern of the population of proportions and the number of individual groups based on the gender and age. A functional aspect – the mortality rate in these groups and a genetic one (derived from genesis – the development and its logical outcome) is characterized by the parameters of survival and the average life span. The concept “survival” as a term of the preservation of health is a reverse index in relation to mortality. In the meantime, mortality was taken for an evaluation of health due to the fact – that the rate of mortality is one of the most accurate and known “manifestations of the population health” and, apart from this, the registration of death is obligatory at the state level on any territory.

The age of death, as a date, was used by us for a mathematical indication (determination) of the duration of life – the duration or the time of existence of health. It is known that death, as a phenomenon, manifesting inner processes in man; is a result of some causes, a consequence of disturbances of health or, otherwise, the result of some causes – the sequel a of health derangements, or, otherwise speaking, the consequence of injuries, diseases, which were conferred corresponding names by the society (ICD - 10) – as causes on which health and its complete loss – death depend.

In addition, the age of death, both as a date and as a demographic statistical factor has enabled to coordinate the scales of the time of the existence of the biological and social, id est, it has made it possible to regard these or other genetic (congenital, internal) and environmental (external) characteristics of existence, both natural (the first) unamenable to changes after birth and as artificial ones (the second) amenable to changes, control and correction, the limiters of the terms of preserving the health and lives of people.

In other words, “the mortality rate” was chosen by us because of a connection, including a methodical one, with the “survival” of the population in a concrete environment (both indices are evaluated according to the mortality tables), whereas the concept “survival” directly depends on the concept “health”. From these positions a choice of “survival” as a gauge of “health” is fully substantiated.

The curve or the scale of “survival”<sup>1</sup> (Fig. 1.) at the temporal cycle of “life” of generations take into account in an integral form all the events, influencing the health of the population. It is the most informative, represents a spatiotemporal characteristic of health which provides (when using topology) an approach to a measurement of physical time (natural and social phenomena) and biological time (the existence of populations, generations, the population).

That is, the scale of survival takes into account everything in a systemic and inalienable unity. It is a unique socio-geographical and, simultaneously, a large – scale – temporal “map” of the dynamics of the population health during all the years of life under definite

<sup>1</sup> Graphic-analytical models to which the scale of survival belongs (see fig.1.) are graphic models, reflecting, the principal features of objects under study, processes and enabling to present different variants of solving tasks, achieving the ultimate

goal on a real time basis on a diagram, evaluate the degree of a conformity between individual components of objects under study.

political, socioeconomic, sanitary-ecological, historical and administrative – territorial conditions.

It reflects national, age-gender, industrial (urban-rural), medical-organizational and many other factors, influencing on the people's health from the positions of their mode of life and the psychology of existence.

Undoubtedly, it does not mean that in order to measure the dynamics of health one couldn't use the scales of other phenomena (for example, diseases)<sup>2</sup>. It is possible, but the scale of survival is exclusively the only one, which takes into consideration EVERYTHING (including the dynamics of diseases). The authors investigated the "systemic" environment of

$I(x)$

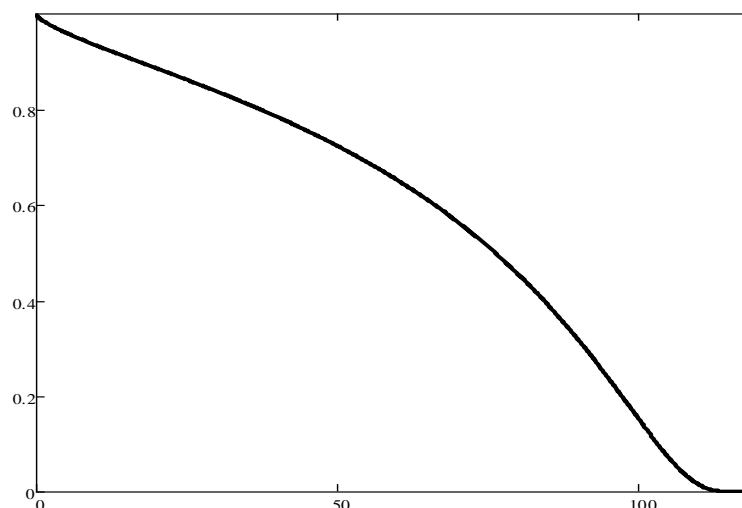


Figure 1. The scale of survival (longevity) typical of individual generations of Ukraine's population at the end of the XX<sup>th</sup> century (the number of newborns is recognized as 1),  $x$  – years of life.

Taking into account the "conditions" of this environment, a person (population) forms his (her) "lifestyle" as an "order", "organization" of the life and life creative work in it. Hereat, "the level of life" on the bases of the style that arose (traditions, laws) as its quality is determined by the "limits of existence" and, correspondingly "the limits of potentialities to satisfy one's needs". This level determines the "lifestyle" as a way intrinsic both to a unique object (an individual, a personality) and a group of people. It is formed on the basis of "likeness" – based on "life patterns" determined by the quality of the "lifestyle" in groups of people and there is a host of them. A person makes a "choice", joining some group (the choice is always general for a certain status group – according to the gender, age, social standing etc.).

But, at the same time, a "choice" always has a unique character – it may be only according to one parameter of the "lifestyle" of the group, the most attractive one for an individual. This "choice" motivates the behavior of a person (and his group) in the environment and moulds their "lifestyle".

the population on its basis, in all its integrity whose inseparable components are the population and the environment of its habitation. Each of them has many items, correspondingly – the aspects of consideration and on each of the latter – its own criteria of their evaluation.

The principal active component of the "systemic" environment is the population (a human). Its presence and vital activity in it are always directed at its own existence and the provision of the latter (by adjusting the environment to its own needs), in other words, oriented at actions of changing (a correction in a desired direction) its environment – the habitation milieu.

Moreover, scientists have been concerned for a long time with the following questions: does man possess the freedom of the will, does he choose decisions consciously or the freedom of choice is an illusion?

To our way of thinking, a person cannot change his (her) character, neither can he (she) change the events of the process of development destined for him (her), as well as desires thrust on him. He (she) can change only his (her) milieu – only here man is granted the freedom of the will. Only changing his (her) surroundings which, in its turn will change him (her), man can walk with vigorous strides in the direction of qualitatively higher world perception.

What becomes primary after all, while executing appropriate actions? Health is primary. Health provides a choice of "healthy social connections", and, in the long run, ascertains the quality of our life in the concept "health" and makes us healthy in a broad aspect of concepts. Exactly health is a "starting guiding impact", reflecting the "degree of conformity" of the "internal" parameters of viability in a concrete situation (the biological aspect for an individual, the social one – for a group of people, the population) and the possibilities of the environment to satisfy certain needs according to their

<sup>2</sup> Examples of measuring and evaluating the dynamics of the population health based on the findings of the disease incidence have also been elaborated and are carried out by us in this paper

orientation (quality) and nature (volumes) in conformity with actions based, on the behavior, (demands) of a person (people), this determining the parameter of their “external” life endurance.

The principal object of theoretical studies, while investigating the integrity considered, became regularities of changes of the states of public health associated with the consistent patterns of the processes of survival (mortality) in the habitation environment for the purpose of evaluating the extent of knowledge and indicators necessary for the information support of administering the population health both in the practice of the department of the public health service and the practice of other social institutions on the territory of its habitation.

A series of new approaches and methods was worked out by the authors within the framework of a systemic study of health on the basis of detecting regularities of an association of health with the parameters of survival for the purpose of processing traditional materials of the birth rate, the rates of morbidity and mortality with further obtaining on their basis a range of measured links for an evaluation and prognosis of the population health, the functioning of the system of health care. A conception of an integral vision of the processes, taking place in the systemic environment, concepts based on the “health of the population” and non-contradictory factors singled out inwardly, influencing on the dynamics of health and the survival of the population has been elaborated. Furthermore, an entire spectrum of such of them which formally were singled out traditionally only within the framework of specialized sciences, having little in common with medicine and, as a rule, were not coordinated among themselves, the latter being an obstacle for their use in the public health care system.

Regarding health as an event – a change of the conditions its spatial – temporal characteristics – as processes and in their light other processes, also being characterized by temporal characteristics, correlations were discovered in this integrity. Health according to EVERYTHING in a systemic environment, all the processes proceeding in it on whose basis there appeared a possibility to determine the integral indices of the whole which was measured in terms of health indices. In particular, demographic, biological, social, economic, genetic, geographical and other aspects of a vision of this integrity, the numerical values of their integral parameters were coordinated and for the first time a LAW, expressing an integral interrelation of EVERYTHING in this integrity – a law of the survival of populations was determined.

The law reflected changes of the human resource (the dynamics of health) during a complete cycle of life existence and, in the long run, – in variations of the life span. The last index, both observed and measured on the basis of using the parameters of the law, became controllable.

It is considered, at that, that health itself is not observed at the biological level. Only its manifestations are observed there, outcomes = of a disease (or the absence as such). Health is observed only at the level of the social dynamics of processes: survival, mortality,

morbidity. Health and disease occur (conformed) both in individuals and in groups of people only at the level the psychomotor system – behavior motivations, when choosing the mode of life according to “patterns” of the lifestyle of separate (groups) of people.

The use of the law of the survival of populations enabled to mould a form (quality) of the health of the population and a healthy society. Hereat, everybody discovers “one’s own” in it. For example, the population in the scales of the dynamics of health chooses an “image” “after itself” and this “image” becomes a guiding impact for it (it is “inside”).

With such an approach the regulation and order (organization) of “images” become the basis of social “taming” of a mode of production of health and a healthy man (society) where a right as a realized will is a system of rules, “images” which the society “sets” and regulates. Thus, proceeding from this, prognosticating health is a prognosis of the fundamentals of building a healthy (desired) society, the foundations of building a system of its protection and the fundamentals of the qualitative characteristics of the environment in which the population should live – an environment for the preservation and reproduction of health, suitable for its gradual improvement and an increase of the life span. In other words, health appears in the role of a regulator of needs on the basis of natural understanding “negatives”, risks. Simultaneously appearing in the role of the function of internal knowledge, it shows and realizes the ability and possibility of using this knowledge and a potential laid in it according to the triad:

<knowledge, health, a healthy person>.

It should be noted that the law of the survival of populations exists without us – a stable interaction of all its components in nature is observed. We only express it in one or other models (models are our conceptions), which may be specified. Having found these components, having determined a form of their associations and its prognosis, one can form purposefully an orientation of actions of the society aimed at achieving “models” of the population health and the environment of its habitation in conformity with them.

Proceeding from the afore-cited the forming of a new future (its prognosis) is carried out according to the following scheme. A “real situation” is taken into account: acting in the environment “circumstances” and “situations” formed on their basis. “Risk factors” stand out in the latter as “events”, changing “the condition” of health and the systemic environment on the whole. While evaluating this condition as “normal” harmonious, equilibrium = favorable, its stability is achieved. According to another evaluation of the condition – acknowledgement of its “unfavorableness” on getting a signal of a “danger” of the condition and a threat to the latter (a threat = realized danger) a task is set = to eliminate this threat. In other words “risk” as an uncertainty, a threat to danger and an undesirable orientation of “events”, changing “the condition” (the health of population society, environment) and a possibility of a “catastrophe” must automatically include “decision taking” and adequate actions towards “risk” (measures programs), concerning its elimination.

Public health service, exerting effects (whose external aspect appears to be “diagnoses”) attempts to “extinguish” them itself handing them over into a “governing impact” of its own activity: it is incapable (acting alone!) to achieve a desired result on such a basis. Hence it should revise its lines of activity, the internal set-up and leading functions in conformity with the systemic character of the concept “the population health”, the sources and principles of its preservation presented in the law of survival at the life cycle of each generation, taking into account an infinite majority of its status characteristics, “selections” of standards and the motivation of behavior aimed at preserving one’s own health.

Conclusions.

1. In the ideology of measuring the health of the population, the Strehler-Mildvan theory of aging, adapted to address the issues of public health management, was used.

2. To calculate the age-gender parameters of survival and to build a “longevity scale” we used materials that are common for calculating mortality tables, they

were used for the first time in scientific practice to assess “health resources of the population” and the rate of their loss (losses) over the years of life in the system “inverse countdown” from mortality – “through the looking-glass”, from the moment of birth.

3. The presented ideology allows passing (on the basis of the aforementioned) to the search for and selection of patterns in the dynamics of public health throughout the entire life cycle.

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### METHODICAL APPROACHES TO DETERMINING THE POPULATION SYSTEM AND THEIR HEALTH, TO THEIR MEASUREMENT AND ASSESSMENT

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#### Abstract

*The paper presents system characteristic of the environment of human existence (and population), its basic components, the system logic of the definition of generic and aspectual concepts of health (individual, family, population), system schemes for their measurement and assessment.*

**Keywords:** *system analysis, management, environment, health, population.*

One of the main tasks of the higher medical school is to develop the understanding of the “population system” and the development of people's health in the dynamics (throughout the life cycle) related to its quality. This knowledge forms the professional thinking of the doctor and the choice of the right solutions for patient care.

It is generally recognized that the environment in general, includes physical and social components. But proclaiming the so-called “anthropogenic” effects on the environment the “population” itself as an object (as an element of “morphology” and environment), as well as “population” as a leading “function” in this environment realizing a certain “lifestyle” in it should be included in the environment. Besides, the submitted list of the components of the environment should include one more component – “state of health” of the population. (Table 1.5 presents all of the above components of the system environment of the population in medical and social aspects).

The morphological characteristics of the object “population” traditionally, primarily, are represented

by the structure (distribution) of people by gender, age, education, occupation, etc. These characteristics in the system medical and social analysis of the population are basic in the “morphology” of forming its health.

Similar (morphological) characteristics for the “lifestyle” of the population are represented by a spectrum of specific knowledge, defining public awareness of its own health conservation (by means of education, training, information communications, etc.).

Morphological characteristics of the object “social environment” (social surrounding) are reflected in the laws of life created by the people themselves, in the historically accumulated and existing traditions, in the social infrastructure of people’s settlements, including the development and accessibility of health care, etc.

The morphology of “physical environment” is determined by its fragments in a spatially confined place of residence (where labor and household life activity of the population passes), namely water availability and debit, soils structure, air quality, climate and other fragments that define the life and health of people.

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