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Methodological approaches to hygienic assessment of public health risk

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ABSTRACT. *Introduction.* In order to increase the informativeness of the results of the population health risk calculation and to ensure the possibility of conducting a comparative analysis, it is necessary to use an indicator that allows to characterize the severity of the relationship between factors and indicators of population health. ***The purpose of the study*** is to substantiate the possibility of using the Global Burden of Diseases indicator for a hygienic assessment of the sanitary and epidemiological well-being of the population based on the use of the health risk assessment methodology. ***Materials and methods.*** Model territories with atmospheric air pollution by fine dust (above the maximum permissible concentration) and acoustic load (60, 65, 70 dBA) were used. The measured parameter is one year of healthy life DALY (Disability-Adjusted Life Year), lost due to disease, disability, or premature death. Statistical processing was carried out using the standard Excel 16.0 (Office 2016) software package. ***Results***. The use of risk factors (chemical or physical pollution of natural environments) allows to assess the proportion of the severity of a particular disease associated with exposure to an unfavorable factor or a combination of environmental factors. The presented calculations are simplifications of complex biological processes. However, as cities develop their transportation infrastructure and noise levels increase, the burden of diseases will also increase. There is a clear non-linear relationship. When the noise level increases from 60 to 70 dBA (by 10 dBA), the total burden of diseases increases by more than two times (from ~1220 to ~2740 DALY/year). ***Conclusion.*** The proposed methodological approach allows for a higher level of comparative quantitative assessment of the impact of factors on public health and implements a mechanism for calculating the effectiveness of preventive measures.

KEYWORDS: hygienic assessment, health risk, global disease burden

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Методические подходы к гигиенической оценке риска здоровью населения

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РЕЗЮМЕ. ***Введение.*** Для повышения информативности результатов расчета риска здоровью населения и обеспечения возможности проведения сравнительного анализа необходимо использовать показатель, который позволяет характеризовать выраженность взаимосвязи факторов и показателей здоровья населения. ***Цель исследования*** — обоснование возможности использования показателя «Глобальное бремя болезней» для гигиенической оценки санитарно-эпидемиологического благополучия населения на основе использования методологии оценки риска здоровью. ***Материалы и методы.*** Использованы модельные территории с загрязнением атмосферного воздуха мелкодисперсной пылью (выше предельно допустимой концентрации) и акустической нагрузкой (60, 65, 70 дБА). Измеряемым параметром был один год здоровой жизни DALY (Disability-Adjusted Life Year), потерянный из-за болезни, инвалидности или преждевременной смерти. Статистическая обработка проведена в пакете стандартных программ Excel 16.0 (Office 2016). ***Результаты.*** Использование факторов риска (химическое или физическое загрязнение природных сред) позволяет оценить, какая доля бремени конкретного заболевания вызвана воздействием неблагоприятного фактора или комплекса факторов окружающей среды. Представленные расчеты являются упрощениями сложных биологических процессов. Вместе с тем с развитием транспортной инфраструктуры городов и ростом шума будет увеличиваться бремя болезней. Наблюдается выраженная нелинейная зависимость. При повышении уровня шума с 60 до 70 дБА (на 10 дБА) суммарное бремя болезней увеличивается более чем в два раза (с ~1220 до ~2740 DALY/год). ***Заключение.*** Предложенный методический подход позволяет перевести гигиеническую оценку на более высокий уровень сравнительной количественной оценки влияния факторов на здоровье населения и реализует механизм расчета эффективности профилактических мероприятий.

КЛЮЧЕВЫЕ СЛОВА: гигиеническая оценка, риск здоровью, глобальное бремя болезней

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

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INTRODUCTION

A key approach in modern evidence-based policy in the fields of public health and environmental protection is the methodology for assessing risks to public health. It is necessary to use an indicator that clearly demonstrates the strength of relationships under study to quantitatively assess the negative impact of environmental factors on public health and to determine the proportion of morbidity, mortality, and disability in the population that may be caused by specific risks (air, water, and soil pollution, noise, etc.). This indicator is also important for enabling a comparative analysis of the population's health and epidemiological well-being across different regions.

The Institute for Health Metrics and Evaluation (IHME) has developed a comprehensive methodological approach embodied in the "Global Burden of Disease" (GBD) indicator and its component, the "Environmental Burden of Disease" (EBD) [1–4]. The approach was developed to measure population health losses due to diseases, injuries, and risk factors. Currently, this indicator is not yet widely used for public health risk assessment.

AIM

The aim was to demonstrate whether the Global Burden of Disease (GBD) indicator can be used for the public health assessment of the population's sanitary and epidemiological well-being based on health risk assessment methodology.

MATERIALS AND METHODS

To test the method for calculating the GBD indicator, model areas with atmospheric air pollution from fine particulate matter (exceeding the maximum permissible concentration, MPC) and various levels of noise exposure (60, 65, 70 dBA) were used. The primary parameter measured by the GBD is DALY (Disability-Adjusted Life Year). One DALY represents one year of healthy life lost due to illness, disability, or premature death. This indicator consists of two components: YLL (Years of Life Lost, years of life lost due to premature death) and YLD (Years Lived with Disability, years of life lived with a health impairment (disability), weighted by severity) [1–10]. The use of risk factors (chemical or physical pollution) allows to estimate what proportion of a specific disease is caused by exposure to an adverse environmental factor or a complex of factors. Statistical analysis was performed using the standard Excel 16.0 software package [2].

RESULTS

An analysis of domestic and international scientific literature enabled a comparison between the traditional approach to public health risk assessment and a methodological approach supplemented by the calculation of the GBD index. The results are presented in Table 1.

The comparative analysis showed that supplementing the hygienic assessment of public health risk with the GBD calculation transforms the hygienic assessment from a mere statement of regulatory exceedances into a quantitative assessment of actual harm to public health, making it scientifically sound, integrated, and prioritized.

To confirm the results of the comparative analysis of approaches, we calculated the GBD for model conditions in areas with atmospheric air pollution from fine particulate matter and noise exposure (60, 65, 70 dBA). The calculations were performed using a generally accepted methodology [1]. The following indicators were calculated: YLL, YLD, DALY. It was taken into account that with an increase in DALYs associated with a specific risk factor, its contribution to the overall disease burden in the population rises (Table 2).

An assessment of the disease burden from air pollution caused by motor vehicles and noise pollution in a hypothetical city N with a population of 1,000,000 people showed that the number of deaths associated with $PM_{2.5}$ air pollution from motor vehicles amounts to 720 per year.

The baseline mortality rate (all causes) for a standard population is ~800 deaths per 100,000 people per year. The exposure risk fractions (ERFs) provided by the World Health Organization (WHO) and studies conducted as part of the Global Burden of Disease project were applied.

The main diseases associated with $PM_{2.5}$ are ischemic heart disease (IHD), stroke, lung cancer, chronic obstructive pulmonary disease

Table 1

Results of a comparative analysis of the traditional approach to hygienic assessment and the methodological approach supplemented by the calculation of the "Global burden of disease" indicator

Таблица 1

Результаты сравнительного анализа традиционного подхода к гигиенической оценке и методического подхода, дополненного расчетом показателя «Глобальное бремя болезни»

Традиционный подход **Traditional approach**	**Подход, дополненный расчетом ГББ** **An approach supplemented by the calculation of the GBD**
Отсутствие интегральной оценки. Разрозненные данные по концентрациям разных веществ не дают общей картины ущерба здоровью населения *Lack of an integrated assessment.* Scattered data on the concentrations of various substances does not provide a comprehensive picture of the damage to public health	*Интегральный и количественный показатель.* Глобальное бремя болезни (ГББ) дает возможность суммировать ущерб от всех заболеваний, связанных с факторами окружающей среды, в единой метрике (DALY). Это позволяет получить общую «цену» загрязнения для здоровья населения региона или страны *An integrated and quantitative indicator.* The Global burden of disease (GBD) allows for the summation of the damage caused by all diseases associated with environmental factors in a single metric (DALY). This allows for the overall «cost» of pollution to the health of the population of a region or country
Сложность определения приоритетов. Сравнивать предельно допустимые концентрации (ПДК) и предельно допустимые уровни (ПДУ) разных факторов бессмысленно *Difficulty in prioritizing.* Comparing maximum permissible concentration (MPCs) and maximum permissible levels (MPLs) for different factors is pointless)	*Сравнимость и расстановка приоритетов.* ГББ позволяет сравнивать между собой абсолютно разные факторы риска. Формируется объективная основа для выбора наиболее значимых проблем, на которые в первую очередь должны направляться управленческие решения и ресурсы *Comparability and prioritization.* The GBD allows for the comparison of completely different risk factors. It provides an objective basis for selecting the most significant issues to prioritize management decisions and resources
Превышение ПДК констатирует проблему, но не показывает ее последствий. Ущерб здоровью может проявляться через годы (хронические болезни) *Exceeding the maximum permissible concentration indicates a problem but does not reveal its consequences.* Health damage may manifest itself years later (chronic diseases).	*Оценка фактических последствий.* ГББ измеряет не потенциальную опасность, а реализовавшийся ущерб — конкретные случаи болезней, инвалидности и смерти, которые произошли здесь и сейчас из-за воздействия факторов среды в прошлом *Assessing actual consequences.* The GBD measures not potential hazards, but actual damage — specific cases of illness, disability, and death that have occurred here and now due to past environmental factors
Учет многофакторности заболеваний. Многие болезни вызываются несколькими факторами (образ жизни, генетика, загрязнение окружающей среды). Традиционный подход не позволяет выделить «экологическую» составляющую *Considering the multifactorial nature of diseases.*Many diseases are caused by multiple factors (lifestyle, genetics, environmental pollution). The traditional approach fails to isolate the "environmental" component.	*Атрибутивная (причинная) оценка.* Методология с ГББ с использованием концепции Population Attributable Fraction (PAF) — популяционной атрибутивной доли — позволяет рассчитать, какая доля случаев конкретного заболевания статистически связана с воздействием данного фактора риска *Attributable (causal) assessment.* The GBD methodology, using the Population Attributable Fraction (PAF) concept, allows to calculate the proportion of cases of a particular disease that is statistically associated with exposure to a given risk factor)

Таблица составлена по данным собственного исследования авторов / The table is based on data from the authors' own research

Table 2

The assessment stages are recommended by World Health Organization (Comparative Risk Assessment, CRA) — comparative risk assessment

Таблица 2

Этапы оценки, рекомендованные Всемирной организацией здравоохранения (Comparative Risk Assessment, CRA) — сравнительная оценка рисков

Этап **Stage**	**Содержание** **Content**
1	*Выбор фактора риска и последствия для здоровья.* Устанавливаются «последствия для здоровья», для которых есть доказанная причинно-следственная связь с этим фактором *Selecting a risk factor and its health consequences.* "Health consequences" are identified for a proven causal relationship with the risk factor
2	*Анализ воздействия.* Оценивается, какая часть населения подвергается воздействию фактора риска и на каком уровне (например, с помощью данных мониторинга качества воздуха, моделей распространения загрязнений, опросов) *Exposure analysis.* An assessment is made of the proportion of the population exposed to a risk factor and at what level (e.g., using air quality monitoring data, pollution distribution models, and surveys)

Окончание табл. 2 / Ending of the Table 2

Этап Stage	Содержание Content
3	*Определение функции «воздействие–ответ».* Это математическая зависимость, показывающая, насколько увеличивается риск возникновения заболевания при изменении уровня воздействия. Эти функции получают из крупных эпидемиологических и токсикологических исследований *Calculation of the exposure-response function*. This is a mathematical relationship that shows how much the risk of developing a disease increases with changing exposure levels. These functions are derived from large-scale epidemiological and toxicological studies
4	*Расчет доли attributable fraction (AF).* AF (атрибутивная доля) — это доля случаев заболевания, которые можно было бы предотвратить, если бы воздействие фактора риска было устранено. $AF = (P \cdot (RR - 1)) / (P \cdot (RR - 1) + 1)$, где P — доля населения, подверженная воздействию; RR — относительный риск для данной болезни при данном уровне воздействия *Calculating the attributable fraction (AF)*. AF is the proportion of disease cases that could be prevented if exposure to a risk factor were eliminated. $AF = (P \cdot (RR - 1)) / (P \cdot (RR - 1) + 1)$, where P is the proportion of the population exposed; RR is the relative risk for a given disease at a given level of exposure
5	*Расчет бремени в DALY.* Берется общее количество DALY по конкретному заболеванию в популяции (из статистики здравоохранения). Умножается на атрибутивную долю (AF) для этого заболевания: Σ (DALY) = бремя определенной болезни (DALY) · AF *Calculating the burden in DALY.* The total number of DALY for a specific disease in the population (from health statistics) is taken and multiplied by the attributable fraction (AF) for that disease. Σ (DALY) = disease-specific burden (DALY) · AF)
6	*Суммирование и анализ.* Бремя рассчитывается для всех заболеваний, связанных с выбранным фактором, а затем суммируется. Это и будет общее экологическое бремя болезней от данного фактора *Summation and analysis*. The burden is calculated for all diseases associated with the selected factor and then summed. This represents the overall environmental burden of disease from this factor

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Table 3

Summary table of disease burden estimates for city N

Таблица 3

Сводная таблица оценки бремени болезней для города N

Фактор риска **Risk factor**	**Основные последствия** **Main consequences**	**Оценочное количество смертей в год** **Estimated number of deaths per year**	**Оценочное бремя (DALY в год)** **Estimated burden (DALYs per year)**
Загрязнение воздуха ($PM_{2.5}$ от транспорта) Air pollution ($PM_{2.5}$ from transport)	Ишемическая болезнь сердца, инсульт, рак легких, хроническая обструктивная болезнь легких Ischemic heart disease, stroke, lung cancer, chronic obstructive pulmonary disease	700–800	10 000–15 000
Шум от транспорта Traffic noise	Ишемическая болезнь сердца, нарушения сна, когнитивные нарушения Ischemic heart disease, sleep disorders, cognitive impairments	40–100	500–1500
Итого Total		740–900	10 500–16 500

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(COPD), and lower respiratory tract infections (in children). The calculation was performed using the method recommended by the WHO, which takes into account the relative risk at the analyzed concentration (RR). DALYs from air pollution amount to≈7,900–8,500 cases per year.

More precise WHO calculations for similar cities show that the overall burden of air pollution can range from 1,000 to 2,000 DALYs per 100,000 population. Given that transportation in the city under analysis is the primary but not the only source, the estimate for the city is:

~10,000–15,000 DALYs per year from motor vehicle air pollution.

A noise level of Lden >55 dBA (the threshold above which the WHO notes serious health consequences) affects 60% of the population (600,000 people). A noise level >65 dBA affects 20% of the population (200,000 people). The main noise-related health conditions include coronary heart disease, cognitive impairments in children, and sleep disorders. Calculations indicate that ~40 deaths per year result from noise exposure. Cognitive impairments in children affect a cohort of ~150,000 schoolchildren. Studies show a 1–2-month lag in reading and memory skills among children in noisy areas. This can contribute a significant number of YLDs. For a city with a population of 1 million, a rough estimate of the total burden is ~500–1,500 DALYs per year from transportation noise (Table 3).

When assessing the burden of disease from rail transport noise in a hypothetical city N with a population of 1,000,000 people, calculations were performed for equivalent noise levels of 60, 65, 70 dBA. Losses due to ischemic heart disease, irritation, and the total disease burden were calculated (Table 5). Data source: coefficients from WHO reports, specifically Burden of disease from environmental noise (2011). The baseline risk data are presented in Table 4.

Table 4

Input data from World Health Organization models (Relative risks, RR)

Таблица 4

Исходные данные из моделей Всемирной организации здравоохранения (относительные риски, RR)

Уровень шума (дБА) **Noise level (dBA)**	**Ишемическая болезнь сердца** **Ischemic heart disease**	**Сильное раздражение** **High Annoyance***
60	1,05	0,20 (20% населения) (20% of the population)
65	1,12	0,29 (29% населения) (29% of the population)
70	1,25	0,44 (44% населения) (44% of the population)

Таблица составлена авторами / The table is prepared by the authors

* The table shows not the RR, but the percentage of the population that is highly irritated at a given noise level (HA%).

* Для раздражения в таблице указано не RR, а непосредственно доля сильно раздраженного населения (HA%) при данном уровне шума.

Table 5

Summary table of results

Таблица 5

Сводная таблица результатов

Показатель **Indicator**	**60 дБА (dBA)**	**65 дБА (dBA)**	**70 дБА (dBA)**
Потери из-за ишемической болезни сердца (DALY) Losses due to coronary heart disease	24	54	100
Потери из-за раздражения (DALY) Losses due to irritation	1200	1740	2640
Суммарное бремя (DALY/год) Total burden (DALY/year)	~1224	~1794	~2740
На 1 000 000 человек Per 1,000,000 people	~1220	~1790	~2740

Таблица составлена авторами / The table is prepared by the authors

DISCUSSION

Air pollution from motor vehicles is the dominant risk factor for public health in urban areas. Air pollution from motor vehicles in the model city N leads to thousands of years of healthy life lost annually. Vehicle noise makes a smaller, yet still very significant, contribution.

By converting DALYs into economic indicators (e.g., via the statistical life value or the DALY cost), the burden can be estimated to cost the city hundreds of millions of rubles annually in the form of losses and healthcare expenditures.

The presented calculations are simplifications of complex biological processes. At the same time, as urban transport infrastructure develops and noise levels rise, the burden of disease will increase. A pronounced nonlinear relationship is observed. When noise levels increase from 60 to 70 dBA (by 10 dBA), the total burden of disease exceeds twofold (from ~1,220 to ~2,740 DALYs/year). Irritation, rather than direct fatalities, is the main contributor to the disease burden. It accounts for more than 95% of all losses at every noise level. Thus, noise is first and foremost a serious problem for the quality of life and mental well-being of the population.

Even at a seemingly “moderate” noise level of 60 dBA, the burden amounts to more than 1 DALY/year per 1,000 people. On the scale of a large city (e.g., 1 million people), this amounts to thousands of healthy life years lost annually, which represents a significant public health problem requiring noise abatement measures.

CONCLUSION

The use of the "Global Burden of Disease" methodology is a modern, scientifically sound tool that takes public health assessment to a qualitatively new level, providing a quantitative, integrated, and comparative assessment of the environmental impact on public health. The methodology provides a clear mechanism for economic justification to empirically calculate the effectiveness of environmental protection and health promotion measures, enabling government agencies and businesses to make optimal investment decisions.

ADDITIONAL INFORMATION

Author contribution. Kopitenkova O.I. — formulating the idea and purpose of the study, determining the methods and design of the research, writing the initial text; Levanchuk A.V. — theoretical analysis, statistical analysis, and calculations, writing the original text; Mironenko O.V. — data collection and annotation; Fedorova E.A. — data collection and manuscript preparation for publication.

All authors read and approved the final version before publication.

Competing interests. The authors declare that they have no competing interests.

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ЛИТЕРАТУРА / REFERENCES

1. Murray C.J., Lopez A.D. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Harvard School of Public Health. Available at: https://archive.org/details/globalburdenofdi0000unse/page/n9/mode/2up (accessed: 15.05.2025).
2. Institute for Health Metrics and Evaluation (IHME). Global Burden of Disease Study 2019 (GBD 2019) Methodology Overview. Seattle, United States: IHME; 2020. Available at: http://www.healthdata.org/gbd (accessed: 17.06.2025).
3. Zhou M., Liang X. Mortality, morbidity, and risk factors in China during the past three decades: findings from the Global Burden of Disease Study 2021.*China CDC Weekly*. 2023;5(14):1–10. Available at: https://www.healthdata.org/research-analysis/about-gbd/gbd-data-and-tools-guide (accessed: 17.06.2025).
4. GBD 2021 US Health Disparities Collaborators. Life expectancy by county, race, and ethnicity in the USA, 2000–2019: a systematic analysis of health disparities. *Lancet*. 2023;400(10345):25–38. https://doi.org/10.1016/S0140-6736(22)00876-5.
5. GBD 2021 US Burden of Disease Collaborators. The burden of diseases, injuries, and risk factors by state in the USA, 1990–2021. *Lancet*. 2024;404(10469):2314–2340. https://doi.org/10.1016/S0140-6736(24)01446-6.
6. GBD 2019 European Union NCDs Collaborators. Trends in non-communicable diseases in the European Union, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Public Health*. 2023;8(Suppl.):S51. https://doi.org/10.1016/S2468-2667(23)00023-2.
7. GBD 2021 Europe Collaborators. The burden of diseases in Europe from 1990 to 2021: A systematic analysis for the Global Burden of Disease Study 2021. *Lancet Public Health*. 2024;9(12):e965–e975. https://doi.org/10.1016/S2468-2667(24)00237-7.
8. GBD 2021 Former Soviet Union Collaborators (Lim S.S.). The burden of diseases in the former Soviet Union from 1990 to 2021: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet Regional Health — Europe*. 2024;36(101136). https://doi.org/10.1016/j.lanepc.2023.101136.
9. GBD 2021 Causes of Death Collaborators. Global burden of 288 causes of death and life expectancy decomposition in 204 countries and territories and 811 subnational locations, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet*. 2024;403(10440):2100–2132. https://doi.org/10.1016/S0140-6736(24)00367-2.

10. GBD 2021 Risk Factors Collaborators. Global burden of 88 risk factors in 204 countries and territories and 811 subnational locations, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet*. 2024;403(10440):2162–2200. https://doi.org/10.1016/S0140-6736(24)00933-4.

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