TERRITORIAL DIFFERENCES IN MORBIDITY IN THE DESERT AREAS OF NAVOIY REGION AND FACTORS AFFECTING THEM

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Abstract. The article considers territorial differences in morbidity in the desert areas of Navoiy Region and analyses the geographical factors that may influence population health. The study focuses on Zarafshon city and the districts of Tomdi, Uchquduq, and Konimex. Particular attention is paid to the region's arid climate, large seasonal temperature contrasts, limited water resources, drinking-water quality, industrial activity, settlement distribution, and unequal access to medical services. Statistical indicators presented in the research materials show differences between territories in respiratory, digestive, cardiovascular, infectious, and parasitic disease groups. The article also discusses healthcare provision and the importance of mapping health indicators through GIS technologies. The findings suggest that morbidity patterns should be interpreted as the result of several interacting natural, environmental, social, and service-related conditions rather than a single isolated factor. Recommendations include strengthening preventive care in remote settlements, improving drinking-water monitoring, expanding environmental observation, and applying a consistent method for collecting and mapping health statistics.

Keywords: nozogeography, morbidity, Navoiy Region, Kyzylkum Desert, territorial differences, population health, arid climate, drinking water, industrial ecology, healthcare accessibility, GIS.

Introduction

Population health is shaped by the interaction of natural conditions, environmental quality, employment, living standards, everyday behaviour, and the availability of medical assistance. These relationships are especially important in desert territories, where extreme heat, low precipitation, high evaporation, dust

events, and long distances between settlements may create additional challenges for public-health planning. Nozogeography provides a framework for examining how diseases are distributed across space and how that distribution relates to geographical conditions.

Navoiy Region occupies a substantial part of Uzbekistan and includes extensive areas of the Kyzylkum Desert. The region's desert settlements do not have identical geographical or socio-economic characteristics. Zarafshon is an urban and industrial centre, while Tomdi, Uchquduq, and Konimex contain settlements with different population densities, distances to service centres, and economic profiles. These contrasts make the area suitable for a comparative study of territorial morbidity patterns.

The purpose of this article is to describe selected differences in disease indicators across the desert territories of Navoiy Region, consider the main geographical and socio-economic factors that may be associated with them, and propose practical directions for improving the territorial organisation of healthcare. The article does not treat statistical associations as proof of direct causation; environmental and health data should be assessed together using comparable methods and verified source records.

Literature Review and Research Methodology

Medical geography examines relationships between health, disease, and the geographical environment. Nozogeography, as one of its areas, focuses on the spatial distribution of diseases and the conditions under which particular disease patterns emerge. Early medical-geographical work considered the influence of climate, landscape, water, and settlement conditions on human health. Later research expanded the field to include natural disease foci, environmental pressures, population mobility, and the territorial organisation of medical care.

Research in Uzbekistan has addressed medical-geographical zoning, environmental influences on health, and the distribution of naturally focal diseases. Studies by Abdulqosimov and Ravshanov have discussed the development of

medical geography and environmental problems associated with water quality, while Komilova and colleagues have examined the distribution of selected focal diseases and broader issues of medical geography. These approaches support the use of territorial comparison and cartographic analysis when studying desert regions.

The study area comprises Zarafshon city and the districts of Tomdi, Uchquduq, and Konimex. The methodological framework includes comparative-geographical analysis, review of statistical indicators, synthesis of natural and socio-economic information, and cartographic interpretation. ArcGIS-based mapping can help display differences between settlements, identify areas where health-service access is limited, and compare disease indicators with environmental or infrastructure variables.

The numerical indicators reproduced below are taken from the research materials supplied for this article. Before publication, the original statistical tables, units of measurement, reference periods, and denominator used for each indicator should be checked. This is particularly important when comparing percentages, absolute counts, and rates per population, because they are not interchangeable.

Natural-Geographical Conditions of the Desert Territories

The desert portion of Navoiy Region forms part of the Turan Plain and is dominated by the Kyzylkum landscape. The territory includes sandy plains, aeolian landforms, rocky and residual uplands, and closed depressions. The distribution of settlements is uneven, and the physical distance between populated places can be considerable. Such spatial characteristics influence transport, water supply, emergency response, and the regularity with which residents can reach medical facilities.

The climate is sharply continental and arid. Summers are very hot, while winter temperatures can fall below freezing. Precipitation is limited and evaporation is high, so water resources are under pressure. In summer, prolonged heat may increase the risk of dehydration and heat-related illness, particularly

among older people, children, outdoor workers, and residents with chronic diseases. Sudden seasonal temperature changes may also affect comfort and aggravate existing respiratory conditions, although the scale of any effect must be assessed with health records rather than assumed from climate data alone.

Monthly observations for Tomdi District in 2025 show that July had the highest mean air temperature in the supplied dataset. The monthly figures illustrate the seasonal contrast characteristic of desert environments and provide context for assessing heat exposure and the timing of preventive measures.

Table 1. Monthly air-temperature indicators in Tomdi District, 2025 (°C)

Month	Mean temperature	Maximum	Minimum
January	0.7	+9	−11
February	1.5	+18	−8
March	9.9	+31	−10
April	21.4	+37	+9
May	26.7	+43	+11
June	30.5	+42	+16
July	32.9	+44	+22
August	30.1	+41	+20
September	23.2	+35	+11
October	16.1	+28	+4
November	9.0	+22	−5
December	3.2	+14	−7

Source: research materials based on information attributed to the Navoiy regional hydrometeorological service.

The table indicates that the mean temperature reaches 32.9°C in July, while the maximum recorded value in that month is +44°C. These conditions make heat protection, reliable drinking-water access, shade in public spaces, and timely medical advice important elements of local health planning. The data are descriptive and should be considered alongside daily observations, population exposure, and clinical records when estimating health impacts.

Environmental and Socio-Economic Factors Affecting Health

Climate, air quality, and water resources

Heat, dryness, and airborne dust are among the environmental conditions relevant to population health in the Kyzylkum Desert. Dust and fine particles can irritate the respiratory tract and may aggravate asthma or other chronic respiratory conditions. The health consequences depend on the duration of exposure, particle concentration, occupational conditions, housing quality, and individual vulnerability. Therefore, local environmental monitoring should be coordinated with public-health observations rather than relying on general assumptions about desert climates.

Water availability and drinking-water quality are also central issues. Where the water supply is unreliable or water has high mineralisation, households may face additional difficulties obtaining safe water for drinking and cooking. The relationship between water characteristics and particular diseases requires laboratory analysis and epidemiological confirmation. Regular sampling from centralised supply systems, wells, and other sources can help identify local problems and guide practical interventions.

Industrial activity and anthropogenic pressure

Mining and mineral processing are important parts of the economy in the desert areas of Navoiy Region. Industrial activity supports employment and regional development, but it also requires careful management of dust, emissions, waste, and water use. The potential health significance of any industrial exposure depends on the type and amount of pollutant, the distance from the source, wind direction, duration of exposure, and the effectiveness of environmental controls.

For this reason, industrial-ecological assessment should combine air and water monitoring with clearly documented health statistics. Where disease indicators appear elevated, researchers should avoid attributing the pattern to industrial pollution without measurements and a suitable comparison design. Environmental monitoring, occupational-health measures, and transparent publication of results are practical steps that can support both prevention and public confidence.

Settlement patterns and healthcare accessibility

The spatial distribution of settlements influences how quickly residents can access primary care, specialist consultations, diagnostic services, and emergency assistance. In remote areas, long travel distances and transport limitations can delay the first medical visit. This can influence not only health outcomes but also the statistics themselves: some illnesses may be recorded less frequently when people have difficulty reaching a clinic.

Urban centres may have a larger concentration of healthcare facilities and specialists, while smaller or more remote settlements may rely on a limited number of medical posts. The organisation of services should therefore reflect settlement distance, population structure, seasonal road conditions, and the likely needs of vulnerable groups. Mobile medical teams and scheduled preventive visits can complement permanent facilities where travel is difficult.

Territorial Distribution of Morbidity

The supplied 2024 research table describes the share of selected disease groups in Zarafshon city and the districts of Uchquduq, Konimex, and Tomdi. Respiratory diseases represent the largest share in the four territories shown, while cardiovascular, digestive, infectious and parasitic, and renal-excretory conditions also contribute to the overall profile. The proportions differ by locality, suggesting that local conditions and the structure of recorded morbidity merit further comparison.

Table 2. Territorial distribution of selected disease groups in the desert territories of Navoiy Region (2024, %)

Disease group	Zarafshon city	Uchquduq District	Konimex District	Tomdi District	Regional average
Respiratory tract diseases	28.4	27.1	36.8	32.3	31.2
Cardiovascular diseases	29.6	26.4	24.7	27.1	26.9
Gastrointestinal diseases	18.2	19.5	20.3	21.7	19.4
Infectious and parasitic diseases	12.3	15.8	11.2	14.6	13.5

Renal-excretory diseases	7.1	8.4	5.6	3.1	6.1
Other diseases	4.4	2.8	1.4	1.2	2.9

Source: research materials supplied for the study; percentages and classification should be checked against the original dataset.

The highest proportion of respiratory diseases in the table is recorded for Konimex District (36.8%), compared with the regional average of 31.2%. Tomdi District has the highest reported share of gastrointestinal diseases (21.7%) and a relatively high share of infectious and parasitic diseases (14.6%). Zarafshon city shows a comparatively high share of cardiovascular diseases (29.6%), while Uchquduq District has the highest reported share of infectious and parasitic diseases (15.8%). These contrasts describe the distribution in the supplied table; they do not by themselves establish the causes of the differences.

Several explanations should be considered when interpreting these patterns. First, environmental exposures and water-supply conditions may vary between localities. Second, the age structure and occupational profile of the population may differ. Third, the availability of medical facilities and diagnostic services can affect which illnesses are detected and recorded. Fourth, the indicators may be influenced by differences in data collection or by the way the disease groups were classified. A robust comparison should control for these factors wherever data are available.

Territorial Differences in Healthcare Provision

Healthcare infrastructure is an important part of the nozogeographical situation because disease prevention and early diagnosis depend on access to services. The research materials provide selected indicators for population size, medical personnel, hospital beds, distance to medical facilities, and satisfaction with healthcare. The values suggest a marked contrast between Zarafshon city and the more remote districts, particularly in the availability of physicians and the distance residents may need to travel.

Table 3. Selected indicators of healthcare provision in the desert territories of Navoiy Region (2024)

Indicator	Zarafshon city	Uchquduq District	Konimex District	Tomdi District
Population (thousands)	82.4	35.6	28.1	18.3
Physicians per 10,000 population	42.3	28.6	15.4	11.7
Paramedical staff per 10,000 population	87.1	61.3	42.7	38.9
Hospital beds per 10,000 population	58.4	44.2	29.1	22.6
Mean distance to medical facility (km)	3.2	28.5	41.7	53.4
Respondents satisfied with medical services (%)	71.4	58.3	38.7	32.5

Source: research materials supplied for the study. The population denominator and calculation method should be confirmed in the original table.

The number of physicians per 10,000 population is highest in Zarafshon city (42.3) and lowest in Tomdi District (11.7). The reported average distance to a medical facility rises from 3.2 km in Zarafshon to 53.4 km in Tomdi. Satisfaction with medical services also varies, from 71.4% in Zarafshon to 32.5% in Tomdi. Together, these indicators point to the importance of geographical accessibility when evaluating healthcare provision across the region.

The results should be used to guide more detailed local assessment rather than as a complete measure of service quality. The number of physicians alone does not describe working hours, equipment, specialist availability, medicine supply, or travel time. Future analysis should combine staffing and facility data with information about road conditions, patient referrals, waiting times, and the frequency of mobile medical visits.

Nozogeographical Interpretation and Mapping

The spatial patterns described in the tables suggest three broad types of areas for further investigation. The first is an industrial-ecological area, where environmental monitoring near industrial sites is especially relevant. The second is a water-supply and rural-settlement area, where drinking-water quality and access to sanitation deserve close attention. The third is a geographically isolated area, where travel distance and service availability may delay diagnosis and preventive

care. These categories are analytical directions, not formal diagnoses of a causal relationship.

GIS methods can help compare disease indicators with settlement locations, healthcare facilities, roads, water-supply points, industrial sites, and environmental sampling locations. The resulting maps can show where several challenges overlap and where additional fieldwork may be most useful. For reliable mapping, each dataset should include its date, spatial unit, source, indicator definition, and limitations. Rates should be compared only when they use consistent denominators and periods.

A useful next step would be to update the disease database annually and combine it with demographic and service-access indicators. Maps could then be prepared for respiratory, digestive, cardiovascular, and infectious-parasitic disease groups separately. This would make it possible to distinguish stable territorial patterns from short-term changes and to identify where mobile clinics, water-quality checks, or environmental measurements should be prioritised.

Conclusion and Recommendations

The analysis demonstrates that territorial differences in morbidity in the desert areas of Navoiy Region should be considered within a broad geographical framework. Arid climatic conditions, water availability and quality, industrial activity, settlement distribution, population characteristics, and access to medical services may interact in shaping the recorded health profile. The supplied tables show differences between Zarafshon city and the districts of Uchquduq, Konimex, and Tomdi in the distribution of disease groups and healthcare indicators.

The main conclusions are as follows: (1) respiratory diseases account for the largest share in the supplied 2024 disease table, with the highest value shown for Konimex District; (2) the shares of digestive and infectious-parasitic diseases differ between districts and warrant further local investigation; (3) access to medical services is uneven, with longer reported distances and lower satisfaction in

remote areas; and (4) environmental and socio-economic indicators should be analysed together with health statistics before any causal interpretation is made.

The following practical recommendations are proposed:

Expand mobile medical teams, scheduled preventive examinations, and teleconsultation opportunities in settlements located far from district centres.

Improve regular laboratory monitoring of drinking water, including centralised supplies and wells, and communicate results to local communities in an understandable form.

Strengthen environmental monitoring around industrial facilities, with particular attention to airborne dust, emissions, waste management, and water use.

Use GIS to map morbidity, healthcare facilities, transport routes, water sources, and environmental monitoring sites in a consistent spatial database.

Standardise disease indicators by recording the year, disease classification, numerator, population denominator, and data source for every territorial comparison.

Conduct additional field surveys and epidemiological studies to test whether observed spatial associations remain after accounting for age, occupation, population size, and access to diagnosis.

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