

## Cartogram of breast cancer incidence in Kazakhstan

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### Introduction

The necessity of medical and geographical description is due to practical needs in the data of sanitary condition of various regions, population sickness rates and spreading of disease. Content, program, objects of medical and topographical descriptions varied with the development of medicine and achievements in the field of geography and biology. In this connection, recently, it was appeared such special and branch regional descriptions of disease as sanitary-epidemiological, sanitary-hygienical and oncoepidemiological and others on continents, countries, regions and areas. The issues of medical and geographical selection with subsequent estimation of natural, social economical factors in use with medical geographical regions and introduction of medical geographical maps. So, medical geographical maps are perspective method of interconnection establishment between factors of geographical environment and human health condition, occurrence and dynamics of various diseases. It is medical geographical approach of diagraming of separate forms of cancer that allows to disclose the peculiarities of malignant tumors spreading in frame of natural-territorial complexes, in close connection with existent systems of life and population activity conditions.

In Kazakhstan administrative territorial division of regions completely corresponds to medical geographical zones. Indicators of breast cancer (BC) incidence were defined in connection with administrative-territorial division of regions. In the investigation we drew up a cartogram of BC incidence in Kazakhstan.

### Materials and Methods

Data of Kazakh Research Institute of Oncology and Radiology served as investigation material. Data about female population figures were received from Statistical Agency of the Republic of Kazakhstan.

NN	Region / city	Rate, $M, \text{ }^0_{/0000}$	Importances
1	Kyzylorda region	22.2	<b>min</b>
2	Atyrau region	22.3	
3	South-Kazakhstan region	22.4	Number of regions and cities <b>n=16</b>
4	Zhambyl region	24.3	
5	Almaty region	26.5	
6	Aktobe region	30.0	
7	Kostanay region	31.7	Average annual $x=\sum(M)/n=32.5$
8	Mangystau region	31.9	
9	Western Kazakhstan region	31.9	
10	Northern Kazakhstan region	33.5	
11	Akmola region	34.3	Standard deflection <b><math>\sigma=7.9</math></b>
12	Eastern Kazakhstan region	35.7	
13	Karagandy region	38.0	
14	Pavlodar region	42.8	
15	Astana city	44.7	
16	Almaty city	47.5	

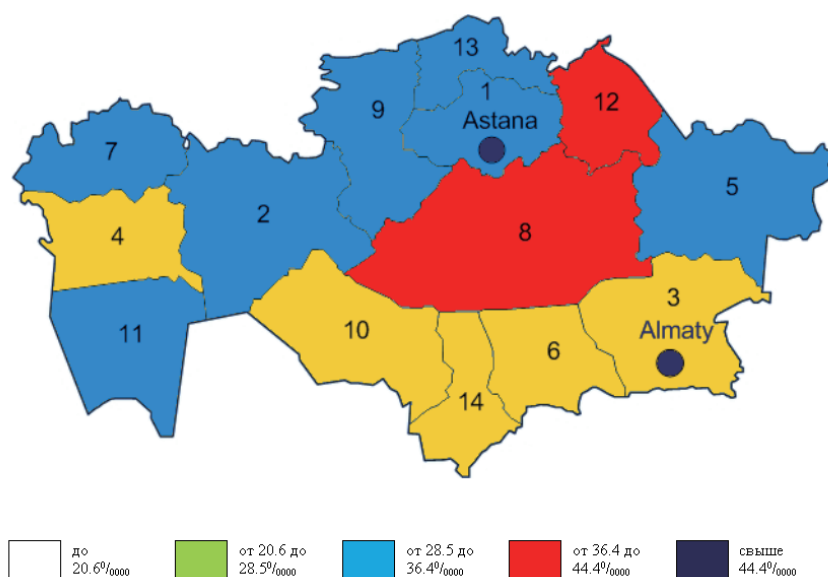
Table 1. Average Annual Age-standardized Incidence Rates (WS) of breast cancer incidence in Kazakhstan upon regions (1999-2008)

As the basic method of BC study retrospective investigation with the use of descriptive and analytical methods of modern medical biological statistics was used. Age-Standard rates (World standard, WS) of 10 years (1999-2008) were used in drawing up of diagram. It was applied method of diagram drawing up proposed in 1974 by Iginov S.I. based on indication of average quadrant decline ( $\sigma$ ) from average ( $x$ ). The scale of grades was calculated thus:  $\sigma$  was accepted as interval, we defined maximal and minimal degrees of incidence according to formula:  $x \pm 1,5\sigma$ , thus minimal indicator is equal to  $x - 1,5\sigma$  and maximal is equal to  $x + 1,5\sigma$ . After that we defined scale of diagram grades: 1)  $(x - 1,5\sigma) + \sigma$ ; 2)  $(x - 1,5\sigma) + 2\sigma$ ; 3)  $(x - 1,5\sigma) + 3\sigma$  and others and grouping of indicators was calculated according to formula  $x \pm 0,5\sigma$ , which corresponds to average level ( $x - 0,5\sigma$  и  $x + 0,5\sigma$ ), а значения, varied from average level of sickness rate is  $\sigma$ , shows decreased ( $(x - 0,5\sigma) - \sigma$ ) and increased ( $(x - 0,5\sigma) + \sigma$ ) indicators of sickness rate.

## Results

Average annual age-standardized incidence rates (WS) of BC in regions of Kazakhstan were presented in table 1. Thus, maximal indicator of BC incidence was established in Almaty city ( $47.5^0/0000$ ), and minimal – in Kyzylorda region ( $22.2^0/0000$ ), number of regions and cities ( $n$ ) is equal to 16.

Further, levels of BC incidence were defined. They corresponds to the following criteria: the lowest indicator is till  $20.6^0/0000$ , low – from  $20.6$  to  $28.5^0/0000$ , average – from  $28.5$  to  $36.4^0/0000$ , high is from  $36.4$  to  $44.4^0/0000$  and highest – above  $44.4^0/0000$ .



**Regions:** 1. Akmola, 2. Aktobe, 3. Almaty, 4. Atyrau, 5. Western Kazakhstan, 6. Zhambyl, 7. Eastern Kazakhstan, 8. Karagandy, 9. Kostanay, 10. Kyzylorda, 11. Mangystau, 12. Pavlodar, 13. Northern Kazakhstan, 14. South-Kazakhstan

Figure 1. Cartogram of breast cancer incidence in Kazakhstan (1999-2008, WS)

Thus, on the basis of abovementioned accounts, the diagram of BC incidence (Figure 1) in various medical geographical zones of Republic was drawn up. In this connection the following groups of regions were defined:

1. Regions with low indicators (till  $20.6^0/0000$ ) – there are no such zones in Republic;
2. Regions with low indicators (from  $20.6$  to  $28.5^0/0000$ ) – Kyzylorda region ( $22.2^0/0000$ ), Atyrau region ( $22.3^0/0000$ ), South-Kazakhstan region ( $22.4^0/0000$ ), Zhambyl region ( $24.3^0/0000$ ) and Almaty region ( $26.5^0/0000$ ). In whole 5 regions;
3. Regions with average indicators (from  $28.5$  to  $36.4^0/0000$ ) – Aktobe region ( $30.0^0/0000$ ), Kostanay region ( $31.7^0/0000$ ), Mangystau region ( $31.9^0/0000$ ), Western Kazakhstan ( $31.9^0/0000$ ), Northern Kazakhstan region ( $33.5^0/0000$ ), Akmola region ( $34.3^0/0000$ ) and Eastern Kazakhstan region ( $35.7^0/0000$ ). Overall 7 regions;
4. Regions with high indicators (from  $36.4$  to  $44.4^0/0000$ ) – Karagandy region ( $38.0^0/0000$ ) and Pavlodar region

(42.8<sup>0</sup>/<sub>0000</sub>). In whole 2 regions;

5. Regions with highest indicators (above 44.4<sup>0</sup>/<sub>0000</sub>) – Astana city (44.7<sup>0</sup>/<sub>0000</sub>) and Almaty city (47.5<sup>0</sup>/<sub>0000</sub>).

### **Conclusions**

In the result of drawn up nosographical map of BC incidence with territorial differentiation “locuses” with low and high indicators were underlined. Received results allows to organizers of health service to acquire distinctive picture relatively to breast cancer incidence, level of sickness rate which gives the opportunity for acceptance of organized methodical activities according to earlier and prevention of BC and also organization of measures on decrease of risk factors influence power.