The proportion of population covered by vaccines with all vaccines included in their national program - DTP3 Diphtheria-tetanus-whooping cough 3 (%)

Objective:

1. Detect DPT coverage for vaccines in Kazakhstan
2. To analyze current data on the vaccination of DTP, indications, and contraindications for vaccination of diphtheria, tetanus and whooping cough
3. Analysis of the immunization system of the Republic of Kazakhstan.

Data sources:

Research method: Information-analytical-statistical

- Normative legal acts of the Republic of Kazakhstan,
- Reports on the status of children in the Republic of Kazakhstan
- Statistical data e-government until 2017.
- Unified reporting form for the UN Children's Fund UNICEF and WHO
- MISC SAV / SPSS
- UNICEF data
- UN Datasets
- Stat.kz

The issue under study

Protecting and strengthening the health of the people is one of the main priorities of the economic and social development of the country, an important focus of which is to strengthen the prevention of diseases.

Vaccination refers to the number of activities requiring significant material costs of the state.

Immunization in Kazakhstan - occupies a special place. For the purpose of the epidemic well-being of children and the population as a whole, as well as for the prevention of infection, a vaccine schedule was developed and approved. Immunity is a biological process that forms at the cellular level after the vaccine is introduced into the body. Practice shows that people who have been infected and sick, despite the presence of vaccinations, the disease is mild, and complications and fatal cases are rare. One of the most well-known ways of prevention is vaccination, in which weakened or killed microbes are introduced in order to protect against this microbe in the future and prevent the development of diseases. Vaccination (also called immunization, or vaccination) helps prevent fatal infectious diseases such as diphtheria, tetanus, polio, and others.

DPT vaccination is one of the recommended procedures for pediatric immunization and is recommended by health experts that protects the body against three infectious diseases: diphtheria, tetanus, and whooping cough. Also, causing the greatest amount of controversy, to do it or not. It is all about its high reactogenicity, that is, the property of vaccines to cause post-vaccination reactions and complications. The components of the DTP vaccine help to develop immunity against a whooping cough, diphtheria, and tetanus. In case of refusal of the DPT vaccine, serious diseases can occur that lead to serious consequences: after whooping cough - pneumonia - in 20%, damage to the nervous system - 0.776%, death - 0.254%; after diphtheria - heart damage up to 60%, damage to the nervous system up to 75%, mortality - more than 30%; after tetanus mortality is very high (death) - 2570%.

DPT vaccines are safe to do to children in infancy. It is recommended to vaccinate children five times - at the age of 2 months, 4 months, 6 months, 15-18 months and 4-6 years. DPT vaccination is basically required before the child starts attending school.

Despite vaccination, in 2015, the incidence of measles increased 13 times in Kazakhstan (1,121 cases in 2015 against 84 cases in 2014). In the same year, about 8,500 people refused vaccination in Kazakhstan, of which 40% refused vaccination for religious reasons and 45% for personal reasons. At the same time, only for the first half of 2017, in the Republic of Kazakhstan, there were 11,557 refusals from preventive vaccinations, which compared to the same period of 2016, an increase of 37.3%. The main reasons for refusal of vaccination are personal (45.7%) and religious beliefs (41.9%), mistrust of vaccines (7.7%), negative information from the media (4.6%). An increasing number of parents doubt the issue of vaccinating their children.

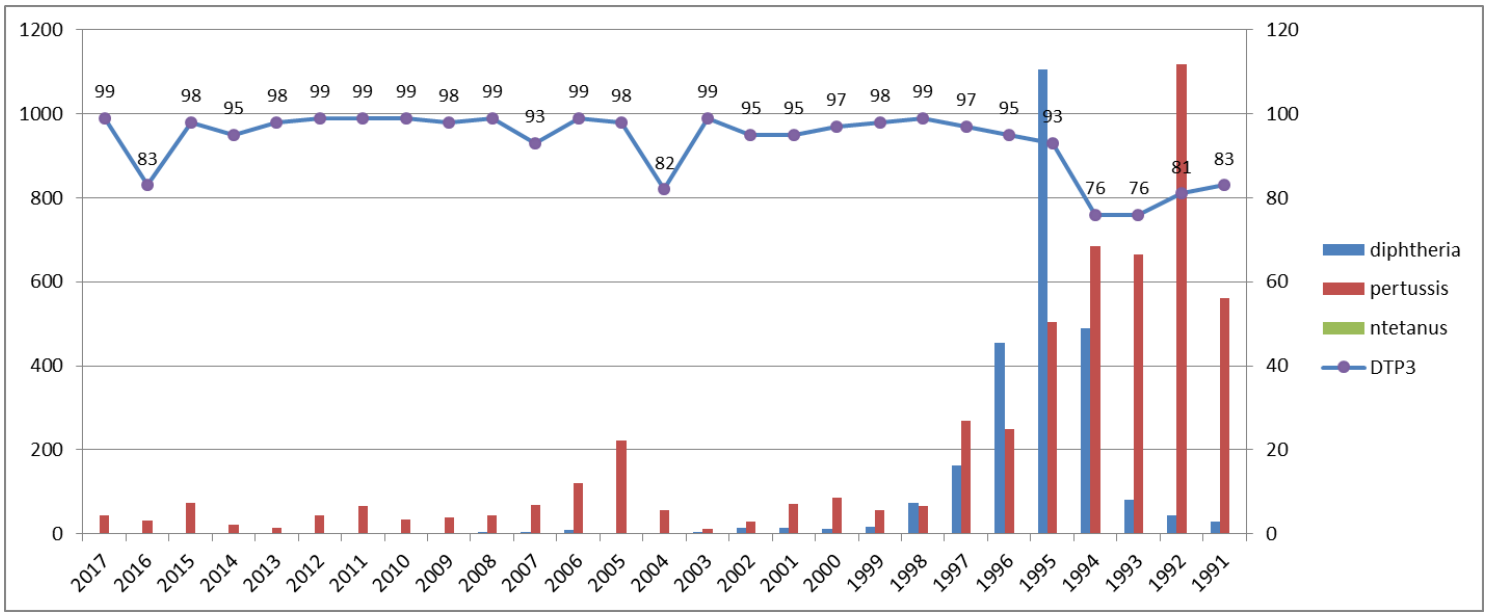
Over eight years, the number of vaccination refusals in Kazakhstan increased 42 times, while in 2010 doctors recorded only 300 cases of failures, by the beginning of 2018 their number increased to 12.7 thousand people. According to the deputy director of the epidemiologic monitoring of infectious and parasitic diseases of the Ministry of Health of Kazakhstan Aynagul Kuatbaeva, about 5 million people are vaccinated in Kazakhstan every year, of which 1.3 million are children under 14 years old. According to WHO, about 1.4 million children under 5 die every year from vaccine-preventable diseases. The most effective prevention against infectious diseases, doctors say, are vaccinations.

A whooping cough is an acute infectious disease that is transmitted by airborne droplets and is characterized by a prolonged course and the occurrence of typical attacks of a spasmodic cough. The causative agent is transmitted by airborne droplets when the patient coughs.

Diphtheria is an acute infectious disease, which is characterized by the process of inflammation at the site of entry of the pathogen with the formation of a fibrinous film and symptoms of intoxication of the body as a result of the action of exotoxin.

Tetanus is an acute, severe infectious disease that is characterized by damage to the central nervous system, resulting in the development of skeletal muscle tension with an increase in general excitability, recurrent seizures, and symptoms of general body poisoning (weakness, headache, malaise, fever).

The DPT vaccine is a suspension of killed pertussis microbes and purified diphtheria and tetanus toxoids. The vaccine should be stored and transported in a dry and dark place at a temperature of 6 ± 2 ° C. The shelf life of the drug is 1 year and 6 months.



Coverage of the Republic of Kazakhstan with the DPT3 vaccine from 1991–2017 and the incidence rate of DPT.

Below is the information needed to calculate the rate of vaccination against pertussis, diphtheria and tetanus in the Republic of Kazakhstan, neighboring countries of Central Asia and Russia for the period from 2012 to 2016. According to WHO recommendations, this indicator is calculated on the number of surviving babies.

Country	2012 y.		2013 y.		2014 y.		2015 y.		2016 y.	
	Number of children	Number of doses	Number of children	Number of doses	Number of children	Number of doses	Number of children	Number of doses	Number of children	Number of doses
Kazakhstan	362581	362481	348923	342134	369919	364299	357502	349860	352714	290850
Kyrgyzstan	143555	137953	145708	140872	145981	139892	151695	146576	147250	141601
Uzbekistan	603156	598360	630029	622981	667297	666287	689430	679496	666147	665309
Tajikistan	230703	217776	232691	223642	248700	240987	267750	256065	262708	253762
Russia	1663195	1617752	1746104	1698099	1776336	1714570	1788294	1735354	1781334	1728186
Number of children - the number of children to be vaccinated Number of doses - the number of doses of vaccine administered										

Over the past 5 years, almost all countries of the Central Asian region, as well as Russia, have achieved the target values of the indicator of coverage of the children's population with three doses of DTP vaccine, set by EPHP at ≥95%. The only exception to this rule was Kazakhstan, where in 2016 there was a sharp decline in the three-dose DPT vaccination coverage rate.

Number of refusals to vaccinate children by region of the Republic of Kazakhstan in 2015 and 2016

№	Region/city of republican significance	Total number of people who refused vaccination in 2015	%	Total number of people who refused vaccination in 2016	%
1	2	3	4	5	6
1	Akmola	316	3,77	397	4,10
2	Aktobe	1188	14,17	1865	19,26
3	Almaty	325	3,88	609	6,29
4	Atyrau	382	4,56	398	4,11
5	East Kazakhstan	245	2,92	230	2,37
6	Zhambyl	177	2,11	196	2,02
7	West Kazakhstan	145	1,73	160	1,65
8	Karagandy	1032	12,31	860	8,88
9	Kostanay	318	3,79	343	3,54
10	Kyzylorda	31	0,37	68	0,70
11	Mangystau	1075	12,82	1116	11,52
12	Pavlodar	125	1,49	224	2,31
13	North Kazakhstan	591	7,05	552	5,7
14	South Kazakhstan	1028	12,26	1280	13,22
15	Astana city	154	1,84	136	1,40
16	Republic of Kazakhstan	**8383**	**100**	**9685**	**100**

As follows from the table, in 2015-2016, the largest share of vaccination refusals in the Republic of Kazakhstan falls on Aktobe, Mangistau, Karaganda and South Kazakhstan regions, as well as the city of Almaty. At the same time, the lowest share of vaccination refusals is in Kyzylorda region.

Since all regions of Kazakhstan have a different composition of the population, differing in age, when comparing the rates of refusals from vaccination, we applied the standardization method to eliminate the heterogeneity of the composition of the compared population groups. Due to this, an idea of what the level of vaccination refusals would be in each of the regions of Kazakhstan would be provided if the composition of the population were the same.

Below are the absolute values of vaccination refusals for 2015 by region, which will be necessary for the subsequent calculation of standardized indicators.

Region / city of republican significance	Till 1 year	1-2 years	3-5 years	6-15 years	16 year	Total number
Akmola	114	81	81	37	3	**316**
Aktobe	179	328	675	6	0	**1188**
Almaty	258	43	7	11	6	**325**
Atyrau	370	11	0	1	0	**382**
East Kazakhstan	120	75	13	36	1	**245**
Zhambyl	102	48	16	8	3	**177**
West Kazakhstan	144	1	0	0	0	**145**
Karagandy	445	280	172	134	1	**1032**
Kostanay	105	80	80	52	1	**318**
Kyzylorda	21	10	0	0	0	**31**
Mangystau	379	418	232	46	0	**1075**
Pavlodar	103	12	9	1	0	**125**
North Kazakhstan	88	141	153	123	86	**591**
South Kazakhstan	255	314	360	91	8	**1028**
Almaty city	1190	61	0	0	0	**1251**
Astana city	124	20	10	0	0	**154**

As can be seen from the table, the largest number of vaccination refusals is observed in the city of Almaty (n = 1251), Aktobe (n = 1188) Mangistau (n = 1075) and South Kazakhstan regions (n = 1028). The smallest number of failures is typical for the population of the Kyzylorda region (n = 31).

Direct standardization method. At the same time, the standard is the half-sum of the age structures of children to be vaccinated in each of the regions.

Per group vaccination failure rates in the regions of Kazakhstan in 2015.

Region / City Republican values	Till 1 year, %	1-2 years, %	3-5 years, %	6-15 years, %	16 year, %	Total (%)
Akmola	1,02	0,31	0,21	0,04	0,04	0,17
Aktobe	1,03	0,89	1,31	0,00	0,00	0,50
Almaty	0,76	0,05	0,01	0,00	0,03	0,06
Atyrau	2,70	0,04	0,00		0,00	0,19
East Kazakhstan	0,62	0,17	0,02		0,01	0,08
Zhambyl	0,46	0,09	0,02	0,00	0,02	0,05
West Kazakhstan	1,36	0,00	0,00	0,02	0,00	0,09
Karagandy	2,25	0,61	0,25	0,08	0,01	0,32
Kostanay	1,04	0,34	0,22	0,05	0,01	0,18
Kyzylorda	0,14	0,03	0,00	0,00	0,00	0,01
Mangystau	2,63	1,20	0,52	0,04	0,00	0,52
Pavlodar	0,93	0,05	0,02	0,00	0,00	0,07
North Kazakhstan	1,34	0,90	0,63	0,17	1,40	0,48
South Kazakhstan	0,40	0,21	0,16	0,02	0,02	0,10
Almaty city	3,96	0,09	0,00	0,00	0,00	0,29
Astana city	0,60	0,05	0,02	0,00	0,00	0,06

The highest rates of vaccination refusals are observed in Mangistau (0.52%), Aktobe (0.50%) and North-Kazakhstan oblasts. The lowest values of the refusal indicator of vaccination are observed in Kyzylorda (0.01%) and Zhambyl regions (0.05%), as well as in Astana (0.06%).

If you look at the age, then among the child population in the age group up to one year, the highest rates of vaccination refusals are observed in Almaty (3.96%), and the lowest is typical for Kyzylorda Region (0.14%).

Conclusion

According to the World Health Organization's report, every year around 1.4 million children under 5 years old die from vaccine-preventable diseases. The most effective prevention against infectious diseases, doctors say, are immunized.

In our research, we found two main reasons for refusing vaccination. One of them is because of distrust of medical personnel, the second is because of religious beliefs. By analyzing statistics about vaccination, refusing vaccination, and disease related to vaccination. By comparing statistical data, we noticed that refusing vaccination is in direct ratio to increasing of number of vaccination related disease.