Economic and health burden of brucellosis in Kazakhstan

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Abstract: Brucellosis is a widespread zoonotic disease considered as an emerging and re-emerging disease with a resulting threat of public health and animal health. Official reports document an animal incidence in Kazakhstan of about 0.6% per year, and the country still registers high number of human cases annually . The main objective of this paper was to evaluate the distribution and economic impact of brucellosis in Kazakhstan. We analysed human disease incidence data obtained from the Government Sanitary Epidemiological Service with the aim to estimate the burden of disease in terms of disability-adjusted life years (DALYs). We also estimated the economic impact in terms of monetary losses. Additionally, we mapped the geographical distribution of the disease throughout Kazakhstan. In total, 1,334 human cases of brucellosis were registered in 2015 in Kazakhstan that resulted in 713 DALYs. Around US Dollar 21 million was spent on compensation for animals that had to be slaughtered due to brucellosis, and an additional US Dollar 24 million was spent on testing animals. Animal brucellosis and human brucellosis occur throughout the whole country, some trends of which are reviewed in this paper. We estimated the burden of the disease and explored possible explanation for high human incidence rates. This paper is the first to estimate the human burden of disease and the economic costs in Kazakhstan. Both of these are substantial.

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Economic and Health Burden of Brucellosis in Kazakhstan

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Impacts

- The economic impact of brucellosis in Kazakhstan is substantial resulting in $45 million per annum associated with animal testing and compensation
- Over 1300 cases of human brucellosis were reported in 2015 in Kazakhstan resulting in an incidence of 7.6 cases per 100,000.
- Human brucellosis results has a burden of over 700 Disability Adjusted Life Years per annum in Kazakhstan

Summary

Brucellosis is a widespread zoonotic disease considered as an emerging and re-emerging disease with a resulting threat public health and animal health. Official reports on animal prevalence in Kazakhstan are about 0.6% per year and country still registers high number of human cases per year. The main objective of this paper was to evaluate the distribution and economic impact of brucellosis in Kazakhstan.

We analyzed human disease incidence data obtained from the Government Sanitary & Epidemiological Service with the aim to estimate the burden of disease in terms of Disability-Adjusted Life Years (DALY). We also estimated the economic impact in terms of monetary losses. We also mapped the geographical distribution of the disease throughout Kazakhstan. In total 1334 human cases of brucellosis were registered in 2015 in Kazakhstan that resulted in 713 DALYs. Around $21 million was spent on compensation for animals that had to be slaughtered due to brucellosis and an additional $24 million was spent on testing animals.

Animal and human brucellosis occurs throughout the whole country, some trends of which are reviewed in this paper. We estimated the burden of the disease, and explored possible explanation for high human incidence rates. This paper is the first to estimate the human burden of disease and the economic costs in Kazakhstan. Both of these are substantial.

Keywords: Brucellosis, Brucella, Epidemiology, Economic impact, Burden of diseases, Kazakhstan.

1 Introduction

Kazakhstan has one of the highest incidences of human brucellosis worldwide with a reported annual incidence of 11.6 annual cases 100,000 of population (FAO, 2015). During 2001 – 2006 an obligatory vaccination was implemented with varying levels of coverage. This was then replaced by a test and slaughter program in 2007 and continues until the present time. The present programme relies on a biannual screening. Sero-positive animals are slaughtered, and the owners are compensated at market value. Thirty percent of compensation comes from Government, and the rest (70%) comes from slaughterhouses. Since 2009, animal identification (tags or microchips) of the herds and registration of all cattle to facilitate the tracking of sero-positive animals were introduced (Grushina et al, 2010).

Previously no economic and disease burden were estimated for Kazakhstan. We used data on human incidence from data officially reported to the government epidemiological and sanitary services to estimate the burden of human brucellosis in Kazakhstan. We used data on animal prevalence obtained through the results of routine screening for brucellosis to map the prevalence of animal brucellosis. We also estimated the economic effects of animal vaccination program and the costs associated with compensation for slaughtered animals.

2. Materials and Methods

2.1 Brucellosis diagnosis

Samples from both cattle and small ruminants are routinely screened by republican veterinary laboratories (RVL). There are 196 branches of RVL throughout the country on different administrative levels. Animals are screened twice each year: the first in spring prior to grazing in summer pastures; and the second test in autumn before their return to stalls. Bulls are tested 4 times a year. Breeding cows or ewes are tested before parturition. Young stock (cattle) are tested at the age of 4-6 months with I-ELISA. Sheep and goats at the age of 3-4 months tested with the Rose Bengal Test (RBT) and complement fixation test (CFT).

Each branch of the RVL operates under the same standardized operating procedures (SOPs). Blood serums are routinely collected from all animals by field veterinarians and delivered to the laboratory. Samples are first analyzed using the RBT and any positive tests are confirmed by CFT in dilution 1/5 - 1/20 and by the serum agglutination test (SAT).

If routine screening results in positive cases in a previously disease free herd, the same blood samples should be retested within 15 to 20 calendar days by SAT and CFT. If results are positive again animals are then sent to slaughter house within 5 calendar days [4].

Laboratories perform RBT according to OIE recommendations. Standard RBT using 30 µl antigen/30 µl serum are used in cattle (OIE 2017). In small ruminants and deer, the laboratory uses modified RBT in order to increase the sensitivity of the test using 15 µl antigen and 30 µl serum. Both negative and positive controls are included.

2.2 Animal data

Data was extracted from the results of screening tests run by RVL. RVL district branches do not routinely isolate *Brucella* from bacterial cultures to confirm species identification. Some samples were confirmed through cultures at the central Kazakh Scientific Veterinary Research Institute (KSRVI) in 2015.

2.3 Human data

Precise anonymised data on brucellosis obtained from the Government Sanitary & Epidemiological Service. Cases reported are only those with a confirmed positive blood culture. The data also shows number of affected for children and adults

2.4 Costs

Costs were estimated as the funds spent on screening tests performed twice a year by local branches of the RVL. Administrative divisions of Kazakhstan to village, district, and region facilitate screening throughout country. Each village has its own veterinarians and technicians that perform screening and then send the serum samples to the local RVL branch.

All the animals tested positive must be slaughtered and compensated by the Government. Current compensation policy states that animals found to be positive in serological tests should be sent to a slaughterhouse. Additional laboratory tests should be taken within of 15 days of a positive serological test result. The slaughter of those animals can only be performed in a state approved slaughterhouse in the presence of the animal owner, state chief veterinarian of that administrative unit and chief state veterinary inspector. If there are pathological changes in organs and tissues this meat is sent to be cured for sausages or processed for canned meat and owners are compensated 30% from the local administration from the budget which is allocated yearly (brucellosis is in the list of diseases for compensation) and 70% compensation is paid by the slaughterhouse .

Blood samples are taken and RBT and SAT tests are undertaken. Animals that are positive in either test are retested with SAT and the sample is additionally tested by the CFT test. If the animal tests positive on either of these two tests it is considered positive. All animals are tested twice yearly with breeding bulls being tested four times a year. Using price list given published by the Republican Veterinary Laboratories (RVL, 2017) we estimated costs spent on annual screenings. We also estimated compensation costs.

2.5 Disability adjusted life years

DALY for brucellosis were estimated using established techniques (Devleesschauwer et al, 2014a,b). We calculated DALYs deterministically without age weighting. When calculating years of life lost (YLL), we used projected life expectancy by WHO for 2050, which is 92 years (WHO, 2013). As we have only data on number of human cases without any indication of the severity of disease, we estimated Years Lost due to Disability (YLD) using a Disability Weight (DW) suggested as 0.150 for chronic brucellosis (Dean et al 2012). The DW is a weighting that reflects the severity of the disease on a scale from 0 which is used for indication of perfect health to 1 **that** is equivalent to death. A study of human brucellosis in Macedonia of 550 patients described the median duration of illness prior to diagnosis to be 30 days, whilst duration of treatment was 45

days, thus making the total duration of 75 days (Bosilovski et al. 2010). This was similar to the duration of disease reported in Dean et al (2016) although the latter only reported data from two studies with a total of 280 cases. Therefore, a duration of 75 days was used for the YLDs. In Germany from 6269 brucellosis cases reported between 1962 and 2005, there were 58 deaths, resulting in a case fatality rate of 0.9%. (Al Dahouk et al 2007). This case fatality rate was used to estimate the number of fatal cases in Kazakhstan to calculate the YLLs. The official data was only recorded as cases in children up to 18 years (19.4%) and adults (80.6%). This indicated a greater proportion of cases in adults compared to the census data as 31% of the population is under 18 (data from United States Census Data – International Programmes: https://www.census.gov/programs-surveys/international-programs/data.html). By comparing the proportion of cases in children and adults to census data we estimate that the mean age of reported cases is 36 years (i.e. older than the mean age of the Kazakh population of 32 years). The estimated mean age of 36 was used as the age of death to estimate YLLs in fatal cases, giving a mean residual life expectancy of 56 years

2.6 Analysis

In order to test the hypothesis that there is a correlation between animal incidence and human incidence, we analyzed number of cases in humans using generalized linear models (from MASS package in R) (Venables, 2002) with cases in small ruminants and cattle as independent variables. We used a negative binomial link function so that over-dispersion of human cases could be adequately captured, with an offset variable for population sizes. Thus any significant association between the numbers of animal cases reported each year and human cases each year at the Oblast level would be illustrated. Likewise any relationship between cattle and sheep incidence was also analyzed. Data on animal prevalence allowed us to map annual prevalence using maptool package in R (Lewin-Koh et al (2017). The GIS data with Kazakhstan's outlines and administrative subdivisions was downloaded from an open source as zip file (DIVA-GIS 2017).

All data is provided in a supplementary file (S1 data set)

3 Results

3.1 Animal incidence

The annual prevalence rates registered in cattle during 2006, 2007 were around 0.30% (3 per 1000) on a national level. This increased to 0.79% in 2008, and peaked at 1.85% in 2009. Between 2013-2015 it has been fluctuating at around 0.6% (figure 1). According to the results of the screening tests in 2015, the percentage of positive reacting cases varied from 0.06% to over 2.5% for cattle depending on the subregion. The regional variability of cases in cattle reported at district level is illustrated in figure 2. In small ruminants the annual percentage incidence was generally between 0.15 and 0.3%, with peak numbers reported in 2013 (0.5%) and 2008 (0.65%) (Figure 3). The variation in percentage of positive cases was from 0.01% to 2.5% at the district level (Figure 4) . There was evidence of a positive association of cattle incidence with sheep incidence at the rayon level ($p<0.001$). In 2015-2016 KazSRVI identified 35 isolates in different regions (Table 3). They were identified from biological samples collected in different regions of West Kazakhstan, and Almaty in 2015 and Kostanay, East Kazakhstan and Almaty in 2016. Mostly *B.abortus* strains were isolated in cattle and *B.melitensis* in sheep. However there are some cases in Kaztalovskiy district of the West Kazakhstan region where *B.melitensis* was isolated in cattle.

3.2 Human incidence and disease burden.

Human data analysis showed decreasing in incidence throughout last 10 years, reaching its peak in 2006 – 17,4 per 100.000 population affecting 2670 people, and its lowest point in 2015 – 7,7 per 100.000 (Figure 5). In 2015, 1334 human cases of brucellosis were registered in Kazakhstan from a population of about 17 million inhabitants (in 14 regions and 2 large cities). Of these 1131 were registered in rural inhabitants. Regional incidences varied from less than 1 case per 100,000 in Mangghystau region to over 20 cases per 100,000 in Zhambyl region (Figure 6). Of the 1334 cases, 926 were confirmed by hemoculture. This resulted in approximately 672 YLLs and 41 YLDs with a total of 713 DALYs or a mean of approximately 0.5 DALYs per case. Only 1 percent of cases are

associated with professional activity such as veterinarian, or laboratory worker. The highest incidence is registered in Almaty, East Kazakhstan, Zhambyl and Qyzylorda regions. The GLM did not show any geographical association between incidences in human with incidences in livestock species.

3.3 Costs

Average compensation throughout the country is approximately 3.2 USD per kilo for recoverable meat. Around 34,000 sheep with average weight of 15kg of recoverable meat were slaughtered in 2015, resulting 1 632 000 USD. In addition, 41,010 heads of cattle with average weight of 150kg of recoverable resulting 19 684 800USD. This resulted in a total of 21 316 800 USD for compensation. We used 3.2 USD per kilo as an average price for both types of meat retrieved from small and large ruminants. The difference between the price is only around 100 KZT that equals 0.27 USD and there is greater regional variation in the price than between species.

Given that each animal is tested at least twice a year with two tests in parallel (RBT and CFT) and then confirmatory test we used 8 tests as a number of tests performed on a positive animal and 4 tests on a negative animal. In 2015, around 6.8 million of heads of cattle were tested and 17 million of heads of sheep and goats. RBT and CFT together cost 330 KZT which is roughly 1 USD, and SAT and CFT together used for diagnosis confirmation cost 334 KZT which is also around 1 USD, resulting in total costs of testing of US$ 24 million (Table 1). The total costs of screening and animal compensation therefore is $45,239,000

As an alternative scenario we estimated the costs of a vaccination programme for mass vaccination of young animals (both large and small ruminants) using OIE approved vaccines as just over $2 million (Table 2). Vaccination of young animals was suggested by many OIE brucellosis experts and EU working documents on elimination of brucellosis, given that prevalence of brucellosis in animals is low (less than 5%) and sufficient veterinary services are in place (Hunter, 2001). Provided that state veterinarians involved in brucellosis control program are on a fixed salary, implementation of the vaccination should not create added labor costs. Fixed labor costs,

which have not been estimated, would be similar for this scenario compared to the present control programme.

4. Discussion

Brucellosis surveillance facilitates the control of infection. Despite the improvement of epidemiological surveillance brucellosis continues to remain a substantial problem certain rural districts and regions of the country.

In this study we used available data given per district for each region of Kazakhstan. The complexities of delivering planned screenings and control measures is increased by many small and large farms with mixed type of animals. Most villages in Kazakhstan have several households with animals that are kept on common pastures and animal movement are usually not monitored. Only when data on animal movement and prevalence in those small villages becomes available will it become possible to undertake a more detailed analysis.

Analysis of the available data demonstrated that the disease prevalence varied between different districts of Kazakhstan. Over much of the country, there was a moderate prevalence of around 0.7-1.3% in cattle. Low prevalence regions include Mangghystau, Qyzylorda, Zhambyl, North-Kazakhstan and Almaty with prevalence at around 0 - 0.2%.

In 2015, West Kazakhstan (1.48%) and Pavlodar (1.66%) registered the highest prevalence, with a few districts in Akmola region reporting prevalences as high as 4.1% in both small and large ruminants. This was due to a major outbreak of brucellosis. Data on isolated *Brucella* species in ruminants clearly showed sheep-cattle relationship. Out of 16 isolates found in cattle 2 were of a *B.melitensis* and the rest of *B.abortus*. However data on number of notified abortions and subsequent results of bacteriological analysis is not available.

The GLM did not show any geographical association between incidences in human with incidence in livestock. Human incidence data was only available at regional level. More detailed

data on human incidence in future might help to further explore possible correlations with animal incidence and between between strains infecting humans and animals.

The 1334 human cases of brucellosis resulted in an estimated 713 DALYs which is higher than the burden of disease compared to that reported for rabies in Kazakhstan (Sultanov et al, 2016). The burden of disease is similar to that in neighboring Kyrgyzstan (Cournotte et al. 2016), although the population of Kazakhstan is somewhat larger. The human disease incidence appears to be decreasing despite a relatively stable incidence in animals. The reasons for this are not yet clear but it is possible to speculate, for example, that milk is more frequently consumed following pasteurization than previously.

The test and slaughter program implemented in Kazakhstan, on its own, might not be sufficient to control and eliminate the disease. Because of the varying prevalence between districts, it might be helpful to apply different regional strategies. In regions with high prevalence mandatory vaccination should be considered. However, authorities should decide if mass vaccination of all animals or vaccination of only young and replacement animals should be undertaken. Regions with no brucellosis or a low incidence should ensure that the disease is not introduced Thus strong movement control of new introduced and trade animals is needed. If mandatory vaccination is applied it should be undertaken using OIE approved vaccines. In our paper we estimated the budget needed to implement vaccination of young animals which is considerably less than the present test and cull programme. In Mongolia, vaccination of livestock appears to be highly cost effective in terms of reducing the human burden of disease (Roth et al. 2003)

Current control strategies including annual screening is based on serological testing of all animals at least twice a year using both RBT and CFT. Positively reacting animals have to be retested in 15-30 days by CFT and SAT. These numerous tests performed on one animal result in substantial costs to the government. We estimated it to be around 24 million USD. OIE terrestrial code suggests using sensitive test as a screening tool and more specific test for confirmation, thus using only RBT as a screening and CFT as confirmatory test. Therefore, running only 2 tests on

positive animal. Using such a screening strategy might decrease the cost by 50%. The cost savings could be used to implement improved strategies against brucellosis or against other zoonotic diseases.

There were a number of study limitations. The burden of human disease was estimated from the reported incidence of disease. Data on human fatalities caused by brucellosis was not available and was estimated from other data. Likewise details of the age related incidence, other than broad categories of adult and child were not available. The duration was assumed to be relatively short as cases received treatment. However, the DALY is driven by the case fatality rate and the duration of disease. Thus for untreated cases there could be chronic sequelae that would dramatically increase the duration of disease and hence the YLDs. If the case fatality rate is substantially different from that assumed, this could also have a dramatic effect of the YLLs. It is also possible that there are further unreported cases. Likewise, the incidence in livestock may be under reported due to limitations of the diagnostic tests or failure to test some animals. There is also a lack of data on the species of *Brucella* effecting both humans and animals which would also have an effect on the severity of disease. Finally, the economic effects in animals are only presented as costs, as they result from efforts to control the disease. The burden of animal disease such as the financial burden or through other metrics (Torgerson et al. 2018) is not possible to estimate without detailed production losses due to Brucellosis and an estimate of duration of infection before affected animals are culled.

Competing Interests

The authors declare that they have no competing interests.

Author Contributions

All authors contributed to the study design and data collection. DC and PT analyzed the data. DC and PT wrote the manuscript. All authors approved the final manuscript. This work was written as a part of Master thesis of Duriya Charypkhan.

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Supporting information

S1 Dataset. Data sets. This ZIP file contains all the data used in the manuscript.

Legend for figures.

Figure 1 Annual incidence (per cent) of brucellosis in cattle from 2006 to 2015.

Figure 2. Incidence of brucellosis (% or cases per 100) in cattle in 2015.

Figure 3. Annual incidence of brucellosis (% of cases per 100) in sheep and goats during 2006-2015.

Figure 4. Incidence of brucellosis (% or cases per 100) in small ruminants in 2015.

Figure 5. Annual incidence (cases per 100,000) of brucellosis in human from 2006 to 2015.

Figure 6. Incidence of human brucellosis (cases per 100,000) in Kazakhstan in 2015.

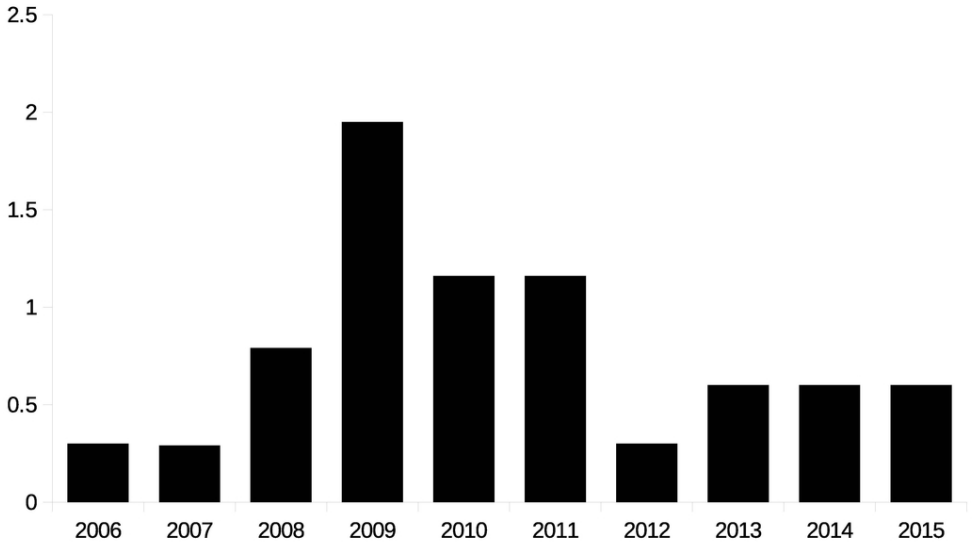

Figure 1. Annual incidence (per cent) of brucellosis in cattle from 2006 to 2015.

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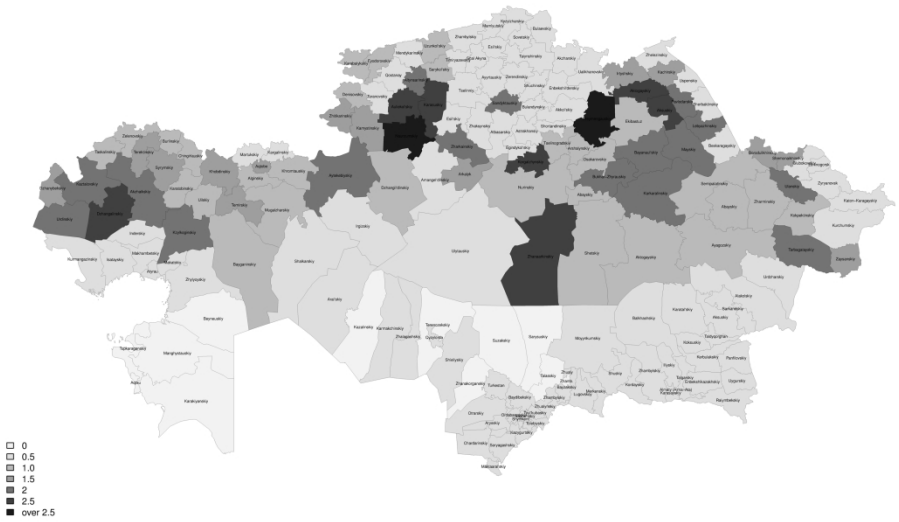

Figure 2. Incidence of brucellosis (% or cases per 100) in cattle in 2015.

304x203mm (300 x 300 DPI)

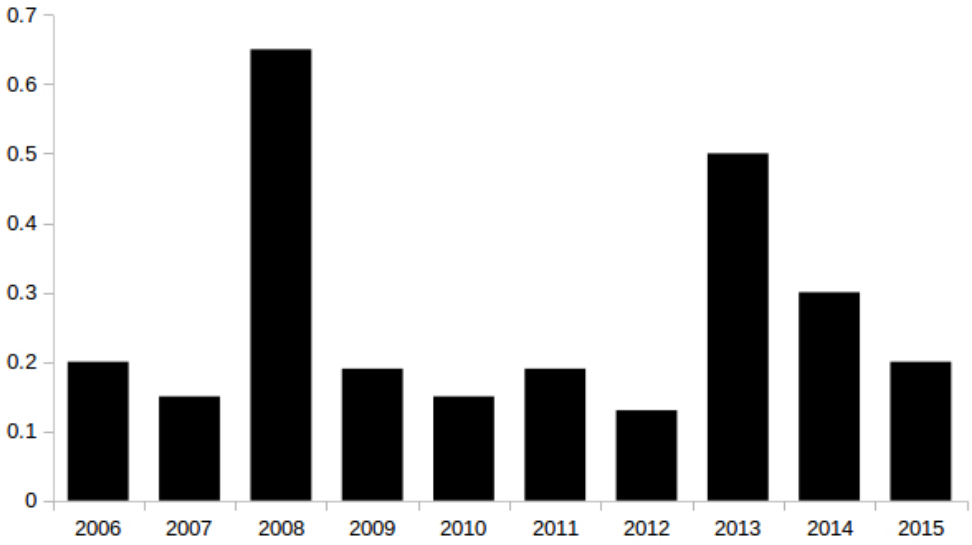

Figure 3. Annual incidence of brucellosis (% of cases per 100) in small ruminants during 2006-2015.

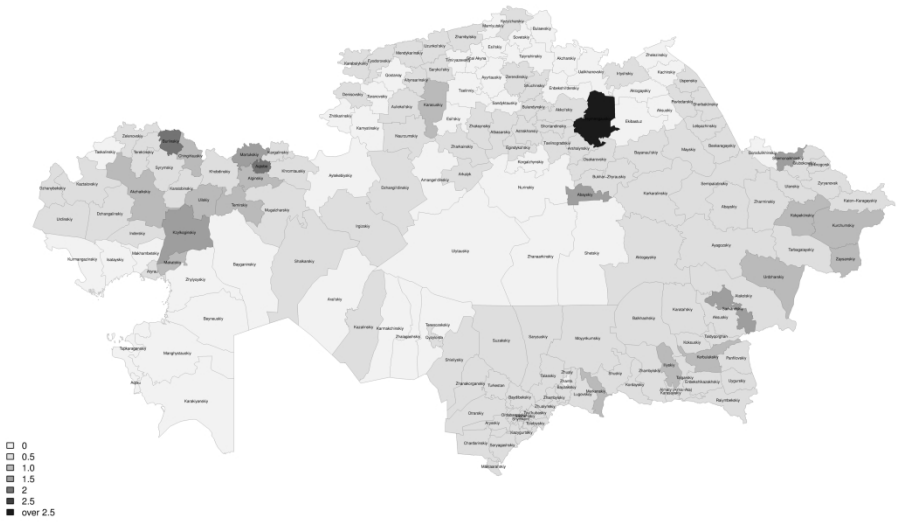

Figure 4. Incidence of brucellosis (% or cases per 100) in small ruminants in 2015.

304x203mm (300 x 300 DPI)

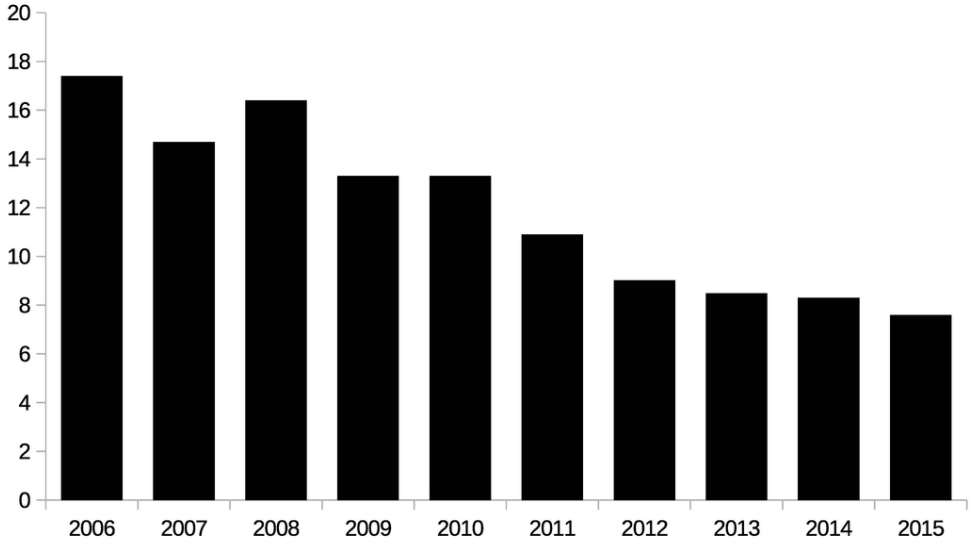

Figure 5. Annual incidence (cases per 100,000) of brucellosis in human from 2006 to 2015.

89x50mm (300 x 300 DPI)

Figure 6. Incidence of human brucellosis (cases per 100,000) in Kazakhstan in 2015.

304x203mm (300 x 300 DPI)

Table 1. Costs of screening tests in 2015.

Animals	Animal Population	Tested heads*	No Reacted positively, hence retested	Cost of annual screening in USD	Cost of retesting in USD
Large ruminants	6,183,900	6 785 465	40 973	6 785 465	40 973
Small ruminants	18, 015,500	17 061 778	34 610	17 061 778	34 610
Total				**23 922 826 USD**	

* Some animals tested on multiple occasions, as described in text.

Table 2. Estimated funds required for vaccination.

Vaccines	Number of animals to be vaccinated	Unit cost in USD	Total vaccine budget
S19	**1 421 021**	**0.8**	**1 136 816**
Rev.1	**2 944 852**	**0.3**	**883 455**
Total			**2 020 271**

Table 3. *Brucella* spp. isolated by KazSRVI in 2015-2016.

Year	Host species	Isolate *B.abortus*	Isolate *B.melitensis*
2015	Cattle	14	2
	Sheep and goats	0	10
2016	Cattle	8	0
	Sheep and goats	0	7

Table 1 - Incidence in cattle in 2006-2008

№	District Designation	2006				2007				2008			
		Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.
1	Akmola	257 200	257 200	406	0,16	654400	654400	1431	0,22	181500	181500	1718	0,95
2	Aktiobinsk	492 800	492 800	3 057	0,62	507000	507000	3037	0,60	368200	368200	7649	2,08
3	Taldykorgan region	459833	459833	259	0,06	461350	461350	308	0,07	318450	318450	217	0,07
4	Almaty region	530 589	530 589	821	0,15	538780	538780	564	0,10	365845	365845	628	0,17
5	Atirau	135 125	135 125	271	0,20	173000	173000	483	0,28	141367	141367	1073	0,76
6	East Kazakhstan Oblast	599873	599873	1 376	0,23	573000	573000	1141	0,20	381300	381300	3609	0,95
7	Zhambul	382 993	382 993	691	0,18	376450	376450	720	0,19	335028	335028	2865	0,86
8	West Kazakhstan Oblast	622 377	622 377	4 836	0,78	566000	566000	5732	1,01	387100	387100	5855	1,51
9	Karaganda	395 582	395 582	2 903	0,73	374160	374160	3452	0,92	313160	313160	3380	1,08
10	Zhezkazgan region	61 030	61 030	125	0,20	88430	88430	101	0,11	78730	78730	101	0,13
11	Kostanai	572 408	572 408	1 195	0,21	740000	740000	1376	0,19	451500	451500	5171	1,15
12	Kyzylorda	251 114	251 114	355	0,14	250000	250000	259	0,10	249740	249740	473	0,19
13	Mangistau	12 638	12 638	0	0,00	14800	14800	0	0,00	10900	10900	0	0,00
14	Pavlodar	473 615	473 615	2 763	0,58	454505	454505	2492	0,55	310660	310660	4280	1,38
15	Semipalatinsk region	410 550	410 550	959	0,23	427000	427000	672	0,16	288400	288400	1973	0,68
16	North kazakhstan Oblast	561 000	561 000	348	0,06	682000	682000	315	0,05	312800	312800	375	0,12
17	South Kazakhstan Oblast	782 126	782 126	460	0,06	743520	743520	346	0,05	538719	538719	488	0,09
	Total:	7 000 853	7 000 853	20 825	0,30	7 624 395	7 624 395	22 429	0,29	5 033 399	5 033 399	39 855	0,79

Table 2 - Incidence in cattle in 2009-2011

№	District Designation	2009				2010				2011			
		Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.
1	Akmola	483 800	483 800	8 828	1,82	498 560	498 560	6 667	1,34	654010	245674	3108	1,27
2	Aktiobinsk	517000	517000	21 549	4,17	553 550	553 550	16 321	2,95	766080	260139	6697	2,57
3	Taldykorgan region	425120	425120	204	0,05	427120	427120	499	0,12	650640	240307	368	0,15
4	Almaty region	536380	536380	693	0,13	560 740	560 740	681	0,12	736160	244849	34	0,01
5	Atirau	184200	184200	4505	2,45	225 900	225 900	3 645	1,61	292940	93928	1038	1,11
6	East Kazakhstan Oblast	506182	506182	9339	1,84	576100	576100	4 435	0,77	755482	276571	2113	0,76
7	Zhambul	347000	347000	2255	0,65	438 750	438 750	2 978	0,68	506300	190459	2071	1,09
8	West Kazakhstan Oblast	506 700	506 700	32 943	6,50	541 740	541 740	22 130	4,08	700430	199686	10395	5,21
9	Karaganda	414010	414010	9186	2,22	414 800	414 800	4 697	1,13	651200	185912	3710	2,00
10	Zhezkazgan region	100390	100390	867	0,86	100 400	100 400	574	0,57	113400	30066	345	1,15
11	Kostanai	609900	609900	11975	1,96	520 900	520 900	7 385	1,42	991010	337888	3532	1,05
12	Kyzylorda	247300	247300	686	0,28	308 610	308 610	777	0,25	399940	153786	650	0,42
13	Mangistau	11000	11000	49	0,45	12 660	12 660	8	0,06	18600	5345	9	0,17
14	Pavlodar	427200	427200	12007	2,81	448 610	448 610	7 635	1,70	676680	253900	3255	1,28
15	Semipalatinsk region	426018	426018	11338	2,66	378 000	378 000	4 485	1,19	624313	237355	2318	0,98
16	North kazakhstan Oblast	452100	452100	2634	0,58	425 725	425 725	2 321	0,55	728565	259352	766	0,30
17	South Kazakhstan Oblast	835800	835800	777	0,09	1 023 268	1 023 268	1 330	0,13	1195150	317464	602	0,19
	Total:	7 030 100	7 030 100	129 835	1,85	7 455 433	7 455 433	86 568	1,16	10460900	3532681	41011	1,16

Table 3 - Incidence in cattle in 2012-2016

District Designation	2012			2013			2014			2015			8 мес. 2016		
	Tested	Positive	inc.	Tested	Positive	inc.	Tested	Positive	inc.	Tested	Positive	inc.	Tested	Positive	inc.
Akmola	530517	2504	0,47	199 354	537	0,3	258275	943	0,4	250481	917	0,37	277396	2180	0,78
Aktiobinsk	653684	4400	0,67	492 768	4 553	0,97	342177	3851	1,1	431850	3358	0,78	291806	2435	0,8
Atirau	226030	964	0,43	184 282	1 428	0,8	150 230	852	0,5	169302	131	0,46	95982	543	0,56
Almaty	1370656	981	0,08	726 601	997	0,1	1033693	795	0,07	980461	1213	0,12	1171078	977	0,08
East Kazakhstan Oblast	1279799	4805	0,37	665470	3 837	0,6	416800	2304	1,4	851577	6458	0,74	660911	4065	0,62
Zhambul	500000	970	0,19	306 470	724	0,2	329007	0	0	383549	627	0,16	222583	299	0,1
West Kazakhstan Oblast	493595	6319	1,28	323 217	4 773	1,5	369 035	6 601	1,7	552283	8164	1,48	386958	5608	1,46
Karaganda	826000	4139	0,38	343 331	3 895	1,0	416094	5026	0,9	503831	4574	0,62	442871	2595	0,6
Kyzylorda	344 529	195	0,06	259 061	135	0,13	231181	68	0	273238	56	0,02	214361	24	0,01
Kostanai	606723	4099	0,68	329 832	2 321	0,7	414 654	4 682	1,1	535379	5247	0,98	332269	3545	1,1
Mangistau	16115	5	0,03	13 736	0	0	15560	0	0	17554	0	0	14267	0	0
Pavlodar	495600	3295	0,66	327 701	3 050	0,9	350101	4764	1,3	402994	6690	1,66	305550	3057	1,00
North kazakhstan Oblast	467589	1125	0,24	260 147	585	0,2	383 277	682	0,2	386947	401	0,1	244512	863	0,35
South Kazakhstan Oblast	1282656	446	0,03	947 099	332	0	854970	497	0	895335	558	0,06	472068	473	0,1
Astana city	1635	0	0	89 023	1 646	1,8	99929	1710	1,7	150684	1932	1,28	333	6	1,8
Total	9095128	34247	0,3	5468092	28813	0,6	5546171	32775	0,6	6785465	40973	0,6	4918798	26670	0,6

Table 4 - Incidence in sheep and goats in 2006-2008

№	District Designation	2006				2007				2008			
		Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.
1	Akmola	97 631	97 631	5	0,01	245000	245000	34	0,01	109000	109000	88	0,08
2	Aktiobinsk	594 836	594 836	1131	0,19	451000	451000	832	0,18	590000	590000	1364	0,23
3	Taldykorgan region	1339843	1339843	1604	0,12	1478450	1478450	1343	0,09	1062170	1062170	2461	0,23
4	Almaty region	1 248 329	1 248 329	1958	0,16	1495010	1495010	1948	0,13	1071825	1071825	1901	0,18
5	Atirau	459 655	459 655	139	0,03	365000	365000	117	0,03	277200	277200	261	0,09
6	East Kazakhstan Oblast	726 065	726 065	2033	0,28	564000	564000	761	0,13	585352	585352	3119	0,53
7	Zhambul	1 943 942	1 943 942	10660	0,55	2271835	2271835	11256	0,50	1506257	1506257	51148	3,40
8	West Kazakhstan Oblast	422 144	422 144	755	0,18	322000	322000	367	0,11	418000	418000	407	0,10
9	Karaganda	385 857	385 857	1674	0,43	320840	320840	669	0,21	371290	371290	692	0,19
10	Zhezkazgan region	146 300	146 300	0	0,00	119950	119950	0	0,00	210150	210150	18	0,01
11	Kostanai	163 703	163 703	152	0,09	175000	175000	59	0,03	161700	161700	77	0,05
12	Kyzylorda	567 471	567 471	690	0,12	942000	942000	795	0,08	571960	571960	915	0,16
13	Mangistau	301 370	301 370	0	0,00	316000	316000	0	0,00	244400	244400	0	0,00
14	Pavlodar	195 331	195 331	93	0,05	264992	264992	44	0,02	243772	243772	107	0,04
15	Semipalatinsk region	706 733	706 733	1514	0,21	596000	596000	1098	0,18	613500	613500	1890	0,31
16	North kazakhstan Oblast	92 500	92 500	6	0,01	165500	165500	6	0,00	117500	117500	0	0,00
17	South Kazakhstan Oblast	2 203 759	2 203 759	1240	0,06	3583107	3583107	1684	0,05	2312261	2312261	3536	0,15
	Total:	11 595 469	11 595 469	23654	0,20	13675684	13675684	21013	0,15	10466337	10466337	67984	0,65

Table 5 - Incidence in sheep and goats in 2009-2011.

№	District Designation	2009				2010				2011			
		Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.	Planned	Tested	Positive	inc.
1	Akmola	396330	396330	214	0,05	464 630	464 630	466	0,10	612510	190729	298	0,16
2	Aktiobinsk	1428680	1428680	3242	0,23	1 497 450	1 497 450	3081	0,21	2167700	520733	715	0,14
3	Taldykorgan region	2054640	2054640	2072	0,10	1928640	1928640	4936	0,26	3029830	469673	1006	0,21
4	Almaty region	2260880	2260880	4158	0,18	2 236 872	2 236 872	2584	0,12	2710600	493558	44	0,01
5	Atirau	788370	788370	440	0,06	832 500	832 500	435	0,05	1112300	323260	181	0,06
6	East Kazakhstan Oblast	1402895	1402895	7775	0,55	1 287 900	1 287 900	4646	0,36	1917300	487396	1898	0,39
7	Zhambul	3021150	3021150	9988	0,33	3 556 000	3 556 000	9743	0,27	4327500	1403384	6645	0,47
8	West Kazakhstan Oblast	1100990	1100990	1403	0,13	1 077 000	1 077 000	1652	0,15	1411453	205790	298	0,14
9	Karaganda	963700	963700	1343	0,14	949 550	949 550	640	0,07	1458500	280480	452	0,16
10	Zhezkazgan region	385450	385450	0	0,00	384 450	384 450	0	0,00	470000	96253	0	0,00
11	Kostanai	404250	404250	947	0,23	418 150	418 150	1786	0,43	559670	128274	244	0,19
12	Kyzylorda	1015960	1015960	1340	0,13	1 100 000	1 100 000	721	0,07	1480700	448785	290	0,06
13	Mangistau	728090	728090	0	0,00	793 000	793 000	0	0,00	1050000	352739	0	0,00
14	Pavlodar	634920	634920	369	0,06	680 100	680 100	663	0,10	986824	238443	361	0,15
15	Semipalatinsk region	1837045	1837045	6796	0,37	1 710 000	1 710 000	3710	0,22	2406800	841446	1678	0,20
16	North kazakhstan Oblast	283140	283140	11	0,00	350 850	350 850	30	0,01	510050	209780	98	0,05
17	South Kazakhstan Oblast	4736497	4736497	3823	0,08	5 348 029	5 348 029	2370	0,04	6742119	1508009	1204	0,08
	Total:	23442987	23442987	43921	0,19	24 615 121	24 615 121	37463	0,15	32953856	8198732	15412	0,19

Table 6 - Incidence in sheep and goats in 2012-2016

District Designation	2012			2013			2014			2015			8months of 2016		
	Tested	Positive	inc.	Tested	Positive	inc.	Tested	Positive	inc.	Tested	Positive	inc.	Tested	Positive	inc.
Akmola	459450	1188	0,3	324 725	338	0,1	294277	291	0,1	286610	219	0,076	350447	1500	0,42
Aktiobinsk	1779791	2826	0,16	1 272 205	3 514	0,3	816987	3953	0,5	1065330	3570	0,33	760 212	1 126	0,1
Atirau	749251	332	0,04	630 342	1 206	0,2	538350	1 853	0,3	569266	1813	0,31	418339	2222	0,53
Almaty region	4168639	5056	0,12	2 524 249	6 339	0,25	2269125	9407	0,45	2949833	7239	0,25	2961311	4734	0,16
East Kazakhstan Oblast	4143644	9918	0,26	1 846 384	7 680	0,45	1635215	9258	0,55	2292458	8042	0,37	1403835	3354	0,25
Zhambul	4356382	11540	0,3	1 997 377	9 145	0,5	1953593	11647	0,5	1989035	4996	0,25	1397654	2842	0,2
West Kazakhstan Oblast	1090654	3085	0,28	805 565	2 042	0,3	724335	2077	0,2	1016815	2838	0,27	709015	915	0,13
Karaganda	1516300	614	0,02	771 872	343	0,05	666144	932	0,1	1277669	1024	0,05	1027640	210	0,02
Kyzylorda	990 782	636	0,06	804 370	502	0,1	671469	916	0,1	497741	195	0,039	514556	100	0,01
Kostanai	350013	388	0,11	404 311	558	0,1	300000	694	0,2	359902	261	0,073	41677	92	0,02
Mangistau	655769	0	0	612 417	0	0	427316	0	0	403341	0	0	275257	2	0
Pavlodar	645840	472	0,07	552 310	205	0	509992	1371	0,2	593203	889	0,15	656490	370	0,06
North kazakhstan Oblast	364872	35	0,01	342 783	79	0	283339	34	0	327674	24	0,07	355024	11	0,003
South Kazakhstan Oblast	6415035	2422	0,04	4 246 087	2 336	0,1	4190421	2982	0	3242790	1449	0,045	1331414	953	0,07
Astana city	1530	28	1,83	150 741	1 813	1,2	146768	2393	1,6	190111	2051	1,07	618	14	2,2
Total	27687952	38540	0,13	7285738	36 100	0,5	15143992	47808	0,3	17061778	34610	0,2	12203489	18445	0,3

Table 7- Incidence of brucellosis in human in 2006-2008

№	District Designation	2006		2007		2008	
		Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population
1.	Aqmola	9	1,2	10	1,3	14	1,9
2.	Aqtobe	38	5,5	36	5,2	29	4,1
3.	Almaty	370	22,9	316	19,4	528	31,9
4.	Atyrau	4	0,8	2	0,4	5	1,0
5.	East Kazakhstan	224	15,7	278	19,4	247	17,4
6.	Zhambyl	630	62,7	527	52,0	527	51,4
7.	West Kazakhstan	43	7,0	18	3,0	26	4,2
8.	Qaraghandy	53	4,0	24	1,8	42	3,1
9.	Qostanay	8	0,9	8	0,9	16	1,8
10.	Qyzylorda	347	55,8	232	36,9	206	32,3
11.	Mangghystau	0	0,0	1	0,3	1	0,2
12.	Pavlodar	18	2,4	8	1,1	15	2,0
13.	North Kazakhstan	5	0,8	1	0,2	0	0,0
14.	South Kazakhstan	913	40,4	811	35,2	918	38,9
15	Almaty city	5	0,4	2	0,2	2	0,2
16.	Astana city	3	0,5	6	1,0	1	0,2
Total		2670	17,4	2278	14,7	2577	16,4

Table 8- Incidence of brucellosis in human in 2009-2013.

№	District Designation	2009		2010		2011		2012		2013	
		Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population
1.	Aqmola	7	0,9	35	4,75	31	4,2	22	3,01	40	5,45
2.	Aqtobe	37	5,2	32	4,43	29	3,7	33	4,18	28	3,5
3.	Almaty	467	26,3	515	30,16	416	21,8	377	19,65	316	16,1
4.	Atyrau	6	1,4	14	2,7	11	2,07	6	1,1	23	4,1
5.	East Kazakhstan	239	16,8	221	15,5	197	14,1	134	9,6	125	8,97
6.	Zhambyl	441	39,8	395	37,63	388	36,6	310	29,2	288	26,8
7.	West Kazakhstan	46	7,4	61	9,73	55	9,03	55	8,9	52	8,4
8.	Qaraghandy	38	2,8	29	2,14	28	2,1	26	1,9	12	0,8
9.	Qostanay	7	0,78	7	0,79	3	0,34	4	0,45	6	0,68
10	Qyzylorda	135	21,1	122	17,52	137	20,3	83	11,58	84	11,5
11	Mangghystau	1	0,2	1	0,22	0	0	0	0,0	0	0
12	Pavlodar	15	2,0	26	3,46	25	3,3	23	3,08	23	3,07
13	North Kazakhstan	1	0,15	3	0,47	7	0,82	6	1,03	5	0,86
14	South Kazakhstan	683	27,3	679	27,65	463	17,6	425	16,12	436	16,1
15	Almaty city	6	0,5	3	0,21	2	0,13	0	0,0	1	0,07
16	Astana city	11	1,6	10	1,42	8	1,1	5	0,67	4	0,5
Total		2110	13,3	2153	13,3	1800	10,9	1509	9,02	1443	8,49

Table 9- Incidence of brucellosis in human in 2014-2016.

№	District Designation	2014		2015		6 months of 2016	
		Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population	Number of cases	Incidence per 100,000 population
1.	Aqmola	25	3,4	28	3,7	5	0,6
2.	Aqtobe	24	2,9	44	5,3	16	1,9
3.	Almaty	278	14,6	237	12,2	77	3,9
4.	Atyrau	15	2,61	25	4,25	23	3,9
5.	East Kazakhstan	140	10,0	103	7,3	49	3,5
6.	Zhambyl	280	25,7	252	22,8	70	6,3
7.	West Kazakhstan	53	8,4	62	9,7	13	2,0
8.	Qaraghandy	18	1,3	16	1,1	6	0,4
9.	Qostanay	16	1,8	44	4,9	24	2,7
10.	Qyzylorda	82	11,0	91	12,0	32	4,2
11.	Mangghystau	2	0,33	2	0,3	1	0,1
12.	Pavlodar	16	2,12	26	3,4	9	1,1
13.	North Kazakhstan	4	0,7	7	1,2	0	0
14.	South Kazakhstan	482	17,5	382	13,6	119	4,2
15	Almaty city	4	0,25	2	0,1	3	0,1
16.	Astana city	4	0,48	13	1,5	1	0,12
	Total	1443	8,3	1334	7,6	448	2,5

Epidemiological situation

№	Region/Oblast	Cases of brucellosis registered		Out of which						Number of cases in non infected area		Registered cases of disease in professional worokers	
				Living in rural places		Children until 14 years old		Children from 15 to 18					
		Number of cases	Inc.	Number of cases	%	Number of cases	%	Number of cases	%	In total	%	In total	%
1	Aqmola	28	3.8	24	85.7	5	17.9	4	14.3	28	100.0	0	0.0
2	Aqtobe	44	5.4	36	81.8	10	22.7	3	6.8	27	61.4	0	0.0
3	Almaty	237	12.4	199	84.0	31	13.1	14	5.9	208	87.8	0	0.0
4	Atyrau	25	4.4	25	100.0	6	24.0	1	4.0	25	100.0	0	0.0
5	East Kazakhstan	103	7.4	85	82.5	11	10.7	1	1.0	80	77.7	0	0.0
6	Zhambyl	252	23.1	214	84.9	35	13.9	13	5.2	252	100.0	0	0.0
7	West Kazakhstan	62	9.9	62	100.0	9	14.5	1	1.6	32	51.6	0	0.0
8	Qaraghandy	16	1.2	13	81.3	3	18.8	0	0.0	12	75.0	0	0.0
9	Qostanay	44	5.0	43	97.7	1	2.3	0	0.0	41	93.2	1	2.3
10	Qyzylorda	91	12.2	82	90.1	12	13.2	6	6.6	85	93.4	0	0.0
11	Mangghystau	2	0.3	0	0.0	0	0.0	0	0.0	2	100.0	0	0.0
12	Pavlodar	26	3.5	24	92.3	0	0.0	0	0.0	22	84.6	0	0.0
13	North Kazakhstan	7	1.2	7	100.0	1	14.3	0	0.0	7	100.0	0	0.0
14	South Kazakhstan	382	13.8	316	82.7	58	15.2	32	8.4	382	100.0	0	0.0
15	Almaty city	2	0.1	1	50.0	1	50.0	0	0.0	2	100.0	0	0.0
16	Astana city	13	1.6	0	0.0	1	7.7	0	0.0	13	100.0	0	0.0

In total	**1334**	**7.7**	**1131**	**84.8**	**184**	**13.8**	**75**	**5.6**	**1218**	91.3	**1**	**0.1**

Hemoculture results

№	Region/Oblast	Cases of brucellosis registered	Hemoculture	%	Culture seedings	%
1	Aqmola	28	26	92.9	11	42.3
2	Aqtobe	44	41	93.2	41	100.0
3	Almaty	237	237	100.0	74	31.2
4	Atyrau	25	25	100.0	23	92.0
5	East Kazakhstan	103	103	100.0	52	50.5
6	Zhambyl	252	243	96.4	243	100.0
7	West Kazakhstan	62	62	100.0	60	96.8
8	Qaraghandy	16	16	100.0	7	43.8
9	Qostanay	44	44	100.0	14	31.8
10	Qyzylorda	91	91	100.0	52	57.1
11	Mangghystau	2	2	100.0	0	0.0
12	Pavlodar	26	26	100.0	4	15.4
13	North Kazakhstan	7	6	85.7	0	0.0

14	South Kazakhstan	382	337	88.2	337	100.0
15	Almaty city	2	2	100.0	2	100.0
16	Astana city	13	13	100.0	6	46.2
In total		**1334**	**1274**	95.5	**926**	72.7

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№	Region/Oblast	Зарегистрировано случаев бруцеллеза	обслед-но лабораторно	Выявлено лиц контактных с больным животным и обследовано	выявлено больных бруцеллезом	Источник заражения	в том числе			Источники инфекции не установлены	Факторы передачи	в том числе				Не установлено	
							Мелкий рогатый скот	Крупный рогатый скот	Др. виды животных			Контактно-бытовой		Алиментарный			
												Абс.чис	%	Абс.чис	%	Абс.чис	%
1	Aqmola	28	16	98	0	28	7	9	0	12	28	28	100.0	0	0.0	0	0.0
2	Aqtobe	44	69	412	8	44	30	6	2	6	44	23	52.3	15	34.1	6	13.6
3	Almaty	237	261	6064	20	237	183	33	1	20	237	189	79.7	28	11.8	20	8.4
4	Atyrau	25	25	101	1	25	25	0	0	0	25	25	100.0	0	0.0	0	0.0
5	East Kazakhstan	103	9746	9746	41	103	54	40	3	6	103	86	83.5	17	16.5	0	0.0
6	Zhambyl	252	243	320	11	252	198	38	0	16	252	236	93.7	0	0.0	16	6.3
7	West Kazakhstan	62	59	9507	22	62	52	3	0	7	62	55	88.7	0	0.0	7	11.3
8	Qaraghandy	16	23	68	0	16	6	9	0	1	16	12	75.0	1	6.3	3	18.8
9	Qostanay	44	42	2963	44	44	0	44	0	0	44	44	100.0	0	0.0	0	0.0
10	Qyzylorda	91	120	364	19	91	72	1	0	18	91	76	83.5	9	9.9	6	6.6
11	Mangghystau	2	2	2	0	2	0	0	0	2	2	0	0.0	0	0.0	2	100.0
12	Pavlodar	26	26	208	4	26	3	15	0	8	26	16	61.5	2	7.7	8	30.8
13	North Kazakhstan	7	7	868	4	7	0	5	0	2	7	5	71.4	0	0.0	2	28.6
14	South Kazakhstan	382	751	3493	16	382	235	131	0	16	382	239	62.6	127	33.2	16	4.2
15	Almaty city	2	2	11	0	2	0	1	0	1	2	0	0.0	1	50.0	1	50.0
16	Astana city	13	0	59	2	13	7	2	0	4	13	8	61.5	1	7.7	4	30.8
Республика Казахстан		**1334**	**11392**	**34284**	**192**	**1334**	**872**	**337**	**6**	**119**	**1334**	**1042**	78.1	**201**	15.1	**91**	6.8

ID	NAME	ID	NAME	VARNAME	NL_NAME	HASC	CC_2,C,15	TYPE_2,C,	ENGTYPE_
1504	Almaty	18769	Aksuskiy			KZ.AA.AK		Rayon	District
1504	Almaty	18770	Alakolskiy	Alakol'skiy		KZ.AA.AL		Rayon	District
1504	Almaty	18771	Almaty (Alma-Ata)			KZ.AA.AM		Rayon	District
1504	Almaty	18772	Balkhashskiy			KZ.AA.BA		Rayon	District
1504	Almaty	18773	Enbekshikazakhskiy			KZ.AA.EN		Rayon	District
1504	Almaty	18774	Iliyskiy			KZ.AA.IL		Rayon	District
1504	Almaty	18775	Karasayski	Karasayskiy (Kaskeler		KZ.AA.KS		Rayon	District
1504	Almaty	18776	Karatal`ski	Karatalskiy		KZ.AA.KT		Rayon	District
1504	Almaty	18777	Kerbulakskiy			KZ.AA.KE		Rayon	District
1504	Almaty	18778	Koksuskiy			KZ.AA.KO		Rayon	District
1504	Almaty	18779	Panfilovskiy			KZ.AA.PA		Rayon	District
1504	Almaty	18780	Raiymbeks	Rayymbekskiy (Narynk		KZ.AA.RA		Rayon	District
1504	Almaty	18781	Sarkandskiy			KZ.AA.SA		Rayon	District
1504	Almaty	18782	Taldyqorgh	Taldyqorghanskiy		KZ.AA.TQ		Maslikhat	Assembly
1504	Almaty	18783	Talgarskiy			KZ.AA.TG		Rayon	District
1504	Almaty	18784	Uygurskiy			KZ.AA.UY		Rayon	District
1504	Almaty	18785	Zhambylskiy			KZ.AA.ZH		Rayon	District
1505	Aqmola	18786	Akkol`skiy	Akkol'skiy (Alekseevsk		KZ.AM.AK		Rayon	District
1505	Aqmola	18787	Arshalynsk	Arshalynskiy (Vishnev		KZ.AM.AR		Rayon	District
1505	Aqmola	18788	Astrakhans	Astrakhanskiy		KZ.AM.AS		Rayon	District
1505	Aqmola	18789	Atbasarskiy			KZ.AM.AT		Rayon	District
1505	Aqmola	18790	Bulandynskiy			KZ.AM.BU		Rayon	District
1505	Aqmola	18791	Egindykol`s	Eginykolskiy (Krasnozı		KZ.AM.EG		Rayon	District
1505	Aqmola	18792	Enbekshil`d	Enbekshil'derskiy		KZ.AM.EN		Rayon	District
1505	Aqmola	18793	Ereymenga	Ereymentauskiy		KZ.AM.ER		Rayon	District
1505	Aqmola	18794	Esil`skiy	Esil'skiy		KZ.AM.ES		Rayon	District
1505	Aqmola	18795	Korgalzhyn	Korgalzhinskiy		KZ.AM.KR		Rayon	District
1505	Aqmola	18796	Sandyktauskiy			KZ.AM.SA		Rayon	District
1505	Aqmola	18797	Shortandinskiy			KZ.AM.SD		Rayon	District
1505	Aqmola	18798	Shuchinski	Shchuchinskiy		KZ.AM.SC		Rayon	District
1505	Aqmola	18799	Tselinogradskiy			KZ.AM.TS		Rayon	District
1505	Aqmola	18800	Zerendinskiy			KZ.AM.ZE		Rayon	District
1505	Aqmola	18801	Zhaksynskiy			KZ.AM.ZS		Rayon	District
1505	Aqmola	18802	Zharkainsk	Derzhavinskiy		KZ.AM.ZR		Rayon	District
1506	Aqt?be	18803	Alginskiy			KZ.AT.AL		Rayon	District
1506	Aqt?be	18804	Aqtobe			KZ.AT.AQ		Maslikhat	Assembly
1506	Aqt?be	18805	Aytekebiys	Aytekebiyskiy (Komsoı		KZ.AT.AY		Rayon	District
1506	Aqt?be	18806	Bayganinskiy			KZ.AT.BA		Rayon	District
1506	Aqt?be	18807	Irgizskiy			KZ.AT.IR		Rayon	District
1506	Aqt?be	18808	Kargalinskiy			KZ.AT.KA		Rayon	District
1506	Aqt?be	18809	Khobdinskiy			KZ.AT.KB		Rayon	District
1506	Aqt?be	18810	Khromtauskiy			KZ.AT.KT		Rayon	District
1506	Aqt?be	18811	Martukskiy			KZ.AT.MA		Rayon	District
1506	Aqt?be	18812	Mugalzharskiy			KZ.AT.MU		Rayon	District
1506	Aqt?be	18813	Shalkarski	Shalkarskiy (Chelkarsk		KZ.AT.SH		Rayon	District
1506	Aqt?be	18814	Temirskiy			KZ.AT.TE		Rayon	District
1506	Aqt?be	18815	Uilskiy			KZ.AT.UI		Rayon	District
1507	Atyrau	18816	Atyrau	Atyrauskiy|Guriev		KZ.AR.AT		Maslikhat	Assembly
1507	Atyrau	18817	Inderskiy	Indenrskiy		KZ.AR.IN		Rayon	District
1507	Atyrau	18818	Isatayskiy			KZ.AR.IS		Rayon	District
1507	Atyrau	18819	Kurmangazinskiy			KZ.AR.KU		Rayon	District
1507	Atyrau	18820	Kzylkogins	Kylkoginskiy		KZ.AR.KZ		Rayon	District
1507	Atyrau	18821	Makatskiy			KZ.AR.MK		Rayon	District
1507	Atyrau	18822	Makhambetskiy			KZ.AR.MB		Rayon	District

1507	Atyrau	18823	Zhylyoyskiy	Embinskiy	KZ.AR.ZH	Rayon District
1508	East Kazak	18824	Abayskiy		KZ.EK.AB	Rayon District
1508	East Kazak	18825	Ayagozskiy		KZ.EK.AY	Rayon District
1508	East Kazak	18826	Beskaragayskiy		KZ.EK.BE	Rayon District
1508	East Kazak	18827	Borodulikhinskiy		KZ.EK.BO	Rayon District
1508	East Kazak	18828	Glubokovsl	Ghlubokovskiy	KZ.EK.GL	Rayon District
1508	East Kazak	18829	Katon-Kara	Katon-Karagayski	KZ.EK.KK	Rayon District
1508	East Kazak	18830	Kokpektinskiy		KZ.EK.KO	Rayon District
1508	East Kazak	18831	Kurchumskiy		KZ.EK.KU	Rayon District
1508	East Kazak	18832	Leninogors	Leninnogorskiy	KZ.EK.LE	Maslikhat Assembly
1508	East Kazak	18833	Semipalatinskiy		KZ.EK.SE	Rayon District
1508	East Kazak	18834	Shemonaik	Shemonakhinskiy	KZ.EK.SH	Rayon District
1508	East Kazak	18835	Tarbagatayskiy		KZ.EK.TA	Rayon District
1508	East Kazak	18836	Ulanskiy		KZ.EK.UL	Rayon District
1508	East Kazak	18837	Urdzharskiy		KZ.EK.UR	Rayon District
1508	East Kazak	18838	Zaysanskiy		KZ.EK.ZA	Rayon District
1508	East Kazak	18839	Zharminskiy		KZ.EK.ZH	Rayon District
1508	East Kazak	18840	Zyryanovsk	Zyryanovskiy	KZ.EK.ZY	Maslikhat Assembly
1509	Mangghyst	18841	Aqtau	Aqtau (Shevchenko)	KZ.MG.AQ	Maslikhat Assembly
1509	Mangghyst	18842	Beyneuskiy		KZ.MG.BE	Rayon District
1509	Mangghyst	18843	Karakiyanskiy		KZ.MG.KA	Rayon District
1509	Mangghyst	18844	Manghysta	Mangistauskiy	KZ.MG.MA	Rayon District
1509	Mangghyst	18845	Tupkaraganskiy		KZ.MG.TU	Rayon District
1510	North Kaza	18846	Akzharskiy	Akzharskiy (Leninskiy)	KZ.NK.AZ	Rayon District
1510	North Kaza	18847	Ayyrtauskiy	Ayyrtauskiy (Volodarsk	KZ.NK.AY	Rayon District
1510	North Kaza	18848	Bulaevskiy		KZ.NK.BU	Rayon District
1510	North Kaza	18849	Esil`skiy	Esil'skiy	KZ.AM.ES	Rayon District
1510	North Kaza	18850	Kyzylzhars	Bishkul'skiy	KZ.NK.KY	Rayon District
1510	North Kaza	18851	Mamlyutskiy		KZ.NK.MA	Rayon District
1510	North Kaza	18852	Shal Akyna	Sergeevskiy	KZ.NK.SA	Rayon District
1510	North Kaza	18853	Sovetskiy		KZ.NK.SO	Rayon District
1510	North Kaza	18854	Taiynshins	Tayynshinskiy|Krasnoa	KZ.NK.TA	Rayon District
1510	North Kaza	18855	Timiryazevskiy		KZ.NK.TI	Rayon District
1510	North Kaza	18856	Tselinniy	Tselinnyy (Kuybyshevs	KZ.NK.TS	Rayon District
1510	North Kaza	18857	Ualikhanovskiy		KZ.NK.UA	Rayon District
1510	North Kaza	18858	Zhambylskiy		KZ.AA.ZH	Rayon District
1511	Pavlodar	18859	Aksuskiy		KZ.AA.AK	Rayon District
1511	Pavlodar	18860	Aktogayski	Aktogayskiy (Krasnoku	KZ.PA.AT	Rayon District
1511	Pavlodar	18861	Bayanaul`s	Bayanaul'skiy	KZ.PA.BA	Rayon District
1511	Pavlodar	18862	Ekibastuz	Ekibastuzskiy	KZ.PA.EK	Maslikhat Assembly
1511	Pavlodar	18863	Irtyshskiy		KZ.PA.IR	Rayon District
1511	Pavlodar	18864	Kachirskiy		KZ.PA.KA	Rayon District
1511	Pavlodar	18865	Lebyazhinskiy		KZ.PA.LE	Rayon District
1511	Pavlodar	18866	Mayskiy		KZ.PA.MA	Rayon District
1511	Pavlodar	18867	Pavlodarskiy		KZ.PA.PS	Rayon District
1511	Pavlodar	18868	Sherbaktin	Shcherbaktinskiy	KZ.PA.SH	Rayon District
1511	Pavlodar	18869	Uspenskiy		KZ.PA.US	Rayon District
1511	Pavlodar	18870	Zhelezinskiy		KZ.PA.ZH	Rayon District
1512	Qaraghanc	18871	Abayskiy	Abayskiy (Michurinskiy	KZ.EK.AB	Rayon District
1512	Qaraghanc	18872	Aktogayskiy		KZ.PA.AT	Rayon District
1512	Qaraghanc	18873	Bukhar-Zhy	Ul'yanovskiy	KZ.QG.BZ	Rayon District
1512	Qaraghanc	18874	Karkaralinskiy		KZ.QG.KK	Rayon District
1512	Qaraghanc	18875	Nurinskiy		KZ.QG.NU	Rayon District
1512	Qaraghanc	18876	Osakarovskiy		KZ.QG.OS	Rayon District

1512	Qaraghanc	18877	Shetskiy	KZ.QG.ST	Rayon	District
1512	Qaraghanc	18878	Ulytauskiy	KZ.QG.UL	Rayon	District
1512	Qaraghanc	18879	Zhanaarkinskiy	KZ.QG.ZA	Rayon	District
1513	Qostanay	18880	Altynsarinskiy	KZ.QS.AL	Rayon	District
1513	Qostanay	18881	Amangel`d	Amangel'dinskiy	KZ.QS.AM	Rayon	District
1513	Qostanay	18882	Arkalyk	Arqalyqskiy	KZ.QS.AR	Maslikhat	Assembly
1513	Qostanay	18883	Auliekol`sk	Auliekol'skiy|Semiozer	KZ.QS.AU	Rayon	District
1513	Qostanay	18884	Denisovski	Denisovskiy (Ordzhoni	KZ.QS.DE	Rayon	District
1513	Qostanay	18885	Dzhangil`di	Dzhangil'dinskiy	KZ.QS.DZ	Rayon	District
1513	Qostanay	18886	Fyodorovsk	Fedorovskiy	KZ.QS.FY	Rayon	District
1513	Qostanay	18887	Kamystinsk	Kamystinskiy (Kamysh	KZ.QS.KA	Rayon	District
1513	Qostanay	18888	Karabalyks	Karabalykskiy (Komso	KZ.QS.KB	Rayon	District
1513	Qostanay	18889	Karasuskiy	KZ.QS.KS	Rayon	District
1513	Qostanay	18890	Mendykarin	Mendykrinskiy	KZ.QS.ME	Rayon	District
1513	Qostanay	18891	Naurzumskiy	KZ.QS.NA	Rayon	District
1513	Qostanay	18892	Qostanay	Qostanay (Kustanay)	KZ.QS.QO	Maslikhat	Assembly
1513	Qostanay	18893	Sarykol`ski	Sarykol'skiy	KZ.QS.SA	Rayon	District
1513	Qostanay	18894	Taranovskiy	KZ.QS.TA	Rayon	District
1513	Qostanay	18895	Uzunkol`sk	Uzunkol'skiy	KZ.QS.UZ	Rayon	District
1513	Qostanay	18896	Zhitikarinskiy	KZ.QS.ZH	Rayon	District
1514	Qyzylorda	18897	Aral`skiy	Aralskiy	KZ.QO.AR	Rayon	District
1514	Qyzylorda	18898	Karmakchinskiy	KZ.QO.KR	Rayon	District
1514	Qyzylorda	18899	Kazalinskiy	KZ.QO.KZ	Rayon	District
1514	Qyzylorda	18900	Qyzylorda	Qyzylorda (Kyzyl-Orda	KZ.QO.QY	Maslikhat	Assembly
1514	Qyzylorda	18901	Shieliyskiy	Shieli	KZ.QO.SH	Rayon	District
1514	Qyzylorda	18902	Terenozekskiy	KZ.QO.TE	Rayon	District
1514	Qyzylorda	18903	Zhalagash	Zhalaganshskiy	KZ.QO.ZL	Rayon	District
1514	Qyzylorda	18904	Zhanakorganskiy	KZ.QO.ZN	Rayon	District
1515	South Kaza	18905	Arysskiy	KZ.SK.AR	Rayon	District
1515	South Kaza	18906	Baydibekskiy	KZ.SK.BA	Rayon	District
1515	South Kaza	18907	Chardarinskiy	KZ.SK.CH	Rayon	District
1515	South Kaza	18908	Kazygurtsk	Kazygurtskiy (Leninski	KZ.SK.KA	Rayon	District
1515	South Kaza	18909	Maktaaral`s	Maktaaralskiy	KZ.SK.MA	Rayon	District
1515	South Kaza	18910	Ordabasynskiy	KZ.SK.OR	Rayon	District
1515	South Kaza	18911	Otrarskiy	KZ.SK.OT	Rayon	District
1515	South Kaza	18912	Saryagashskiy	KZ.SK.SG	Rayon	District
1515	South Kaza	18913	Sayramski	Say	KZ.SK.SR	Rayon	District
1515	South Kaza	18914	Shymkent	Shymkent (Chimkent)	KZ.SK.SH	Maslikhat	Assembly
1515	South Kaza	18915	Suzakskiy	KZ.SK.SU	Rayon	District
1515	South Kaza	18916	Tolebiyskiy	Tolebisyskiy	KZ.SK.TO	Rayon	District
1515	South Kaza	18917	Turkestan	Turkistanskiy	KZ.SK.TU	Maslikhat	Assembly
1515	South Kaza	18918	Tyul`kubas	Tyu'lkubasskiy	KZ.SK.TY	Rayon	District
1516	West Kaza	18919	Akzhaikski	Akzhaikskiy (Chapaev	KZ.WK.AK	Rayon	District
1516	West Kaza	18920	Burlinskiy	KZ.WK.BU	Rayon	District
1516	West Kaza	18921	Chingirlaus	Chingirlausky	KZ.WK.CH	Rayon	District
1516	West Kaza	18922	Dzhangalinskiy	KZ.WK.DG	Rayon	District
1516	West Kaza	18923	Dzhanybekskiy	KZ.WK.DB	Rayon	District
1516	West Kaza	18924	Karatobinskiy	KZ.WK.KR	Rayon	District
1516	West Kaza	18925	Kaztalovsk	Kaztalobskiy	KZ.WK.KZ	Rayon	District
1516	West Kaza	18926	Syrymskiy	KZ.WK.SY	Rayon	District
1516	West Kaza	18927	Taskalinskiy	KZ.WK.TA	Rayon	District
1516	West Kaza	18928	Terektinskiy	KZ.WK.TE	Rayon	District
1516	West Kaza	18929	Urdinskiy	KZ.WK.UD	Rayon	District
1516	West Kaza	18930	Zelenovskiy	KZ.WK.ZE	Rayon	District

1517	Zhambyl	18931	Bayzakskiy Sverdlovskiy	KZ.ZM.BA	Rayon	District
1517	Zhambyl	18932	Kordayskiy	KZ.ZM.KO	Rayon	District
1517	Zhambyl	18933	Lugovskoy	KZ.ZM.LU	Rayon	District
1517	Zhambyl	18934	Merkenskiy	KZ.ZM.ME	Rayon	District
1517	Zhambyl	18935	Moyynkumskiy	KZ.ZM.MO	Rayon	District
1517	Zhambyl	18936	Sarysuskiy	KZ.ZM.SA	Rayon	District
1517	Zhambyl	18937	Shuskiy	KZ.ZM.SH	Rayon	District
1517	Zhambyl	18938	Talasskiy	KZ.ZM.TL	Rayon	District
1517	Zhambyl	18939	Zhamb.	KZ.ZM.ZB	Rayon	District
1517	Zhambyl	18940	Zhambylskiy	KZ.AA.ZH	Rayon	District
1517	Zhambyl	18941	Zhualy	KZ.ZM.ZY	Rayon	District
1517	Zhambyl	18942	Zhualynskiy	KZ.ZM.ZL	Rayon	District

VALIDFR_	VALIDTO_	REMARKS	SHAPE_LE	SHAPE_AI	Cattle	s&G
1997	Present		9.652116	1.542787	0.12	0.40
1997	Present		15.61075	4.242477	0.16	0.12
1997	Present		0.962854	0.031346		
1997	Present		10.74374	4.413856	0.06	0.15
1997	Present		5.256762	1.072167	0.10	0.33
1997	Present		5.362649	0.940971	0.24	0.94
1997	Present		3.153741	0.243523	0.06	0.03
1997	Present		7.804663	2.776448	0.07	0.46
1997	Present		8.69387	1.258346	0.15	0.50
1997	Present		4.269064	0.789639	0.07	0.18
1997	Present		5.401151	1.173592	0.01	0.02
1997	Present		10.84856	1.533481	0.07	0.24
1997	Present		9.203194	1.181122	0.19	1.38
1997	Present		5.132955	0.501465	0.01	0.07
1997	Present		7.69696	0.675861	0.15	0.11
1997	Present		4.591712	0.942598	0.18	0.23
1997	Present		8.772577	2.068065	0.05	0.01
1997	Present		7.562846	1.381206	0.3	0.1
1997	Present		5.744842	0.770025	0.6	0.1
1997	Present		5.867739	0.93353	0.06	0.05
1997	Present		7.173143	1.404757	0.1	0.3
1997	Present		6.173324	0.682683	0.4	0.1
1997	Present		5.238546	0.674731	0.2	0.01
1997	Present		8.352068	1.413761	0.4	0
1997	Present		9.059756	2.282856	4.1	4.1
1997	Present		6.697953	1.13196	0.1	0
1997	Present		7.30779	1.16189	2.4	0
1997	Present		5.457292	0.83122	1.8	0
1997	Present		5.272541	0.595437	0.18	0.3
1997	Present		6.862307	0.789135		
1997	Present		6.776572	1.061856	0.9	0.2
1997	Present		7.396658	1.130051	0.2	0.1
1997	Present		6.092139	1.305056	0.04	0.1
1997	Present		7.995673	1.590175	1.6	0.03
1997	Present		6.998398	0.935395	0.7	0.8
1997	Present		3.079644	0.302989	1.2	1.5
1997	Present		13.47749	4.535613	1.5	0
1997	Present		13.26599	7.349697	0.6	0
1997	Present		12.05537	5.037217	0.2	0.02
1997	Present		5.00281	0.616207	0.2	0.1
1997	Present		7.430981	1.714027	1	0.3
1997	Present		7.71044	1.608721	0.8	0.2
1997	Present		5.920242	0.824012	0.4	1
1997	Present		13.59681	3.612394	0.9	0.1
1997	Present		16.28324	7.379507	0.2	0.05
1997	Present		8.567592	1.540896	1.2	0.7
1997	Present		5.724495	1.33525	0.7	0.9
1997	Present		4.905699	0.371119	0.3	0.17
1997	Present		6.570391	1.377387	0.1	0.2
1997	Present		7.362795	1.664697	0.4	0
1997	Present		14.08141	2.498644	0.4	0
1997	Present		9.10066	2.88585	1.5	1.3
1997	Present		4.270788	0.552495	0.4	0.6
1997	Present		6.123417	1.10473	0.1	0

1997	Present	13.85636	3.553779	0.2	0
1997	Present	7.415876	2.405671	0.56	0.02
1997	Present	16.03955	5.602503	0.54	0.18
1997	Present	5.508222	1.25119	0.27	0.06
1997	Present	5.092928	0.792409	1	0
1997	Present	7.076745	0.944304	0.11	0.09
1997	Present	9.71737	1.619907	0.04	0.02
1997	Present	8.062474	1.776646	0.54	0.92
1997	Present	9.717871	2.9035	0.41	0.78
1997	Present	3.022394	0.409121	0.02	0.06
1997	Present	16.10495	3.911852	0.51	0.13
1997	Present	4.906536	0.516973	1.12	1.04
1997	Present	8.440946	2.709495	1.51	0.4
1997	Present	6.884984	1.228403	1.52	0.19
1997	Present	9.720352	2.961704	0.43	0.73
1997	Present	5.104126	1.139467	1.11	0.9
1997	Present	8.933471	2.750248	0.81	0.03
1997	Present	7.251568	1.429743	0.01	0.01
1997	Present	2.303278	0.150535	0	0
1997	Present	11.63102	4.556002	0	0
1997	Present	17.69274	7.232726	0	0
1997	Present	17.62335	5.596541	0	0
1997	Present	14.33169	1.140247	0	0
1997	Present	6.419773	1.098225	0.04	0
1997	Present	7.797251	1.294256	0.05	0
1997	Present	6.633993	1.102137		
1997	Present	5.354087	0.676625	0.07	0
1997	Present	6.315529	0.883508	0.04	0.04
1997	Present	4.934123	0.579809	0.01	0
1997	Present	4.599641	0.648439	0.06	0
1997	Present	5.143917	0.641755		0
1997	Present	9.975741	1.518839	0.04	0
1997	Present	4.524221	0.649712	0.02	0
1997	Present	8.406236	1.635458		
1997	Present	10.86078	1.697805	0.36	0
1997	Present	6.138451	1.068171	0.01	0.04
1997	Present	5.962261	1.060207	2.44	0
1997	Present	7.866881	1.251146	2.31	0
1997	Present	9.774664	2.372546	1.97	0.13
1997	Present	9.722082	2.505012	0.56	0
1997	Present	7.899553	1.361026	1.49	0.22
1997	Present	5.517411	0.921585	1.34	0
1997	Present	5.994188	1.051229	1.95	0.16
1997	Present	7.978699	2.30519	1.85	0.46
1997	Present	5.116483	0.862367	1.58	0.15
1997	Present	4.937375	0.91895	0.27	0.08
1997	Present	4.670006	0.74803	0.2	0.04
1997	Present	7.100799	1.035947	0.17	0
1997	Present	6.080725	0.831576	0.8	1.2
1997	Present	17.13145	6.739047	0.7	0.3
1997	Present	10.02523	1.918934	1.5	0.1
1997	Present	13.46485	4.37183	1.8	0.2
1997	Present	16.17563	5.855849	0.6	0
1997	Present	8.895052	1.411421	0.5	0.1

1997	Present	15.23334	7.92387	0.9	0
1997	Present	20.59089	15.40976	0.2	0
1997	Present	14.44909	7.523937	2	0
1997	Present	4.571152	0.718176	1.85	0.03
1997	Present	12.75006	3.508596	0.37	0
1997	Present	7.151577	1.418063	1.37	0.01
1997	Present	7.365901	1.452761	2.1	0.23
1997	Present	5.438659	0.863856	0.64	0.02
1997	Present	12.43144	4.805549	0.53	0.01
1997	Present	7.751907	0.920274	0.55	0.36
1997	Present	6.593999	1.675311	1.31	0
1997	Present	7.679302	0.988708	0.96	0.12
1997	Present	7.313555	1.690064	2.38	0.81
1997	Present	5.424164	0.930074	0.07	0.01
1997	Present	8.65578	2.074465	2.75	0.01
1997	Present	7.415494	1.096761	0.22	0
1997	Present	5.02742	0.86292	0.82	0.04
1997	Present	5.798033	1.026285	0.2	0
1997	Present	6.388745	1.063703	0.66	0.21
1997	Present	5.64589	0.985843	1.07	0
1997	Present	12.68394	6.434989	0.01	0.007
1997	Present	10.81455	3.592595	0.01	0.006
1997	Present	11.13799	4.389306	0.002	0.1
1997	Present	3.780022	0.263985	0.06	0.04
1997	Present	10.00324	3.481462	0.01	0.01
1997	Present	13.61001	3.5523		
1997	Present	10.31296	2.655805	0.04	0.002
1997	Present	7.868762	1.869755	0.009	0.01
1997	Present	7.621723	0.691718	0.02	0.01
1997	Present	5.276433	0.768943	0.05	0.06
1997	Present	6.770322	1.307367	0.06	0.02
1997	Present	5.085876	0.428533	0.016	0.08
1997	Present	2.614904	0.226522	0.01	0.01
1997	Present	4.327498	0.297358	0.03	0.02
1997	Present	10.659	2.034726	0.03	0.03
1997	Present	4.851678	0.802448	0.04	0.01
1997	Present	3.978614	0.186275	0.09	0.16
1997	Present	1.088178	0.036293	0.14	0.11
1997	Present	9.217147	4.642572	0.004	0.1
1997	Present	4.389057	0.317324	0.08	0.11
1997	Present	5.703187	0.861329	0.04	0.04
1997	Present	2.873273	0.236017	0.09	0.16
1997	Present	12.94239	3.234121	1.77	0.57
1997	Present	4.844986	0.688179	0.77	1.6
1997	Present	5.852836	0.935732	0.69	0.5
1997	Present	8.499153	2.632812	2.32	0.2
1997	Present	5.785436	0.996539	1.17	0.1
1997	Present	6.117183	1.237273	0.52	0.2
1997	Present	10.75818	2.464885	1.71	0.1
1997	Present	7.12177	1.591816	1.1	0.2
1997	Present	5.647886	1.048054	0.56	0
1997	Present	7.198807	1.106645	1.09	0.09
1997	Present	7.123026	2.364776		
1997	Present	8.384684	1.046395	0.57	0.17

1997	Present	5.282689	0.531305	0.2	0.3
1997	Present	6.701126	0.950782	0.3	0.4
1997	Present	5.578139	0.994661		
1997	Present	6.310743	0.69179	0.3	0.7
1997	Present	13.60575	5.649432	0.1	0.2
1997	Present	10.66304	3.530069	0	0.3
1997	Present	8.154608	1.297234	0.1	0.2
1997	Present	6.619694	1.311069	0	0.1
1997	Present	1.607907	0.10574		
1997	Present	4.37546	0.317662	0.1	0.2
1997	Present	1.396517	0.077185		
1997	Present	3.853536	0.348308	0.2	0.1