Setting warning values for communicable diseases in Bosnia & Herzegovina

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Summary

This report tackles the issue of establishing unusual values that can be used as a warning sign of impending potential epidemics. This report presents a method to establish warning values based on the reporting period 2008-11 for Bosnia and Herzegovina (BiH). The notifiable diseases were divided into three groups characterized by no warning needed, one case being enough for alarm and diseases requiring warning values based on past trends.

For this last group the warning values were based on the percentile distribution of the weekly reporting for key communicable diseases and by geographic area. It was envisaged that weekly numbers of notifications >=95th percentile identified epidemic weeks and values between 90th-94th percentiles identified warnings if such values had been present during the two weeks preceding the epidemic period and if they had a specificity of 95% or more.

The warning values can be used both to improve the quality of data and to set the alarm. Such values could be the result of vagaries of reporting and the first step would be to check if data would require verification, which will be useful to monitor data quality. If the data are correct, the next step would be to keep a watchful eye in case the reporting continues to exceed the warning value in the second consecutive week and verify the reasons.

It has also to be considered that warning values have been estimated on the basis of past reporting and they need to be re-evaluated. As the reporting is expected to improve, the number of cases is likely to increase and thus the old percentile distributions might become obsolete, requiring their recalculation. The advantage of the method used in this analysis is its simplicity and the possibility for the PHI to update the warning values in the future as the notification system is likely to improve.

Introduction

The main objective of the surveillance of communicable diseases is to detect and control epidemics. These are defined as "The occurrence in a community or region of cases of an illness, specific health-related behavior, or other health-related events clearly in excess of normal expectancy. The community or region and the period in which the cases occur must be specified precisely."[1] The definition of "clearly in excess" needs to be quantified on the basis of past records for defined geographic areas, and according to methodological criteria.

Establishing a threshold to define epidemics is not straightforward even for the most advanced surveillance systems. There are thresholds that are defined somewhat arbitrarily for administrative and legislative reasons. In the UK the definition of influenza epidemic is based on the rate of consultations for flu-like symptoms in a sample of reporting by general practitioners exceeds 400 per 100,000 population in one week[2] . In the United States, an epidemic of influenza is declared if the proportion of deaths due to pneumonia and influenza recorded in 121 sentinel cities exceeds 1.6

[1] Porta M. A Dictionary of Epidemiology. Oxford University Press. 2008.

[2] Fleming DM. Weekly returns service of the Royal College of General Practitioners. Commun Dis Public Health 1999;2:96±100.

standard deviations above the seasonal baseline[3]. In countries where meningococcal meningitis is endemic, 15 cases per 100,000 per week is used as the epidemic threshold[4].

In Bosnia and Herzegovina (BiH) there are no threshold values to define epidemics and the objective of this report is to show a simple method to establish warning values to improve the detection of epidemics. The analysis was based on all the individual notifications that were reported in BiH between 2008-11.

Method

One of the simpler method used in the literature[5] [6] to define unexpected values in the number of notifications is the percentile distribution of weekly reporting. Very high percentiles (e.g. >=95th percentile) are considered to significantly exceed expected values and thus are in line with the definition of epidemics. Therefore, for each disease and geographic area, the percentile distribution of the weekly reporting between 2008-11 provided the epidemic and warning values according to the definition in Box 1.

Box 1 Definitions adapted from Hashimoto S et al[6]

Pre-epidemic period = the two weeks preceding the epidemic period;
Epidemic period = number of notifications per week >=95th percentile;
End of Epidemic period = number of notification <90th percentile for 2 consecutive weeks after the epidemic period;
Warning values = number of notifications per week between 90th-94th percentile within the pre-epidemic period and with a specificity of 95% or higher;
Specificity = % weeks without warning in non epidemic periods;
Sensitivity = % epidemics with true positive warnings in pre-epidemic periods;
Positive Predictive Value= % true positive warnings among all warnings.

The above mentioned definitions take into account the problems related to the poor quality of the data. Because of data quality, it is not very frequent to have the classic bell shape epidemic curve in which the numbers rise gradually, reach a peak and gradually decline. Because of high variation in reporting compliance, the number of weekly notifications might exceed the 95th percentile, drop down the following week and rise again afterwards. To take this problem into account the length of the epidemic period begins with the first week when the number of notifications are >=95th percentile and continues up to when the numbers drop for two consecutive weeks under the 90th percentile.

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[3] Brammer TL, Izurieta HS, Fukuda K, Schmeltz LM, Regnery HL, Hall HE, Cox NJ. Surveillance for influenza ± United States, 1994-95, 1995-96, and 1996-7 seasons. Morb Mortal Wkly Rep CDC Surveill Summ 2000;49:13±28.

[4] Moore PS, Plikaytis BD, Bolan GA, Oxtoby MJ, Yada A, Zoubga A, Reingold AL, Broome CV. Detection of meningitis epidemics in Africa: a population-based analysis. Int J Epidemiol 1992;21:155±62.

[5] Hailay Desta Teklehaimanot HD, Schwartz J, Teklehaimanot A and Lipsitch M. Alert Threshold Algorithms and Malaria Epidemic Detection. Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 10, No. 7, 1220-1226, 2004.
Hashimoto S

[6] Hashimoto S, Murakami Y, Tuniguchi K, Nagai M. Detection of Epidemics in their early stage through infectious disease surveillance. International J Epidemiology. 2000:29:905-10

Using the above mentioned criteria, key diseases in category 3 of Table 1 were included in the analysis and frequency distribution were run on individual records for cantons of the Federation, regions of the RS and Brcko District. The decision if the 90-94th percentile could be acceptable as the warning value was based on the specificity >=95%. The goodness of the association between the acceptable warning values and the epidemics was evaluated in terms of sensitivity and positive predictive values.

Results

The diseases were divided into four groups listed in Table 1. The first group was composed of diseases not requiring a warning value (e.g. varicella) because they are usually of mild nature and no vaccination or other interventions are in place in BiH in case of substantial increase in reporting. The second group of diseases was composed of potential public health threats (e.g. poliomyelitis) for which one case would be enough to set the alarm. The third group included diseases (e.g. salmonella) for which a warning value is needed to decide if reporting substantially exceeds the expected values and sufficient cases were reported to estimate percentile distribution on which the method was based.

Table 1 Diseases and warning values

Group	Rationale for Warning Value	Not Required	Comments
I	No Need for warning values	Varicella, Zoster, Pharyngitis	No specific intervention is envisaged.
II	One Case per week	Smallpox, Avian Influenza and SARS, Human Influenza caused by a new subtype, Acute Flaccid Paralysis or confirmed Poliomyelitis, Cholera, Meningitis, Bubonic Plague, Anthrax, Typhoid, Yellow Fever, Viral Hemorrhagic Fevers (Ebola, Lassa, Marburg), West Nile fever	Because they are by definition unusual or unexpected and may cause serious public health impact.
		Botulism	One case is enough because the source needs to be identified immediately.
		Pulmonary TB	Once case is enough to start investigating index and contacts because of potential spread to other people.
		Rabies	One case is enough because of the urgency of isolating the source.
		Postvaccinal complication	Rarity of events and need to identify vaccine batches.
III	Warning and epidemic values are needed.	Diseases for which interventions are envisaged and for which it is possible to detect warning and epidemic values according to the methodology.	Sufficient data are required to build a percentile distribution by geographic area.

For the diseases in the third group, weekly numbers of notifications were estimated for the cantons and regions for which individual records were available. These included all the regions of RS, BD and the cantons of the Federation with the exception of canton 10, Bosnian Podrinje, Central Bosnia and Zeniza-Doboj cantons, for which only aggregated records for 48 weeks per year were available. The reason for excluding these cantons lies on the fact that in the future the data will be presented in 52 weeks per year and thus the warning values based on the 48 weeks per year would not be applicable. This is also the reason why influenza for the Federation was not considered as it was in 48 week period. Influenza was also not considered for the RS because there were only two years worth of data and they were not available for the regional level.

The data are presented for salmonella, other gastrointestinal infections, lyme borelliosis, measles, mumps, scarlet and brucella. For each disease, Table 2 presents the values related to the 90th and 95th percentiles, the sensitivity, specificity and positive predictive values. In this context, the warning values were >=90th percentile of the weekly distribution and having a specificity of >=95%. The epidemics were identified as weekly reporting >=95th percentile weekly distribution, that is consistent with the definition of epidemics as significantly higher than expected number of cases.

Salmonella

Box 1 summarizes the trends for Salmonella in the cantons taken into consideration. In Sarajevo canton, salmonella had a clear seasonal trend, with weekly numbers increasing in summer and decreasing in winter. There were several outliers that were preceded by a value of 8 cases per week, that corresponded to the 90th percentile and had a sensitivity of 98%, and thus it was an acceptable warning value. This value was associated with a sensitivity of 38%, meaning that more than one third of epidemic periods were preceded by this warning value. The positive predictive value was 43%, meaning that less than half of the warnings were followed by an epidemic.

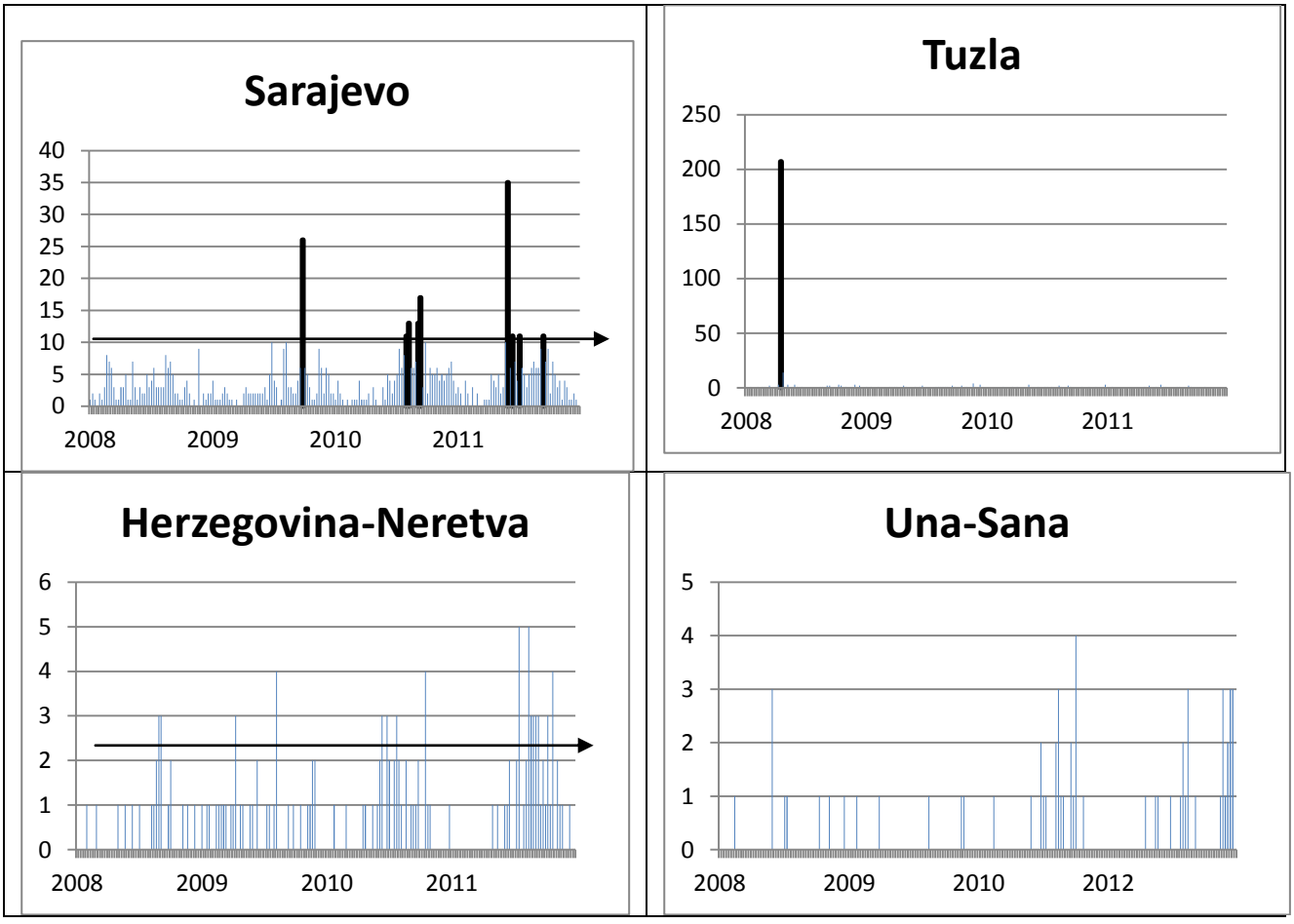
The other cantons with warning values were Herzegovina-Neretva and West-Herzegovina canton. In Herzegovina-Neretva canton, reports of >=3 weekly cases corresponded to >=95th percentile and thus the weeks with such values were considered epidemic periods. Two cases per week corresponded to the 90th percentile and were associated with a specificity >= 95% and thus they were an acceptable warning value, whose sensitivity and positive predictive value were 63% and 42% respectively. West-Herzegovina Canton had a warning value with low predictive power, Una-Sana Canton did not have a potential warning value (sensitivity <95%) and Posavina Canton had no cases.

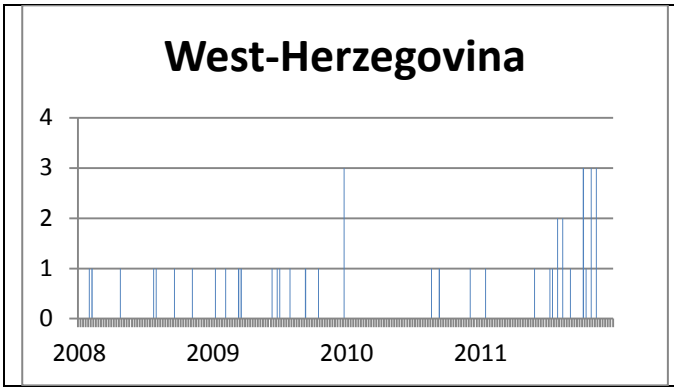
Table 2 Warning values for salmonella in the Federation

	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Value per week
Sarajevo Canton	8	10	98%	38%	43%	>=8 cases
Tuzla Canton	2	3	94%	0%	0%	NA*
Herzegovina-Neretva Canton	2	3	96%	63%	42%	>=2 cases
Una-Sana Canton	1	2	90%	33%	10%	NA*
West-Herzegovina Canton	1	2	89%	33%	4%	>=1 (but this threshold has low predictive value)
Posavina Canton	**					

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Box 1 Salmonella trends in the Cantons of the Federation of BiH





POSAVINA CANTON NO CASES

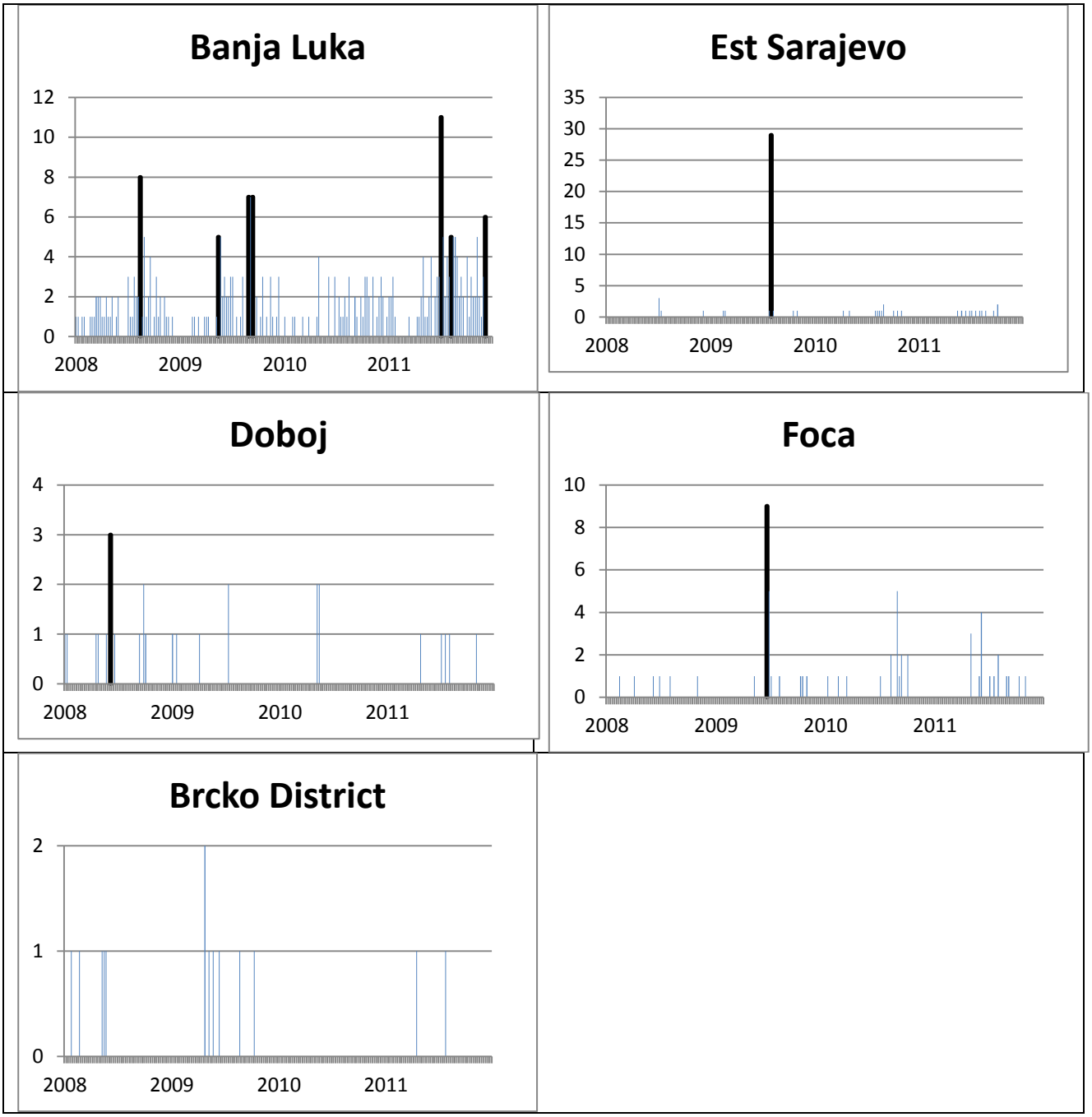
The RS experienced isolated weeks when salmonella cases were >=95th percentiles (epidemic periods) but no warnings preceded them. Box 2 shows that the epidemics of salmonella in the RS were mainly contributed by Banja Luka, Eastern Sarajevo Canton and Foca. Because these epidemic periods were not preceded by values >= 90th percentile weekly distribution, no warning value was present. The epidemic in Eastern Sarajevo canton was concentrated in one week and died out in the following week.

Table 3 Warning values for salmonella in RS

	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Value per week
Banja_Luka	4	5	97%	0%	0%	NA*
Est_Sarajevo	1	3	99%	0%	0%	NA*
Doboj	1	2	94%	50%	14%	NA*
Foca	1	5	90%	29%	9%	NA*
Trebinje	**					
Zvornik	**					

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Box 2 Salmonella trends in RS & BD



Other gastrointestinal infections

Besides salmonella and brucellosis, most infections affecting the gastrointestinal tract were coded as "other gastrointestinal diseases" and there were very few cases with specific diagnosis. Therefore it was decided to consider in this section all gastrointestinal infections that were not due to salmonella and brucellosis. Each canton had an increase of gastrointestinal infections in summer and a decline in winter with a few spikes >=95th percentile, that were not preceded by potential warning values except for Herzegovina-Neretva canton. The lack of warning in the other

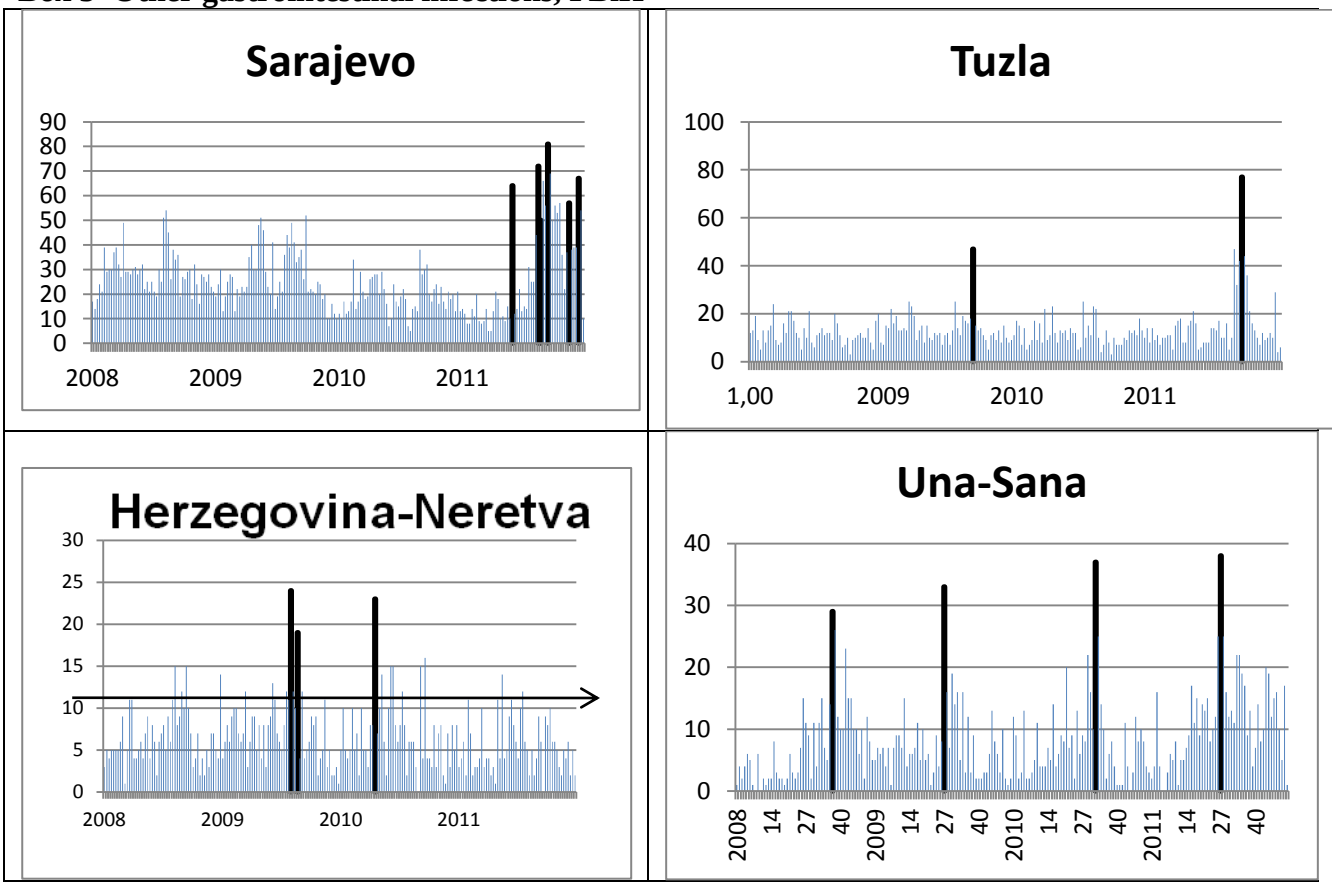
cantons was due to the fact that epidemics started abruptly and not as a gradual increase in notifications characterizing the normal bell shape curve of traditional epidemics.

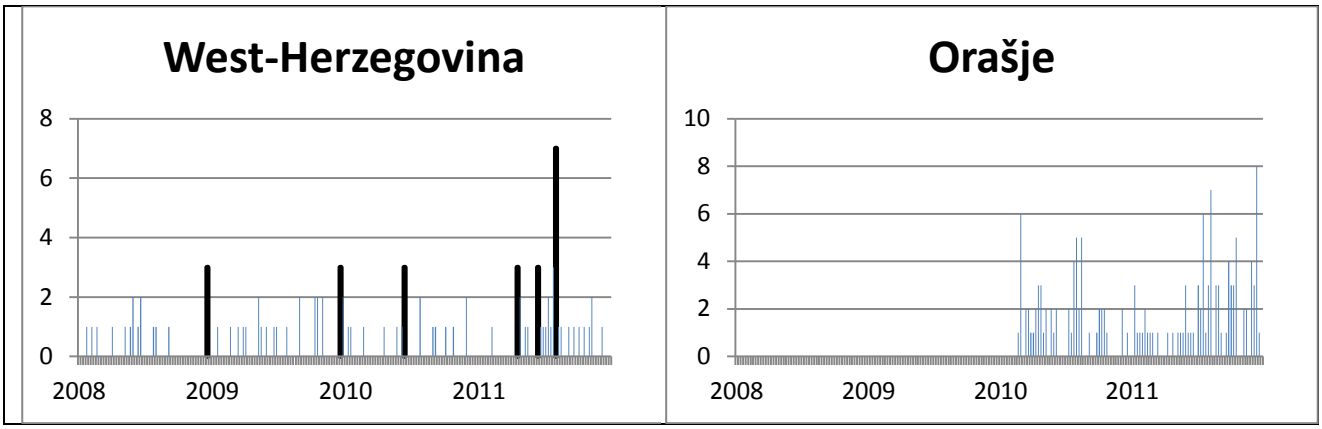
Table 4 Other gastrointestinal infections in the Federation

	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Values in weekly notifications
Sarajevo Canton	48	55	96%	0%	0%	NA*
Tuzla Canton	18	21	97%	0%	0%	NA*
Herzegovina-Neretva Canton	11	14	95%	44%	31%	>=11
Una-Sana Canton	16	22	96%	0%	0%	NA*
West-Herzegovina Canton	2	3	95%	17%	9%	>=2 (but this threshold has low predictive value)
Orašje	**					

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Box 3 Other gastrointestinal infections, FBiH





Also in the RS there were abrupt increases in reporting for all gastrointestinal infections in certain periods without much warning preceding them. Box 5 shows that Banja Luka, Doboji and Brcko District had several periods with epidemic values (>=95th percentile) which were not preceded by warning values (Table 5).

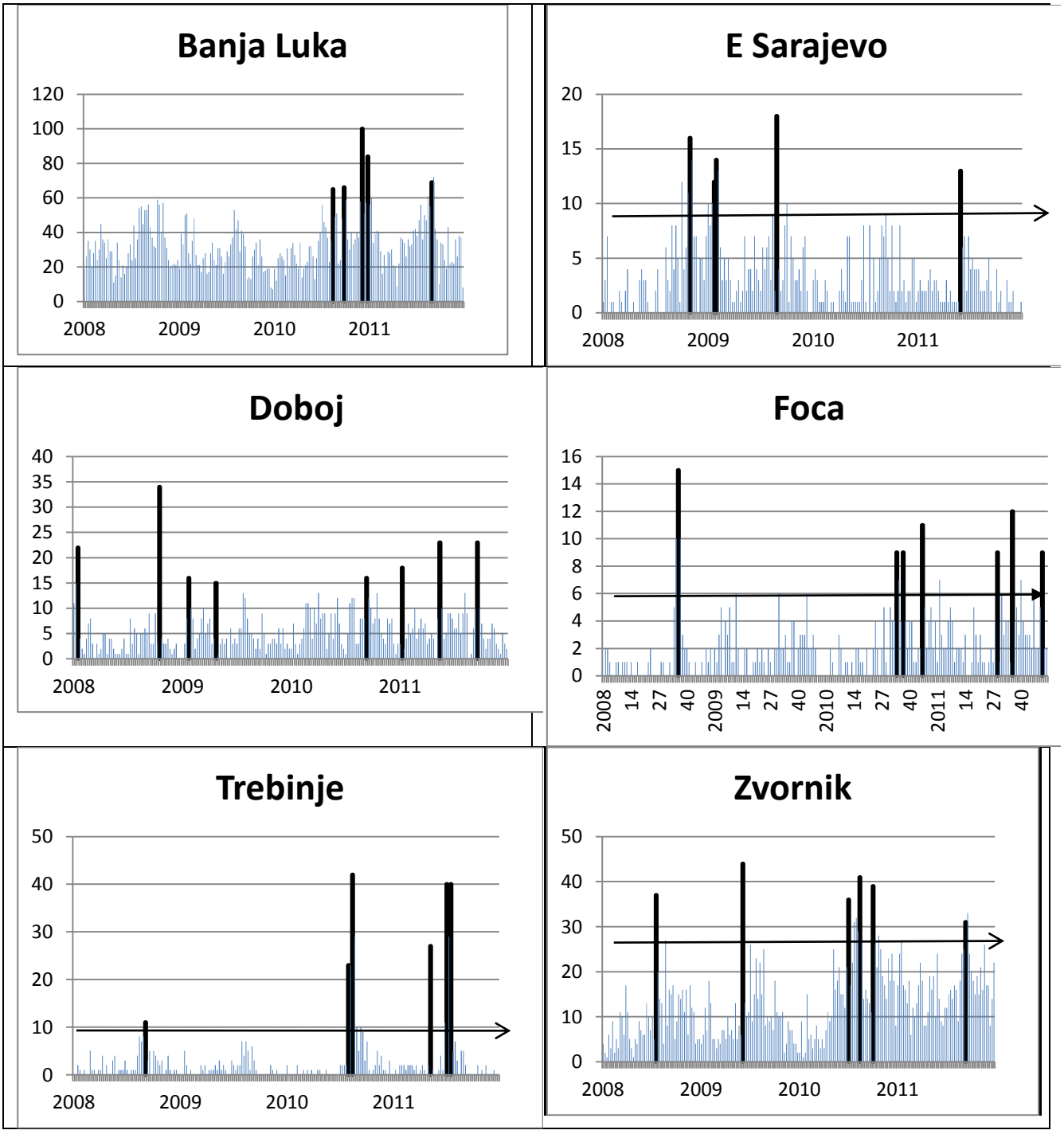
The other regions had acceptable warning values but with relatively low predictive power, meaning that for each positive alarm there were a few false alarms. Trebinje had four epidemic periods, one of which was preceded by a warning value of 7 cases per week (>=90th percentile), but this was associated with 3 false alarms and thus the predictive value was 1/4 or 25%. Similarly, Eastern Sarajevo canton had a warning value of 8 cases per week that was associated with 2 true and 8 false alarms and thus a predictive value of 2/10 or 20%. For Foca and Zvornik, the predictive power of their warning values was even lower.

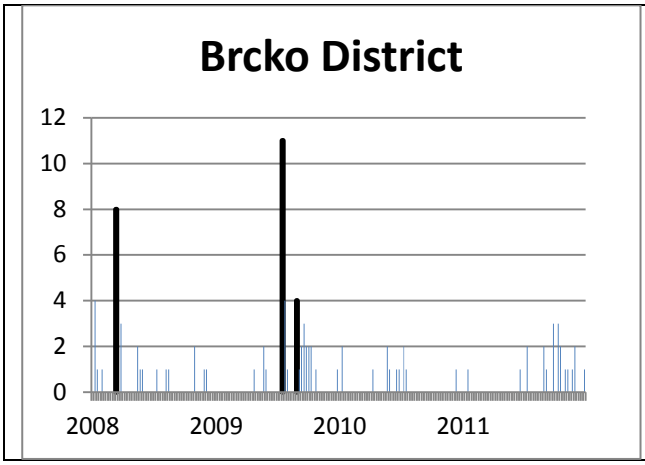
Table 5 All gastrointestinal infections in the RS

	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Values in weekly notifications
Banja Luka	54	59	97%	0%	0%	NA*
E Sarajevo Canton	8	10	96%	33%	20%	>=8
Doboj	11	13	97%	0%	0%	NA*
Foca	5	7	93%	33%	13%	>=5
Trebinje	7	11	98%	25%	25%	>=7
Zvornik	25	29	97%	17%	14%	>=25
Brcko District	2	3	95%	0%	0%	NA*

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Box 4 Other gastrointestinal infections, RS& BD





Lyme Borelliosis

Lyme Borelliosis was almost never reported in the Federation, while the RS had a clear seasonality. In the Federation there were very few cases of lyme borelliosis in 2008-11 versus 405 cases in the RS, suggesting that unless such difference is epidemiologically justified, the most likely reason is under-reporting in the Federation. In the RS these cases were mainly reported in Banja Luka and Doboji and followed a clear seasonality with increasing numbers in the summer months. There were no acceptable warning values.

Measles

Because measles is presently under control, even one case per week should be considered worth an investigation. There were 5 cases in February 2010 in BD and 9 cases in December 2010 in Tuzla canton that were preceded by 1 case in the previous two weeks. Most cases that were reported for the period 2008-11 were individual cases.

Mumps

The epidemic of mumps spread across the Federation at the beginning of 2011 and was followed by a second peak towards the end of 2011. As this epidemic was characterized by a gradual increase it was preceded in most cantons by warning values. The limitations of these warning values are due to the fact that there was no seasonality and they were based on a single epidemic.

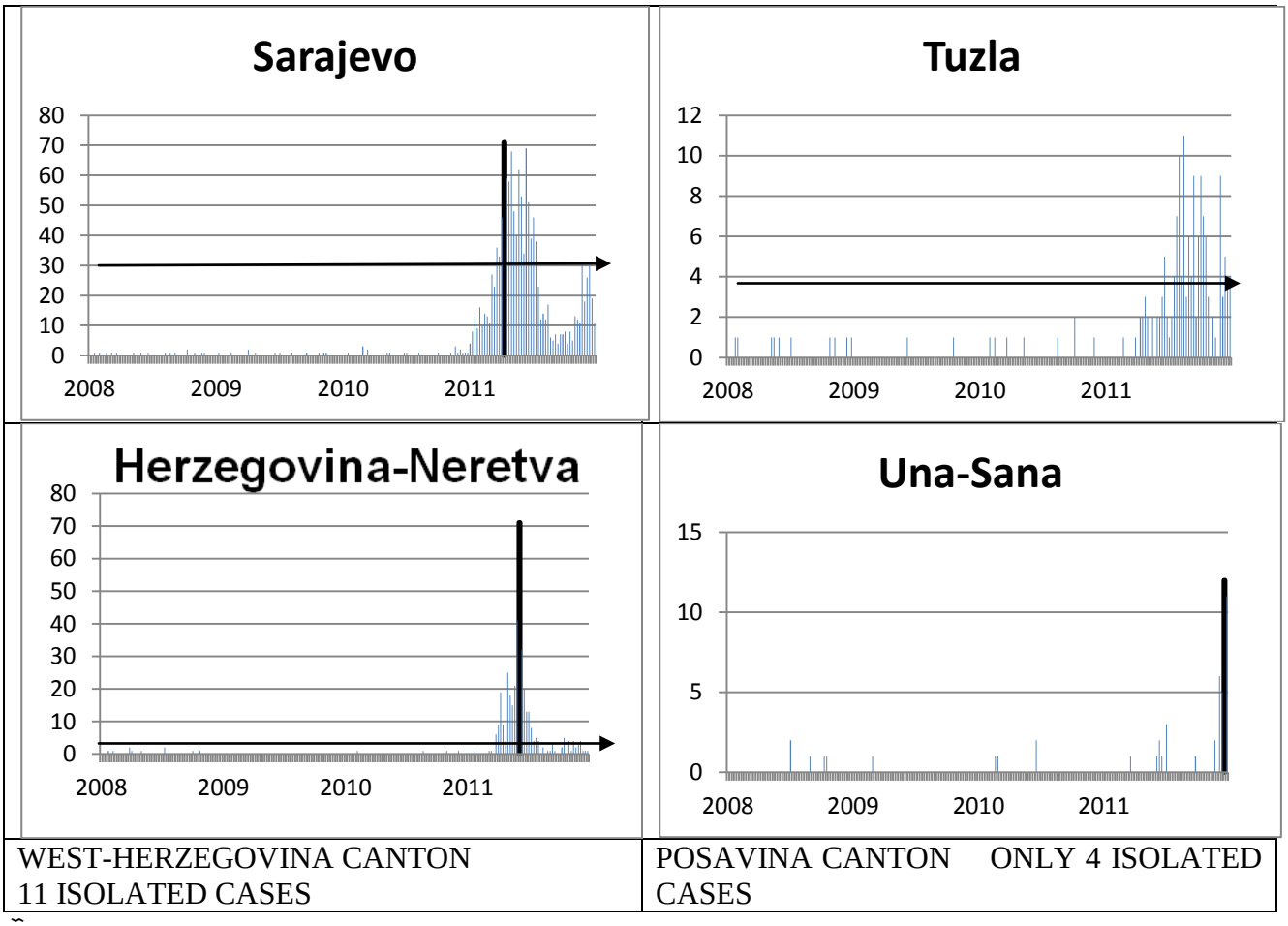
Table 6 Warning values for mumps in the Federation

	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Values in weekly notifications
Sarajevo Canton	>=26	46	98%	100%	20%	>=26
Herzegovina-Neretva Canton	>=4	13	98%	100%	20%	>=4
Una-Sana Canton	>=1	2	99%	100%	50%	>=1
Tuzla Canton	>=3	5.55	99%	100%	50%	>=3
West-Herzegovina						NA**

Canton						
Posavina Canton						NA**

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Box 5 Mumps trends, FBiH



WEST-HERZEGOVINA CANTON 11 ISOLATED CASES

POSAVINA CANTON ONLY 4 ISOLATED CASES

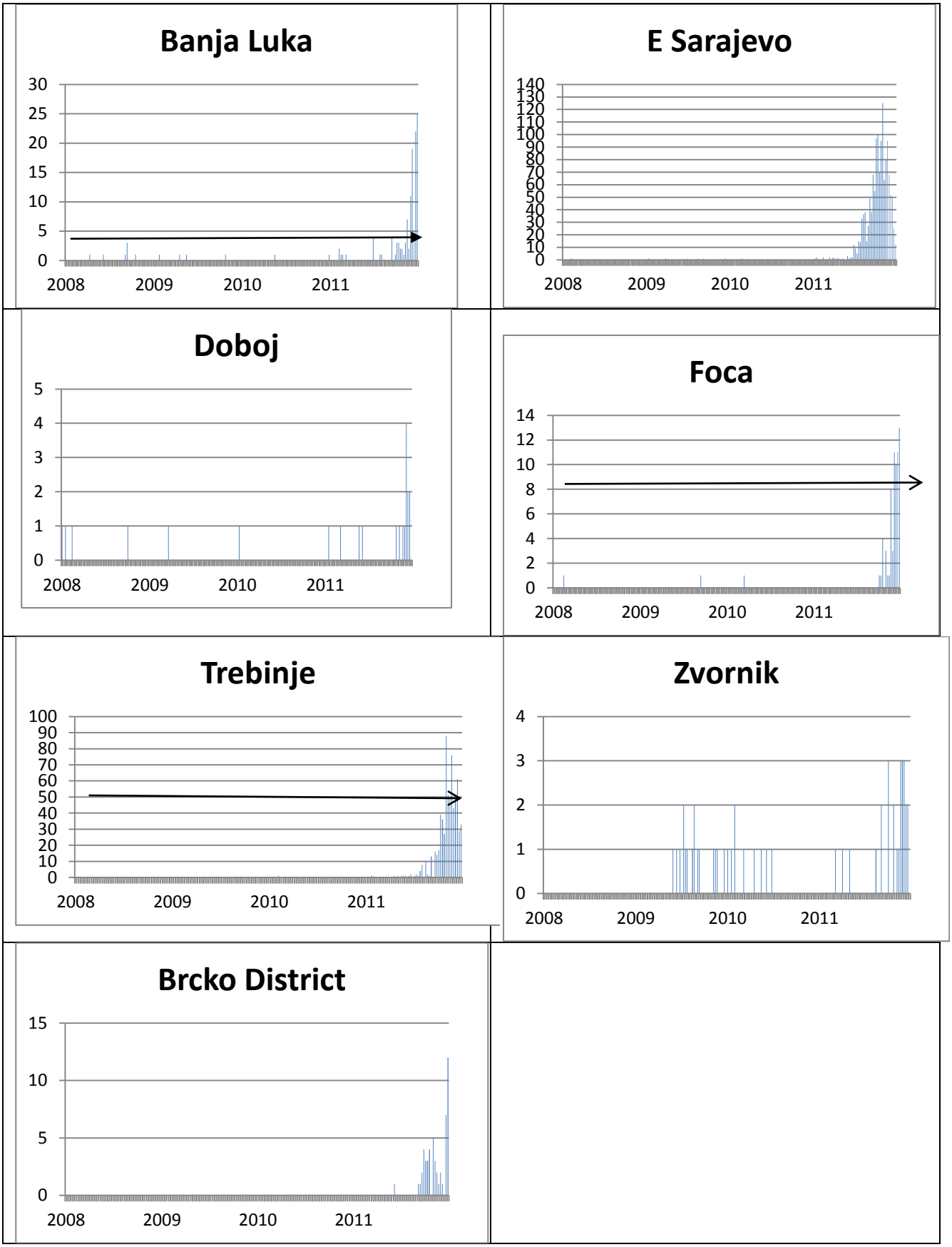
The epidemic of mumps moved from the Federation to the RS towards the end of 2011. Except for Doboji, Zvornik and Brcko, the rest of the regions and Brcko District had warning values preceding the epidemics.

Table 6 Warning values for mumps in the RS

	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Values in weekly notifications
Banja_Luka	1	2	98%	100%	17%	>=1
E_Sarajevo Canton	1	2	95%	100%	9%	>=1
Doboj	1	2	94%	100%	8%	>=1
Foca	1	2	97%	100%	13%	>=1
Trebinje	1	2	99%	100%	33%	>=1
Zvornik	1	2	91%	100%	5%	>=1
Brcko_District	6	14	100%	100%	50%	>=6

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

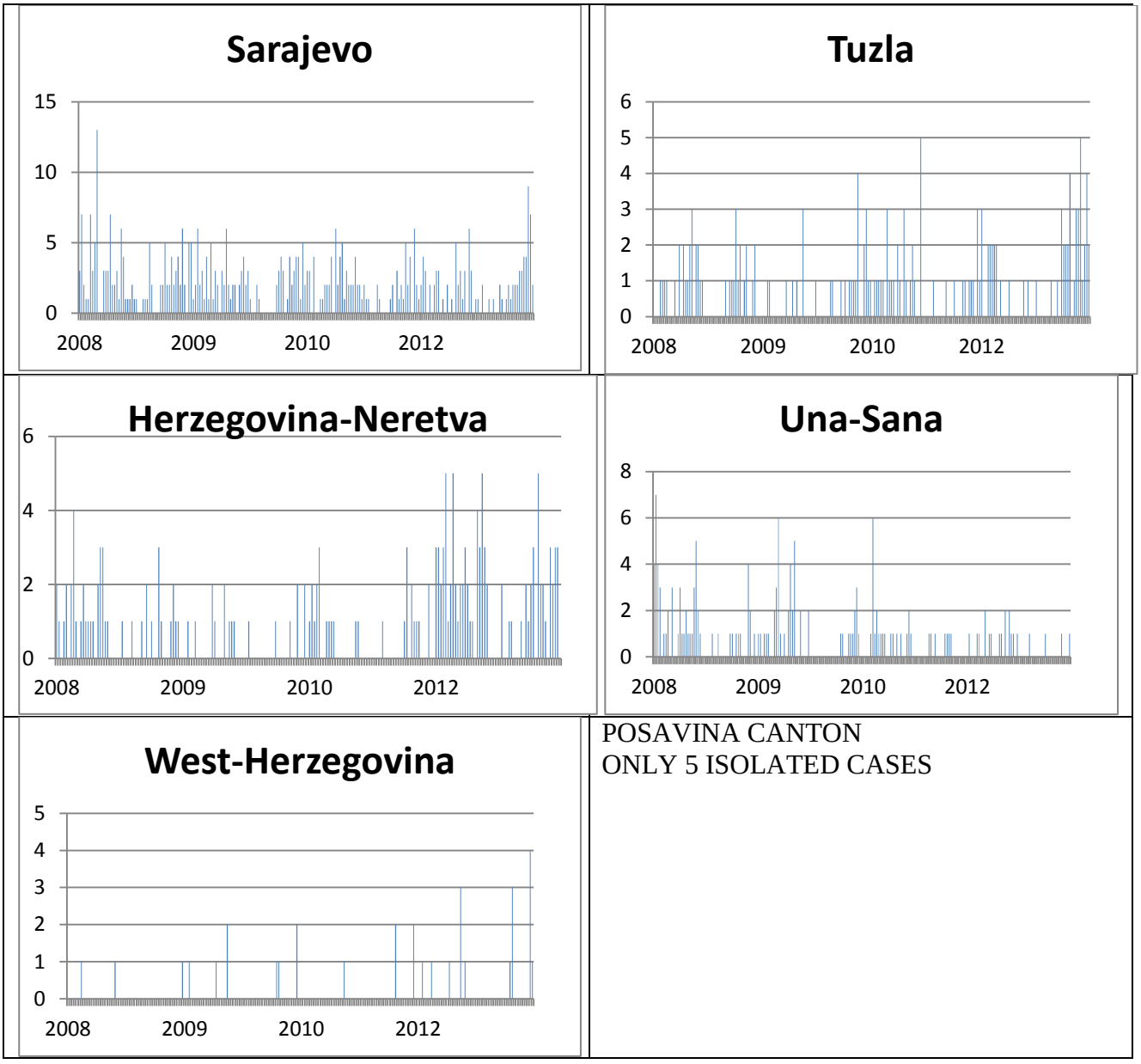
Box 6 **Mumps, RS**



Scarlet

In the Federation, scarlet had a seasonal pattern, increasing in winter and decreasing in summer. No warning values were identified and in the RS scarlet had no seasonal pattern.

Box 7 Scarlet trends, FBiH



Brucella

The whole Federation had a consistent decline in reported brucella in all the cantons. Only Sarajevo Canton had a potential warning value >=2 cases per week, with a sensitivity of 33% and positive predictive value of 25%.

A decline in brucella reporting was present in the RS too. Brucella was mainly contributed by Banja Luka while the other regions reported very few cases. The only potential warning value was

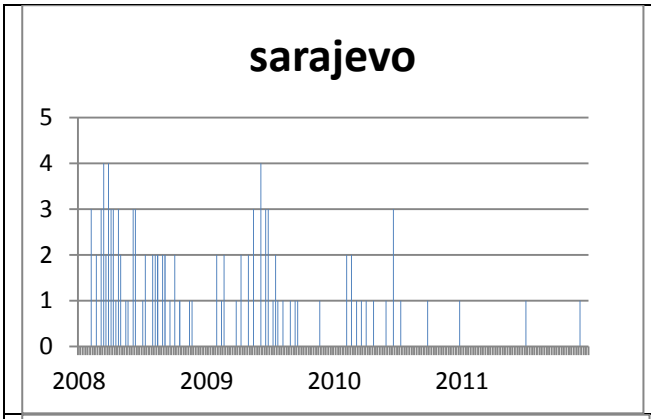
2 cases per week in Herzegovina-Neretva Canton which was associated with a sensitivity of 33% and a positive predictive value of 25%.

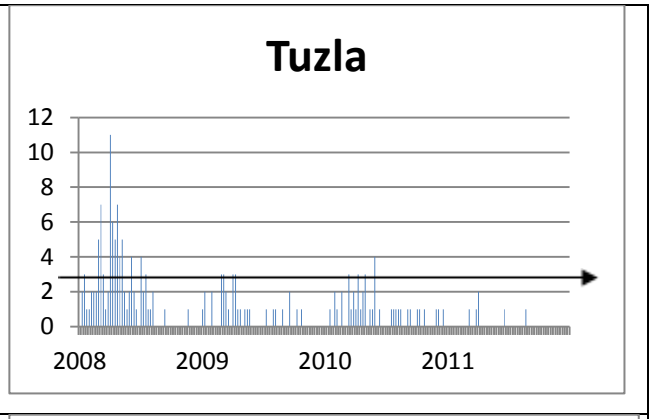
Table 7 Brucellosis, FBiH

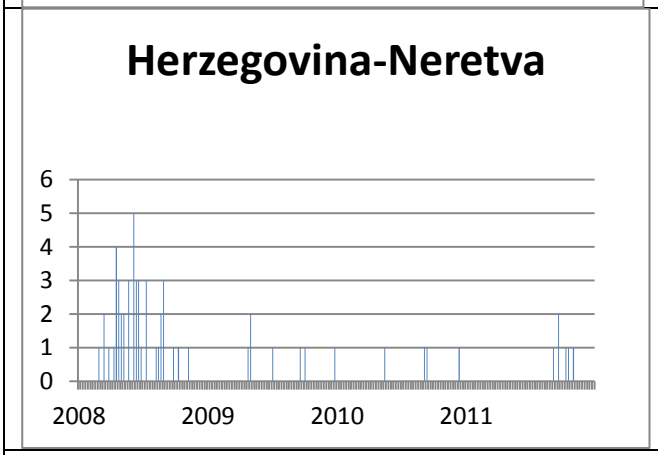
	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Values in weekly notifications
Sarajevo Canton	2	3	94%	20%	8%	NA*
Herzegovina-Neretva Canton	2	3	98%	33%	25%	>=2
Una-Sana Canton	4	6	100%	0%	0%	NA*
Tuzla Canton	3	4	100%	0%	0%	NA*
West-Herzegovina Canton						**
Posavina Canton						**

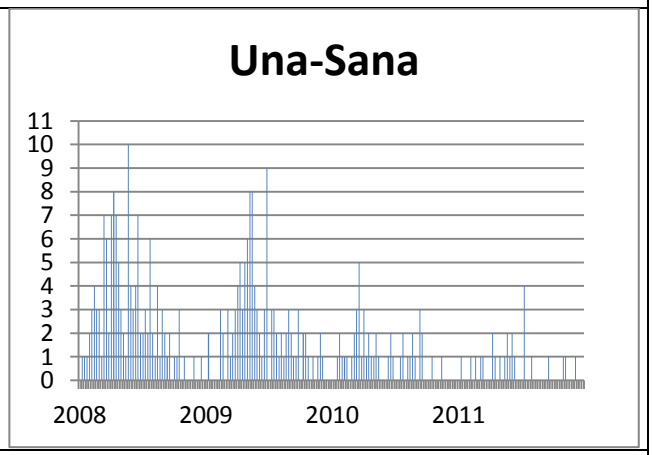
*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Box 8 Brucella trends, FBiH









WEST-HERZEGOVINA CANTON 2 CASES ONLY

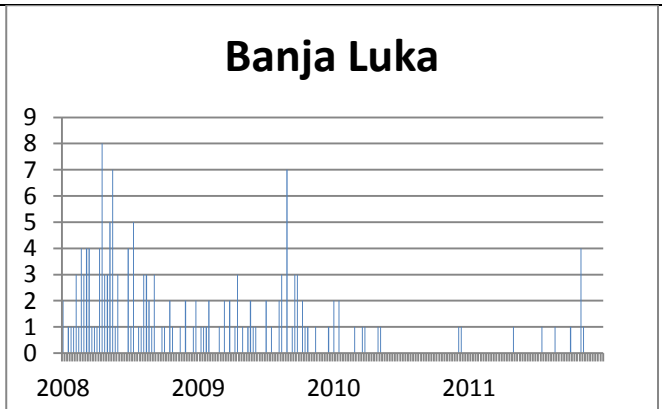
POSAVINA CANTON NO CASES

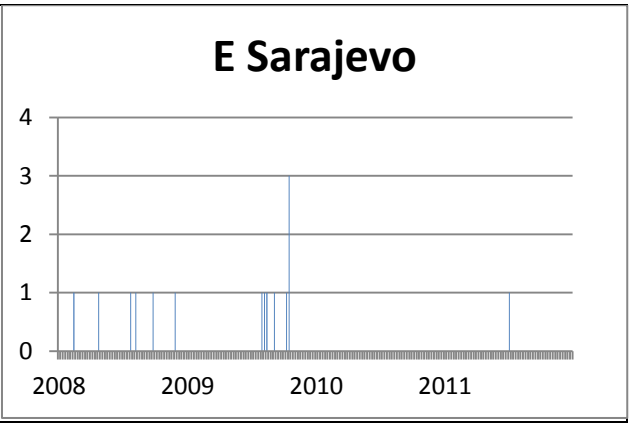
Table 8 Brucella, RS & BD

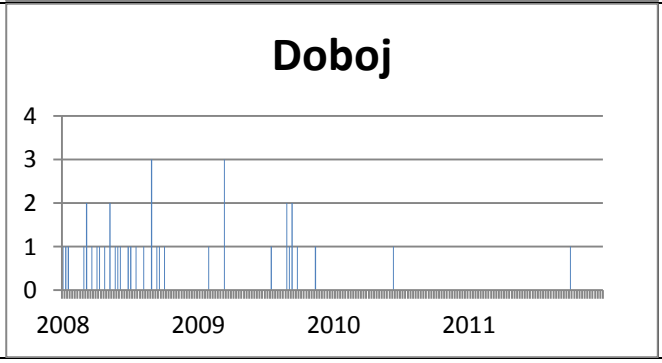
	90th percentile	95th percentile	Specificity	Sensitivity	Positive Predictive Value	Warning Values in weekly notifications
Banja Luka	3	4	94%	20%	8%	NA*
E Sarajevo Canton						**
Doboj	1	2	98%	33%	25%	NA*
Foca						**
Trebinje						**
Zvornik	2	3	100%	0%	0%	NA*
Brcko District						**

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Box 9 Brucella trends, RS

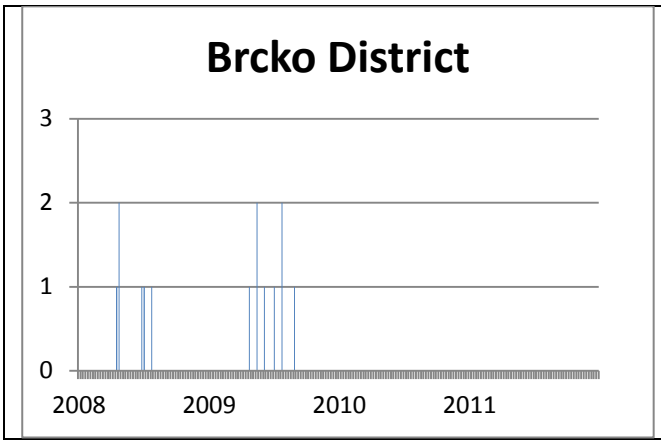






FOCA

ONLY 3 CASES



Other Diseases

Other diseases did not have acceptable warning values. This was due to lack of significant seasonal variation and or potential warning values not reaching a specificity of 95%. In the Annex, a separate Table provides the 95th percentiles for these diseases. In the absence of the early warning values associated with the 90-94th percentile, 95th percentile might be used as a late warning.

Discussion

The first state was to categorize the diseases into three groups in terms of rationale behind warning values. Besides the diseases not requiring any action and thus no warning values, the second group of diseases was characterized by the potential of producing serious public health threats and thus the decision of individual cases being sufficient to cause alarm. The remaining diseases requiring a threshold values was dealt separately in the analysis based on the reporting of the period 2008-11.

Percentile distributions of the number of cases reported per week were estimated for each key disease by entity, canton and region that had reported individual records. Each week was given a percentile value according to its number of cases and those weeks that had reported a number of notifications>=95th percentile were considered epidemic weeks, while the values >=90th percentile were potential early warning values to predict epidemics. These potential warning values became acceptable warning value if they were present in the 2 weeks before the epidemic period and if specificity was >= 95%.

The association of the warning values with the epidemic periods was evaluated. A high sensitivity meant that the warning values preceded a high proportion of the epidemics, a high specificity meant a low frequency of false alarms and a high predictive value meant a high proportion of alarms being true. For salmonella, Sarajevo, Herzegovina-Neretva and Una-Sana cantons, and Doboji and Foca had warning values with reasonable levels of sensitivity and predictive power. For all gastrointestinal infections Herzegovina-Neretva, West-Herzegovina and Posavina cantons, and Trebinje, Zvornik and Eastern Sarajevo had reasonable warning values. For lyme borelliosis there were no warning values and the Federation reported almost no cases. Parotitis was characterized by epidemics with a clear bell shape curve and thus it was easier to find warning values that preceded them.

The reason why for many geographic areas there were no acceptable warning values is due to several reasons. It was not always possible to find such values for all cantons and regions because they had to meet the criteria of 95% specificity to avoid too many false alarms. Another reason was the fact that some epidemics began abruptly and thus were not preceded by any gradual increase as in a classic bell shape curve. The poor quality of the data contributed as well to produce wide fluctuations that created irregular pattern that were not following classic epidemic curves and this did not allowed to have warning values.

For the cantons and regions that did not have warning values, it is still possible to trigger the alarm whenever the weekly notifications are >= 95th percentile. These values are usually quite high and thus they are probably not an early warning sign, but they can still provide a late warning of a potential epidemic. Again it should be stressed that even with values >=95th percentile there is a need to first exclude vagaries of reporting and even if these are excluded, the high values might not be always a sign that an epidemic is ongoing. It should be taken into account that the percentiles are based on past reporting and thus they are likely to be valid until the present state of under-reporting continues. If the notification system will improve the high values of the past might become the low values of tomorrow because of increased reporting (compared with the past) even in non epidemic periods. Nonetheless, for the time being, any reporting >= 95th percentile is bound to be unusually high and thus it should be used as an alarm bell for further verification.

Conclusions

This report provides the first building block for an alert system that is at the basis of any Early Warning System (EWS). The warning values are based on the past trends and can be used to test their predictive value in the new EWS. It should be taken into account that if the notification system improves there could be a spurious increase in reporting that might exceed present warning values even if there are no epidemics. This implies that warning values will have to be revised in line with the development of the notification system.

ANNEX I WARNING VALUES IN CASES PER FOR KEY DISEASES IN FBIH

Table 1 90th percentiles as potential warning values and 95th percentiles as unusually high values

	Sarajevo Canton	Tuzla Canton	Herzegovina-Neretva Canton	Una-Sana Canton	West-Herzegovina Canton	Posavina Canton
SALMONELLA						
Warning values	>=8	NA*	>=2	NA*	>=1	**
Unusually high value (>=95th percentile)	>=10	>=3	>=3	>=2	>=2	NA*
OTHER GASTROINTEST						
Warning values	NA*	NA*	>=11	NA*	>=2	**
Unusually high value (>=95th percentile)	>=55	>=21	>=14	>=22	>=3	NA*
MUMPS						
Warning values	>=26	>=3	>=4	>=1	NA*	NA*
Unusually high value (>=95th percentile)	>=46	>=6	>=13	>=2	NA*	NA*
BRUCELLOSIS						
Warning values	NA*	NA*	>=2	NA*	**	**
Unusually high value (>=95th percentile)	>=3	>=4	>=3	>=6	NA	NA

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Table 2 Other diseases with no warning values and for which 95th percentiles could be used as unusually high values

	Sarajevo Canton	Herzegovina-Neretva Canton	Una-Sana Canton	Tuzla Canton	Posavina Canton
scarlet	6	2	4	3	NA*
STD	3	2	2	3	2
Helminthiasis	4	3	2	7	NA*
Scabies	7	9	3	7	1

*Not preceding the epidemic and or <95% specificity ** no or too few cases

ANNEX II WARNING VALUES IN NUMBER OF CASES PER WEEK FOR KEY DISEASES RS

Table 1 90th percentiles as potential warning values and 95th percentiles as unusually high values

	Banja Luka	East Sarajevo Canton	Doboj	Foca	Trebinje	Zvornik	Brcko
SALMONELLA							
Warning values	NA*	NA*	NA*	NA*	**	**	NA*
Unusually high value (>=95th percentile)	>=5	>=3	>=2	>=5	NA*	NA*	NA*
OTHER GASTROINT.							
Warning values	NA	>=8	NA	>=5	>=7	>=25	NA*
Unusually high value (>=95th percentile)	>=59	>=10	>=13	>=7	>=11	>=29	>=3
MUMPS							
Warning values	1	1	1	1	1	1	6
Unusually high value (>=95th percentile)	2	2	2	2	2	2	14
BRUCELLA							
Warning values	NA	**	NA	**	**	NA	**
Unusually high value (>=95th percentile)	>=4	>=1	>=2	>=2	>=1	>=3	>=2

*Not preceding the epidemic and or <95% specificity ** zero or too few cases

Table 2 Other diseases with no warning values and for which 95th percentiles could be used as unusually high values

	Banja_Luka	Doboj	Foca	Trebinje	Zvornik	E_Sarajevo Canton	Brcko_District
scarlet	4	2	3	1	2	2	2
STD	7	2	3	6	1	1	5
Helminthiasis	4	9	11	1	2	5	3
Scabies	5	2	2	2	2	3	2