

Factors influencing risk of poliovirus reemergence in Poland

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Abstract

BACKGROUND

The European Region achieved polio-free status in 2002. For the purposes of poliomyelitis eradication it is critical to prevent reintroduction of wild strains and spread of vaccine-derived virulent strains in polio-free countries. Thus high coverage levels of polio immunization and reliable acute flaccid paralysis (AFP) surveillance systems should be maintained. Polio surveillance systems are considered to have sufficient sensitivity if more than one case of AFP is detected annually per 100,000 children under 15 years of age. In this study we assessed the quality of AFP surveillance in Poland.

METHODS

All poliomyelitis cases reported to Poland's National Institute of Hygiene in 1998-2002 were included in the study. The surveillance quality was assessed using World Health Organization indicators and a timeliness analysis of reporting and sample collection.

RESULTS

320 AFP cases in children under 15 years were reported over the five-year period. Annual incidence per 100,000 varied from 0.57 in 2000 to 1.05 in 2001 and 1.06 in 2002. Mean annual incidence in voivodeships ranged from 0.42 in Zachodnio-pomorskie to 1.45 in Swietokrzyskie. The percentage of cases with timely stool collection increased from 39% in 1998 to 82% in 2002 and the percentage of cases reported within two days of hospitalization increased from 14% in 1998 to 48% in 2002. The median number of days from hospitalization to reporting decreased from four in 1998-2000 to three in 2001-2002 ($p < 0.0001$) and the median number of days from onset to first stool sample collection decreased from seven in 1998-2000 to five in 2000-2002 ($p < 0.0001$). Of 1,350 stool samples from AFP cases and their contacts investigated, 76 strains of poliovirus were isolated, all Sabin-like.

CONCLUSIONS

The surveillance indicators improved during the study period. The quality of surveillance, however, is uneven on the sub-national level. Thus, there may be differential delays in the reporting of imported polio cases. This project was supported in part by grant number D43TW00915 from the Fogarty International Center, National Institutes of Health.

Background

- Polio Eradication Program started in 1989. It involves all countries.
- American Region was declared polio-free in 1996, Western-Pacific Region in 2000, European Region in 2002.
- To date the Program was a tremendous success. During 15 years number of cases of poliomyelitis decreased from 350,000 in 1988 to 2,918 in 2002.
- There is a need to continue surveillance of new acute flaccid paralysis (AFP) cases and their reliable testing for polio in a timely manner to avoid reintroduction of the virus imported from still endemic regions.
- The aim of this study was to assess the quality of surveillance indicators developed by World Health Organization and detect potential problems with timeliness and completeness of virological examination and reporting. A special focus was given to regional differences in surveillance

Results

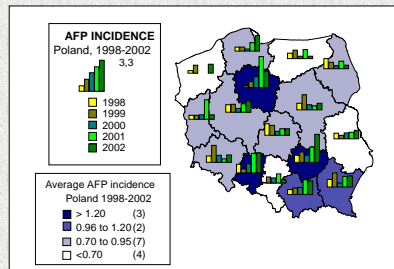
Table 1. WHO surveillance indicators in Poland, in 1998 – 2002.

Indicators and their satisfactory levels	Results for Poland				
	1998	1999	2000	2001	2002
Detection and Investigation					
AFP107 Annualized rate of non-polio AFP in children under 15 years of age (≥ 1.0)	0.64	0.97	0.57	1.05	1.06
AFP112 : % of total AFP with 2 fecal specimens within 14d, >1 day apart ($\geq 80\%$)	39%	49%	64%	87%	82%
AFP120 : % of total AFP with 1 fecal specimen within 14d ($\geq 80\%$)	61%	69%	81%	92%	85%
AFP125 : Modified AFP surveillance index (≥ 0.7)*	0.25	0.48	0.36	0.91	0.86
AFP202 : Percentage of provisional AFP reported <7 days of onset ($\geq 90\%$)	86%	85%	93%	91%	92%
Follow-up and Classification					
AFP204 : Percentage of provisional AFP investigated <48h after report ($\geq 80\%$)	14%	20%	50%	36%	48%
AFP405 : Percentage of provisional AFP with clinical diagnosis reported ($\geq 90\%$)	100%	100%	100%	99%	100%

* Proportion of children under 15 living in areas, where the acute flaccid paralysis surveillance is satisfactory. AFP125 = AFP107 * AFP120.

Results: comparison of AFP incidence

Figure 1 AFP incidence in Poland in 1998 – 2002, by voivodeship.



Methods

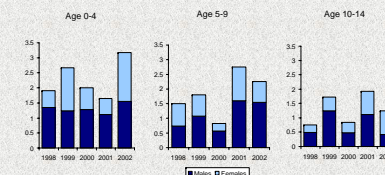
AFP surveillance in Poland started in 1990. It involves the following steps:

- Reporting of all AFP cases (without facial nerve palsy) in children under 15.
- Hospitalization of cases in designated neurological wards
- First report of case sent by epidemiologist from regional health department (Voivodeship Sanitary-Epidemiological Station) to National Institute of Hygiene.
- Two stool samples are collected from each case within 14 days after hospitalization, at least 1 day apart and sent to National Poliovirus Laboratory
- A final clinical and epidemiological examination reported within 60-90 days after onset

Statistical analysis

- For comparisons of continuous variables the Wilcoxon rank-sum test was used
- For comparison of categorical variables – chi-square and Fisher tests were used
- A multi-factor AFP incidence modeling was performed using Poisson model.

Figure 2 AFP incidence in Poland in 1998 – 2002, by gender and age groups.

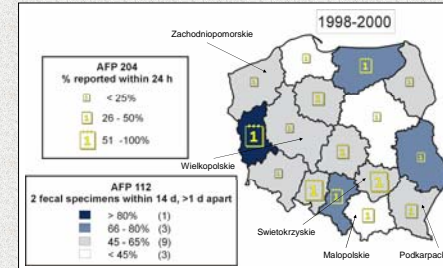


Multivariate comparison of age and gender groups:

Risk for males vs females: RR = 1.42 (95% CI 1.13 - 1.78, $p=0.0022$)
Risk for age 0-4 vs age 10-14: RR=1.77 (95% CI 1.35 - 2.33, $p<0.0001$)

Results: comparison of timeliness of reporting 1998-2000 and 2001-2002

Figure 3 WHO surveillance indicators AFP 204 and AFP 112 (in percentages) by voivodeship. Poland, 1998-2000



AFP 204:

Comparing the proportions of cases reported within 48 hours at the voivodeship level showed significant improvement in :

- Malopolskie – from 31% to 89% ($p<0.001$)
- Podkarpackie – from 47% to 90% ($p=0.04$)
- Wielkopolskie – from 60% to 100% ($p=0.017$)

AFP 112:

Comparing the proportions of cases with 2 fecal specimens collected within 14 days at the voivodeship level showed significant improvement for Zachodniopomorskie, where it increased from 0 to 100% ($p=0.02$).

At the country level, after controlling for regional case distribution in the periods 1998-2000 and 2001-2002, AFP 112 indicator increased significantly ($p<0.0001$; Mantel-Haenszel test).

Additional timeliness analysis:

Median number of days between hospitalization and report date decreased at country level from 6 to 3 days ($p<0.0001$). In voivodeships:

- Wielkopolskie – it decreased from 6 to 3.5 days ($p=0.02$)
- Zachodniopomorskie – it decreased from 5 to 1 day ($p=0.03$)

In 4 voivodeships the number of days increased (not significant).

Median number of days between AFP onset and report date

decreased at country level from 8 to 5 days ($p<0.0001$). In voivodeships:

- Malopolskie – it decreased from 10 to 4 days ($p=0.05$)
- Swietokrzyskie – it decreased from 12.5 to 3 days ($p=0.02$)
- Wielkopolskie – it decreased from 9.5 to 3.5 days ($p=0.01$)

In 3 voivodeships the number of days increased (not significant).

Median number of days between AFP onset and first stool sample collection decreased at country level from 8 to 5 days ($p<0.0001$). In:

- Swietokrzyskie – it decreased from 9.5 to 2 days ($p=0.02$)
- Wielkopolskie – it decreased from 8 to 4 days ($p=0.001$)

In 1 voivodeship the number of days increased (not significant).

Figure 4 WHO surveillance indicators AFP 204 and AFP 112 (in percentages) by voivodeship. Poland, 2001-2002

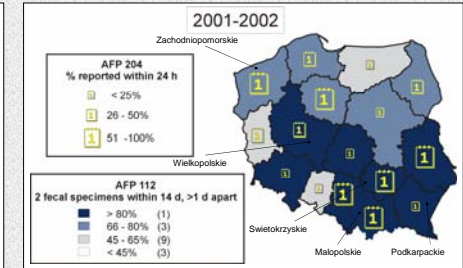
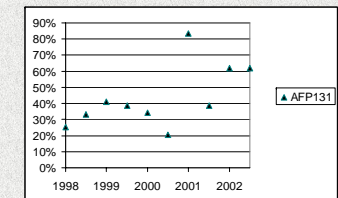


Figure 5 AFP 131 indicator: percent of all children under 15 years of age in Poland living in the region where the modified index is above 0.6, Poland, 1998-2002.



Priority investigation

A comparison of priority cases (according to WHO guidelines implemented in 2001) with remaining cases showed how priority investigation influenced the timeliness of AFP reporting in Poland.

- 17 cases were meeting definition for priority investigation in 2001 and 2002.
- AFP 112 was 82.4% in priority, whereas 80.5% in "normal" cases ($p=0.45$)
- AFP 204 was 41.2% in priority, whereas 41.5% in "normal" cases ($p=0.89$)

Conclusions

- AFP surveillance was systematically improving during the years 1998-2002.
- All surveillance indicators, except AFP 204 (proportion of cases reported within 48 hours) reached a satisfactory level in the years 2001 and 2002.
- Geographical comparisons and the AFP 131 indicator show that surveillance quality is not evenly distributed in all regions. There are provinces where introduction of wild poliovirus could not induce appropriate fast detection and response of the public health system.
- Variability of indicators at national and regional level is a problem. AFP incidence dropped from 0.97 in 1999 to 0.57 in 2000. Again, in 2003 AFP incidence rate was 0.69, compared with 1.06 in 2002. It shows that the system is not enough sensitive and unstable.
- Currently there is a need to improve regional performance of the AFP surveillance system using administrative and educational means.