Sudden increase of diphtheria with *Corynebacterium diphtheriae* among migrants arriving in Germany, 2022: statistical outlier – or detection of an outbreak?

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**Background**

In early August 2022, Germany’s national public health institute for disease prevention and control, the Robert Koch Institute (RKI), noticed an upsurge in diphtheria cases: 26 cases were notified in that year, 8 of which were migrants, mainly from Afghanistan and Syria. However, the annual average is 22 cases, including 3 migrants.

Here, we describe the outbreak detection, and evaluate how routine surveillance contributed. The outbreak description with quantitative epidemiological data is published elsewhere [1].

**Results**

**Comparison of cases from 2022 with cases from previous years**

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<td>Expected</td>
<td>Observed</td>
<td>Difference</td>
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<tr>
<td>Local residents</td>
<td>13.8</td>
<td>8.1</td>
<td>+111%</td>
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<td></td>
<td>1.2</td>
<td>1</td>
<td>-13%</td>
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<tr>
<td>Arriving migrants</td>
<td>2.8</td>
<td>1.6</td>
<td>+300%</td>
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<td>0.2</td>
<td>7</td>
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**Check that there were no alternative explanations**

- In July 2022, fewer Afghan and fewer Syrians (~19% each) applied for asylum in Germany for the first time, compared to July 2021.
- More cases were observed than expected, based on the number of new asylum seekers in Germany in 2022.
- Afghanistan reported 61 cases in 2021 to the WHO, after several years with zero or single-digit case counts, or no reporting. No details are known. Syria reported zero cases again in 2021.
- There was no indication that the incidence of diphtheria in the main countries of origin might have changed.
- Several diphtheria cases were detected after mpox had been initially suspected but ruled out.
- Detection bias due to more frequent diagnostics of skin lesions in spring 2022 might have helped to detect early outbreak cases.

**Discussion**

**Upsurge, statistical outlier or outbreak?**

Conclusion within six weeks of the event’s beginning: Unprecedented number of diphtheria cases in Germany represents an outbreak which is, moreover, part of an international outbreak in Europe.

**Reasons for relatively quick outbreak detection**

- Reports from abroad and exchange with ECDC boosted vigilance.
- RKI conducted timely case controls for each diphtheria case.
- RKI probed that there were no other reasons but an outbreak.
- RKI, NCLD and ECDC voluntarily exchanged data.

**Methods**

RKI initiated investigations to confirm an outbreak. First tasks were:

- Analyse cases reported in 2022 and compare with previous years, based on the annual average of the previous three calendar years;
- Assess possible alternative explanations;
- Compile epidemiological data from routine surveillance and microbiological data from Germany’s National Consiliary Laboratory for Diphtheria (NCLD).

Simultaneously, RKI exchanged additional information with federal and local health authorities as well as with ECDC and WHO/Europe.

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**Where to go from here**

**Outbreak detection in general:** Is an iterative process that requires a thoroughly conducted outbreak confirmation.

**Ongoing outbreak:** 169 outbreak-related diphtheria cases among migrants in Germany by 19/03/2023. Epicentres not identified.

**Of utmost public health relevance:** Active case finding and outbreak detection in supposedly unaffected countries along the Balkan route and in Europe.

**References**
