Improving the Effectiveness of On-Site Inspection in the Monitoring of the Comprehensive Test-Ban Treaty

A method for assessing the reduction in effectiveness of OSI taking into account the frequency and duration of potential illnesses among inspection team members, as well as recommendations for reducing the probability of these illnesses, has been developed. The models used account for the geographical and climatic characteristics of the regions, as well as the season during which the OSI are conducted.

i *– number of disease;*
T *– duration of OSI;*
T_0 *– time of substitution of member of the inspection group;*
T_A *– time of absence;*
T_j *– duration of #j technology;*
P_{is} *– probability of disease occurence over the statistical observation period* T_s *;*
$\frac{P_{is}}{T_s} = \nu_i$ *– the prevalence of disease;*
N_j *– number of members in the inspection group involved in the #j technology;*
$P_{m_{ji}}$ *– probability of* m_{ji} *cases of disease #i among members in the inspection group of #j technology;*
L_j *– amount of measurments;*
σ_j *– standart deviation of the measurments results (taking into acount the amount of disease cases) by #j technology;*
σ_{0j} *– standart deviation of the measurments results by #j technology;*
$M(X)$ *– mathematical expectation of* X *value.*

The mean number of diseases m_{ji}:

$$M(m_{ji}) = \sum_{m_{ji}} m_{ji} P_{m_{ji}} = \nu_i N_j T_j$$

Considering the low probability of multiple simultaneous diseases in a single group member, the overall prevalences of diseases can be summed.

The time missed by a member of the inspection group varies depending on whether the disease occurs at the beginning or at the end of the On-site Inspection.

The mean time of absence:

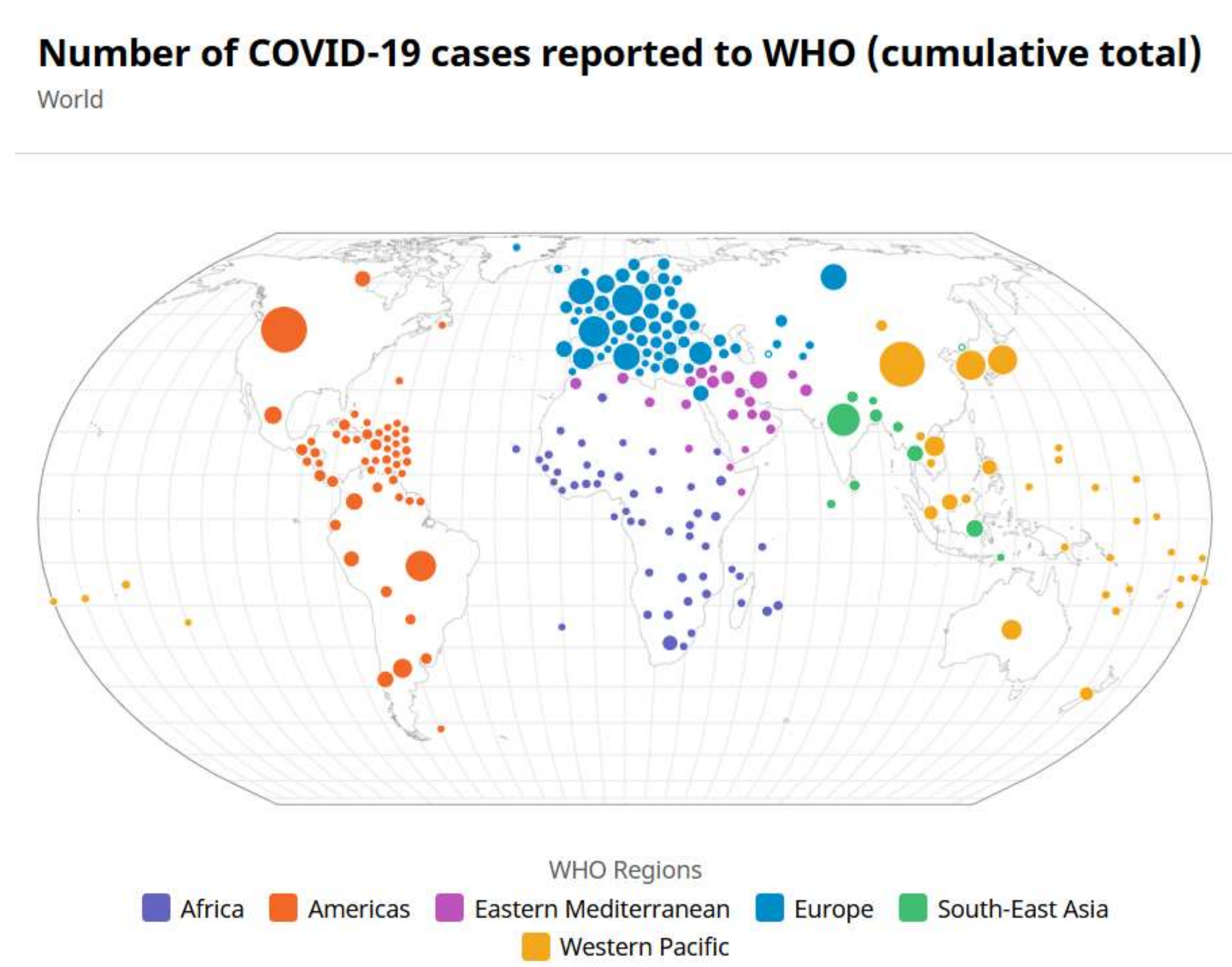
$$M(T_A) = N_j T_0 \left(T_j - \frac{T_0}{2}\right) \sum_i \nu_i$$

The amount of measurements L_j is proportional to time of the inspection of the group involved in the #j technology.

$$\sigma_j \sim \frac{1}{\sqrt{N_j T_j - M(T_A)}} \qquad \sigma_{0j} \sim \frac{1}{\sqrt{N_j T_j}}$$

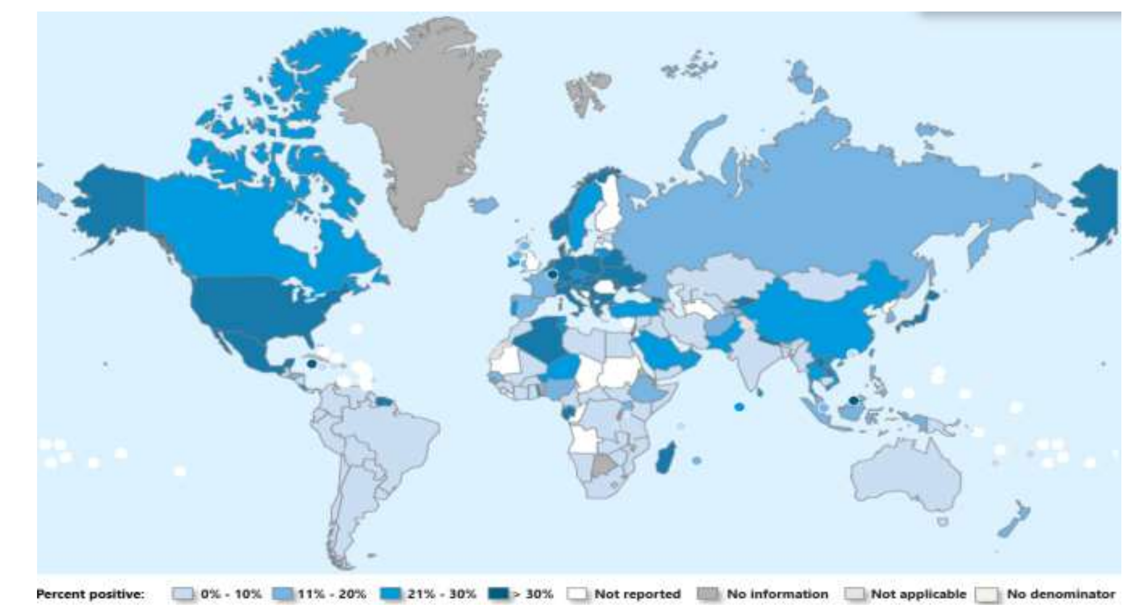
Here, the standard deviation is estimated. It is not dependent of the number of members in the inspection group involved in the #j technology.

$$\sigma_j = \frac{\sigma_{0j}}{\sqrt{1 - \frac{T_0}{T_j}\left(T_j - \frac{T_0}{2}\right)\sum_i \nu_i}}$$

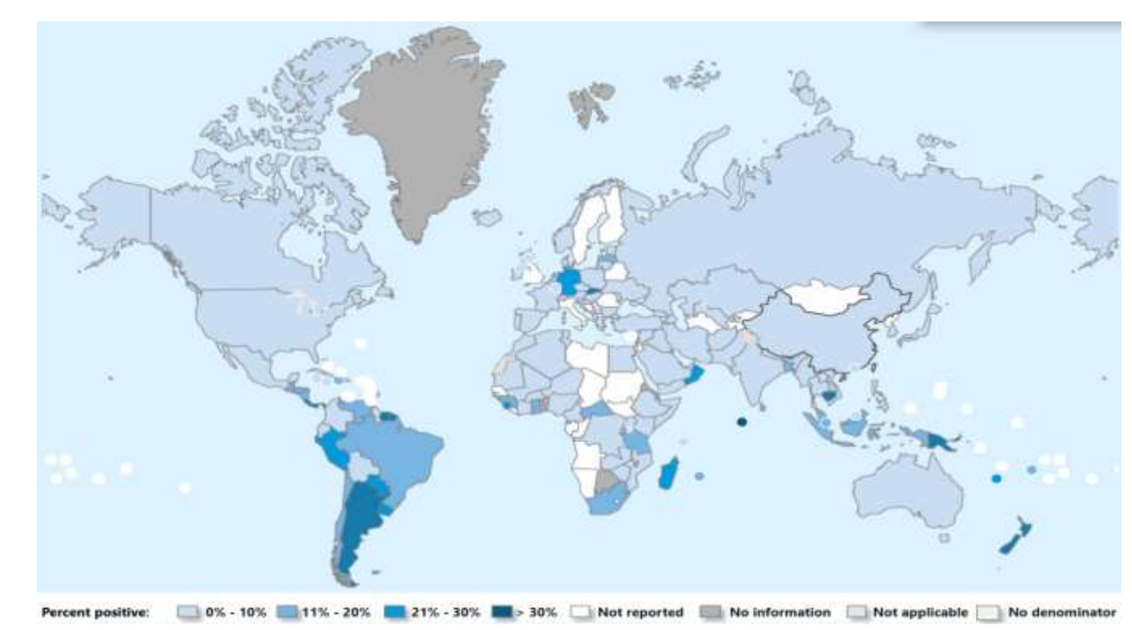


Number of influenza cases worldwide

February 2025



June 2025



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