Holiday Hemoglobin: How the Vacations Affect Blood Donations Across Diverse Urban Sites

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Background: Sufficient blood supplies are essential for a wide variety of surgeries as well as for the treatment of a large number of diseases. In our scenario, three collaborating transfusion centers in different Czech cities acquire blood from voluntary donors. However, not every invited donor finally comes or can give usable blood due to unexpected events or non-compliance with pre-collection restrictions such as diet or limited sports.

Aims: In this study, we aimed to build predictive models to estimate the weekly amount of really acquired Transfusion Units (TU).

Methods: We combined evidence of invited donors and weekly acquired TUs in 2021-2024. We extended this dataset with evidence of national, regional, and company holidays. Finally, we trained predictive models using data from 2021, 2022, and the beginning of 2024. These predictive models were evaluated using data from the year 2023.
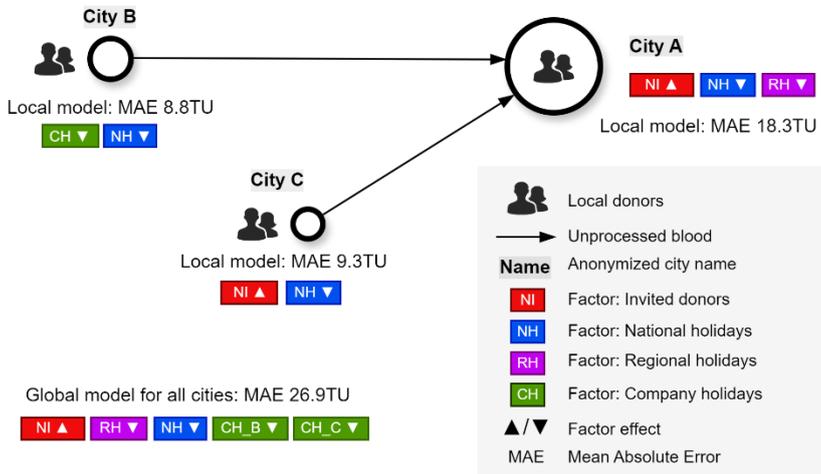
Results: The global prediction model for all three centers showed a mean absolute error of 26.9 TU and a Pearson correlation of 0.96 compared with the reality in 2023. Interestingly, city-specific models use different prediction features, pointing to diverse population behavior.