

Research Project

Systemanalyse der saisonalen Grippevirusübertragung und –verbreitung in Basel-Stadt / System analysis of seasonal influenza – virus transmission and evolution in the City of Basel , Projekt Nr. CR3213_166258, EKNZ 2015-363

Third-party funded project

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Status Completed

Diseases with influenza viruses are frequent and may be associated with severe clinical consequences and high health costs. The virus transmission in urban environments is very complex and the mechanisms and determinants of the transmission of viruses in the urban population have not been fully understood. This project aims at understanding the possible transmission paths of influenza infections within the urban context. It is assumed that geographic spreading patterns of influenza may help identify causes as well as transmission paths of the viruses which in turn may assist in formulating preventative measures. Core element of this research endeavor therefore is a large research network from the fields of Medicine, Life Sciences, Infectious Diseases, Social Geography and Ecology, Clinical Microbiology and Medical Statistics, capable of analyzing the geographic and microbiological-molecular-genetic dimensions of influenza transmission and modelling the transmission mathematically and statistically.

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Inter-disciplinary, inter-faculty, inter-institutional research approach. A unique feature of the research project then is its interdisciplinary, interfaculty, inter-institutional approach through cooperation of the fields of Medicine, Environmental Sciences and Biosystems Engineering, particularly the following: at the University Hospital Basel: the Emergency Department, the Division of Infectious Diseases and Hospital Epidemiology, the Division of Clinical Microbiology, the Clinical Trial Unit at the Department of Clinical Research, the Blood Donation Center, and at the University of Basel: Applied Microbiological Research at the Department of Biomedicine, the Department of Environmental Sciences Human Geography Research Group, and the Institute of General Practice Medicine. At the Swiss Federal Institute of Technology Zurich: the Computational Evolution at the Department of Biosystems Science &

Engineering. The following work packages will be executed as described in greater detail in the research data base.

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1 Geographic approaches

GIS - (Geographic Information Systems) visualizations and geoinformatic analyses.

Influenza incidences and structural characteristics of the urban quarters in the City of Basel and of Swiss communities

- situate the number of registered influenza cases in the City of Basel, using University hospital patient data and map the dispersion and spatial distribution and concentration patterns of the different influenza incidences according to influenza virus subtypes (influenza A or B) and other respiratory diseases
- examine possible associations between these characteristics and those of the urban environment and of urban quarters (e.g. population density, age distribution, proximity to schools and public transport andă the built-up area).

Household Survey - Determinants of the influenza vaccine uptake in Basel

- analyses vaccine uptake, vaccine coverage, health behavior, perceptions on vaccination and other preventative measures, source of health information
- differences according to urban quarters, person specific variables (e.g. age, gender, place of residence) and reported behaviors and perceptions.

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2 Medical, microbiological approaches

- analyse the transmission network of the influenza virus using Next Generation Sequencing (NGS)
- genetic information of the pathogens and how they spread and mutate within the city context.

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3 The biosystems science and engineering approach uses mathematical modelling to

- develop mathematical models for influenza transmission
- understand the transmission patterns of the influenza pathogen and
- simulate preventative measures in the model.

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Relevance. Influenza viruses adapt rapidly to the host immune system. Due to the constant change the virus can escape the targeted immune response and thereby create an opportunity to spread, causing every winter epidemics. The adaption happens through small genetic transformations. Therefore, the immunological protection acquired is only short-lived. The frequency of influenza cases does not only depend on a single individual but also on the population as a whole. Putting disease incidences into a spatial context contributes to the understanding of transmission paths of influenza in an urban context. It has not been intensely investigated if there is a connection between influenza incidences in an urban space and aspects of the urban environment as well as the different quarter structures, but it is considered likely, and this is the focus of this interdisciplinary, interfaculty, interinstitutional project

Keywords influenza vaccination, influenza vaccination coverage, vaccination uptake, vaccination determinants, Influenza vaccination, influenza vaccination coverage, vaccination uptake, vaccination determinants, Switzerland, Basel

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Foundations and Associations

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