

Inventory of the disease pyramid

COVID-19 related effects

Background:

WP8 of VEO has as the primary task to “gain understanding of the burden of silent epidemics, the circulating strains, hotspots of occurrence or emergence, and associated drivers / risk factors”. Silent epidemics are in VEO defined as “infections with low mortality/morbidity or a very slow epidemic curve that often go undetected by the (public) health system, or circulate for a long time in the population prior to finally being detected as a problem”. In particular, this WP aims at:

1. Investigating how sewage surveillance can help to determine the total size/burden of epidemics (i.e. cases not detected by surveillance systems at the lower parts of the surveillance pyramid)
2. Identify novel key drivers for “silent epidemics” through the major interventions
3. Predicting temporal dynamics of silent epidemic agents by (metagenomic) sewage surveillance
4. Reconstructing transmission networks and pathogen from (metagenomic) sewage surveillance



In addition, the ongoing COVID19 epidemic offers a unique opportunity not only to determine the spread and burden of SARS-CoV-2, but also to investigate how these large-scale society interventions have impacted numerous other diseases.

WP8 requires extensive validation of sewage surveillance data using data from other types of “traditional” surveillance. The initial plans were to investigate this by performing sampling of sewage in a limited number (4-5) of cities in the EU where there is a variety of sources of public-health surveillance available for validation. A number of initiatives within VEO is already ongoing, ranging from sampling of sewage in multiple cities to collection of clinical and epidemiological data, but also collection of clinical isolates. They mainly focus on COVID-19 and SARS-CoV-2, but some also study a wider range of pathogens.

First we will make an inventory of which cities/sites can offer both sewage surveillance data and high-coverage data from other surveillance sources.

In addition, we want to make an inventory regarding the system variables of the study location that potentially act as drivers of urban amplification of an epidemic. It is also expected that this last inventory can be the initiation of a common dataset across all WPs.

Below is a table with the current status on longitudinal sampling of sewage already initiated. This is followed by two tables; one on data availability and the second on need/availability of epidemiological drivers.

Please fill in at least the first of these tables

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WEEKLY SAMPLING - GS and VEO partners (May 14, 2020)									
CONFIRMED	Country	Contact	City	Comment	Received?	Started			
x	5.1.2a	5.1.2e 1.2e	5.1.2a	Twice every week	yes	Nov. 2015			
x									
x								In March	
x						Sampling every second month			
x							5 samples	17.03.20	
x				5.1.2e		On its way			
x									
				5.1.2e			Waiting for permission to start		
x				5.1.2e			Permission received at last...		late April
x									
x								7 samples	13.03.20
x									
							On hold		
							On hold		
x							Kept at -20 at WWTP	4 samples	26.03.20
x									
							On hold - cant do it right now		
							On hold - cant do it right now		
							Once in a while, not weekly		
x							weekly or close to weekly		
x									

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Table 1. Data availability epidemiology / microbiology

City:

	Pathogen/disease	Excess death	Hospital	General practice	Community	Sewage	Metadata (age, gender, epidemiological data)	Comments
Syndrome	Influenza-like illness (ILI)	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
	Gastrointestinal	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
	Other (please specify) ¹	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
Serology	SARS-CoV-2	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
	Norovirus	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
	Campylobacter	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
	Enterovirus	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
	Other (please specify) ¹	Yes/no	Yes/no	Yes/no	Yes/no		Please specify	
Pathogen	SARS-CoV-2	Yes/no	Yes/no	Yes/no	Yes/no	Yes/no	Please specify	
	Norovirus	Yes/no	Yes/no	Yes/no	Yes/no	Yes/no	Please specify	
	Campylobacter	Yes/no	Yes/no	Yes/no	Yes/no	Yes/no	Please specify	
	Enterovirus	Yes/no	Yes/no	Yes/no	Yes/no	Yes/no	Please specify	
	Other (please specify) ¹	Yes/no	Yes/no	Yes/no	Yes/no	Yes/no	Please specify	

¹ Please add rows when needed.

Table 2. Drivers for urban amplification of “silent epidemics”

A huge amount of epidemiological data are already available at the country level. We are in the process of organizing datasets from World Bank (76 datasets), UNICEF (41 datasets), WHO (60 datasets) and UN (32 datasets). We have indicated below where we expect such data to be available at the national level.

Please use the table below to 1) suggest new epidemiological drivers you would like to get and 2) indicate availability at the national/local level and the accessibility.

Driver theme	Drivers in study area	Available at the national level from external source	Availability	Source / level
Human susceptibility	Diabetes	Y		
	Obesity	Y		
	Other co-morbidity factors	Y		
	Vaccine coverage (if available)	Y		
	Pre-existing immunity (for second wave)			
Climate & weather	Temperature	Y		
	Rainfall	Y		
	Humidity	Y		
	Wind	Y		
	Air quality	Y		
Human demographics and behaviour	Population	Y		
	Population density	Y		
	Age distribution	Y		
	Gender distribution	Y		
	Ethnic groups (HLA-type, blood group)			
	Expression of ACE2 receptor across different populations			
	Human connectivity			
Economic development	Density/availability of veterinary care for companion animals and livestock			
	Transport system used / transport data			
	Built environment and urban design			
	Capability to impose and fund a lockdown			
Land use & ecosystem changes	Vegetation (i.e. Deforestation / urbanisation)	Y		
	Flooding	Y		
	Livestock density and management	Y		

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	practice			
Technology & industry	Social media engagement			
Human wildlife/livestock interaction	Wildlife density & movements			
	Vector density & movements			
	Contact to livestock and wildlife reservoirs (re: zoonotic emergence)			
Breakdown of public health measures	No. of GPs per inhabitants	Y		
	No. of hospital beds per inhabitants	Y		
	PPE availability and cultural preferences			
	Treatment programmes / access to healthcare	Y		
Poverty & social inequality	Socio-economic status distribution	Y		
	Living conditions			
	Sanitation	Y		
	Housing types distribution			
	Household size distribution	Y		
	Drinking water quality	Y		
War & famine				
Lack of political will	Regulatory systems			
International travel & commerce.	Livestock / animal product / food movements	Y		
	Global movement of people - transport			
Consumption	Diet, food intake and cultural preference			
	Food production (i.e locally produced/imports)			
Others	Historical trend data			
	GPS coordinates & sewage connection			
	Properties of the virus Infectivity			