

Margaret J. Varga, Holly B. Bratcher, Keith A. Jolley and Martin C. J. Maiden
Maiden Lab, Department of Zoology, University of Oxford, United Kingdom.

INTRODUCTION

Invasive Meningococcal Disease (IMD) is caused by the human-associated bacterium *Neisseria meningitidis* when it invades the blood, causing septicemia, and/or the meninges, causing meningitis. IMD affects most nations and age groups, though age distribution is not uniform, with the highest rates in infants, children and teenagers. Epidemiological information is crucial for the public health response.

CHALLENGES

There are reference databases of genomic data, including PubMLST.org, which have been developed to facilitate open access. PubMLST contains extensive curated databases of over 100 different microbial species and genera.

The large size and complexity of these rich genomic databases mean that it is very difficult to gain insight into, and understanding of, the information they contain.

INTERACTIVE WEB-BASED STORYBOARD

We have developed an interactive web-based 'Storyboard', using data from PubMLST, that provides information on IMD occurrence in England. The Storyboard is directed at both public engagement and disease surveillance applications. It supports user exploration and analysis of the time-evolution of, and detail about, the changes in, and distribution of, IMD. Users can interactively explore the epidemiological years, serogroup, clonal complex, geographical region and age group, and thus, for instance, discern patterns and trends of disease, Figures 1 - 3.

CONCLUSIONS

The Storyboard enables users to explore and understand the complex information in an easy manner, and without the need for training or a user manual.

This system is applicable to all types of users: the general public, policy makers and decision makers, epidemiologists, researchers, genomics specialists and others.

FUNDING

Meningitis Research Foundation (MRF) and Biomedical Resource Grant from the Wellcome Trust.

How does the meningococcus spread?

Neisseria meningitidis only infects humans. The meningococcus is spread person-to-person by the respiratory route when two or more people are in close contact. This means that the bacterium moves in the form of aerosol droplets created when a person with the meningococcus in their throat sneezes or coughs, it can also be passed on by kissing, sharing cutlery or toothbrushes. The meningococcus spreads most efficiently among people who are close together, indoors, for long periods of time. As most transmission results in an asymptomatic infection (referred to as colonisation) most of this spread is unseen.

Disease occurs when an invasive meningococcus meets a susceptible person (someone who has not been vaccinated or has a problem with their immune system) and overwhelms the body's defences. Higher levels of disease are especially associated with conditions where the meningococcus spreads most easily, examples including military recruits, university students or overcrowded housing conditions. Kissing, smoking, and attending pubs or clubs have also been associated with the spread of meningococci in teenagers. In most cases, IMD develops within a few (3-5) days of exposure to an infected person, so outbreaks of disease are often also associated with the behaviours that promote person-to-person spread.

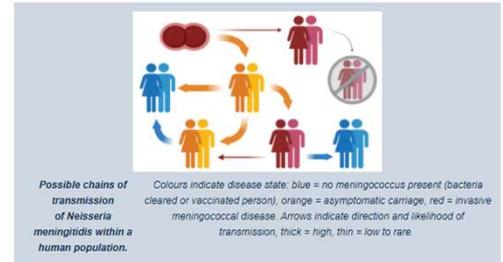


Figure 1: How does the meningococcus spread?

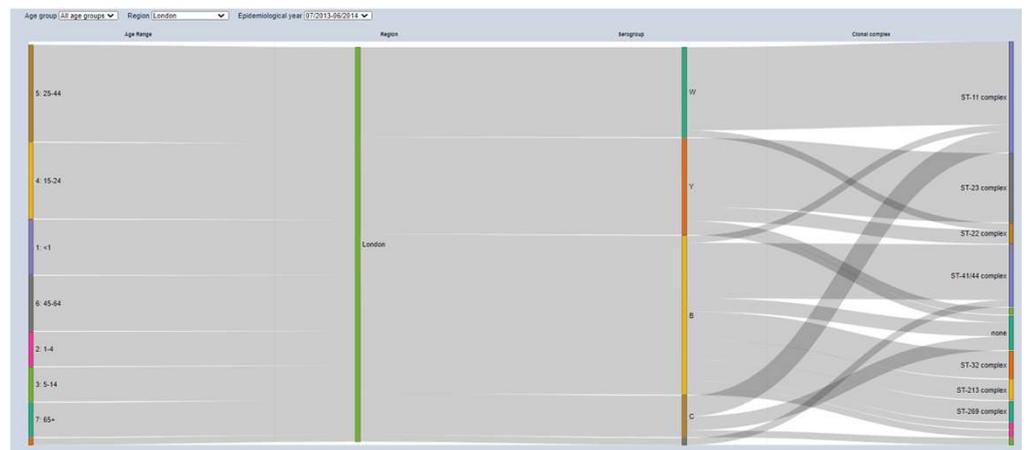


Figure 2: Exploration of all age groups in London with their associated serogroup and clonal complex during 07/2013 – 06/2014

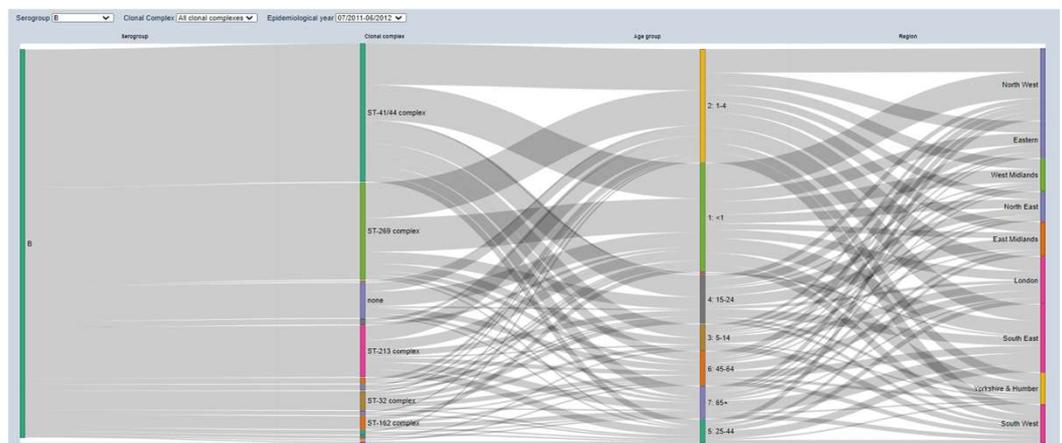


Figure 3: Exploration of Serogroup B, all its clonal complexes and associated age group and region during 07/2011 – 06/2012