From: Salathé, M. *Digital epidemiology: what is it, and where is it going*?. Life Sci Soc Policy 14, 1 (2018).

Digital Epidemiology

[1] Digital epidemiology is a new field that has been growing rapidly in the past few years, fueled by the increasing availability of data and computing power, as well as by breakthroughs in data analytics methods. The goal of epidemiology, very broadly speaking, is to understand the patterns of disease and health dynamics in populations as well as the causes of these patterns, and to use this understanding to mitigate and prevent disease, and to promote health. The goal of *digital* epidemiology is exactly the same: epidemiology that uses digital data. This broad and straightforward definition includes any modern approach to epidemiology based on digital sources. An additional and much narrower definition for digital epidemiology which is more appealing and more thought-provoking, is that digital epidemiology is epidemiology that uses data that was generated outside the public health system.
[2] Digital epidemiology has come a long way in the past 10 years. What started as a small and diverse group of researchers from various fields analyzing the increasing amount of internet data for epidemiological purposes has now turned into a nascent field of its own. Similarly, the number of scholarly publications, scientific events, and academic groups dedicated to digital epidemiology has grown steadily over the past few years. In these early years of digital epidemiology, its growth has been aided by the rapid growth of digital data, the widespread penetration of mobile phones and internet usage. It has also been helped by the increasing power of machine learning that is necessary to make sense of the available data.
[3] The original growth of digital epidemiology was largely fueled by the rapidly increasing amounts of data generated on the internet, particularly also on social media. Google Flu Trends (GFT) was among the earliest well-known examples of digital epidemiology, using symptomatic search queries for the purpose of tracking influenza-like illnesses. The specific problem with GFT was the private ownership of the underlying data, which meant that the algorithm could not be reproduced and investigated independently. In other words, public health authorities had no deep insight into the algorithm and the underlying data and they were not able to contribute directly to its improvement. Furthermore, they had no say in the decision to shut down the system. It is understandable that no public health authority would be particularly keen on using a system over which it has absolutely no control. Therefore, the field needs to focus on finding ways to make data openly accessible, at least to health authorities and researchers, and ideally to the community at large.
[4] This approach, however, **is at odds with** the current trend of major internet services which substantially reduce access to data. There are multiple responses to this trend. The first response, ironically, is to do less digital epidemiology in the strict sense, i.e. to rely less on third-party data that was not generated for epidemiological purposes. Also, the public health system could generate its own digital data streams. For example, existing successful case studies of innovative approaches include InfluenzaNet (2014), a system that monitors the activity of influenza-like illness with the help of volunteers via the Internet. This innovative surveillance system is based on the voluntary online participation of the population who, on a weekly basis, respond to an internet questionnaire about flu symptoms. Many more are expected in the near future. The second response is to build on the fact that data generated by individuals, no matter through which corporate service, belongs to the individuals who generated it - or that, at least, the individual has a right to a copy of his or her data. It is possible that a representative fraction of the population could be convinced to share health-related data with public health authorities, either directly or through third parties such as health cooperatives. As these underlying developments are continuing, the growth of the field of digital epidemiology will continue alongside with it.

Paragraph [1] of this passage:

- A. describes the consequences of epidemics in the public health system
- B. describes a research method which addresses health issues
- C. explains the development of infectious diseases
- D. identifies the reasons for the success of digital epidemiology
- E. presents two conflicting research areas in health

According to paragraph **[2]**, which of the following statements is true?

- A. Researchers have contributed to the increase in internet access.
- B. Digital epidemiology has developed into an independent field of study.
- C. Digital epidemiology evolved sporadically over several decades.
- D. Digital epidemiology is developing too fast for current digital programmes.
- E. The data available is difficult to access.

Which of the following, in paragraph **[3]**, is true about Google Flu Trends?

- A. Public health authorities can regulate the system.
- B. The internet has contributed to the system.
- C. Access to personal data is not protected.
- D. The public health authorities can make adjustments to the system.
- E. The algorithms are accessible to public health authorities.

Paragraph **[4]** concludes that:

- A. a decrease in digital epidemiology is inevitable
- B. public health systems must collaborate with external laboratories
- C. public health authorities need to gain independent access to personal data
- D. there will be a three-fold increase in digital epidemiology
- E. individuals should be encouraged to keep their own data private

The expression **is at odds with** in the context of paragraph **[4]** means

- A. enumerates
- B. exemplifies
- C. reports
- D. contradicts
- E. summarizes

From: Sampson HA. *Food allergy: Past, present and future.* Allergol Int. 2016 Oct;65(4):363-369.

Food Allergy

[1] Although the first account of food allergy is generally attributed to Hippocrates, an often quoted line from a Latin poet «What is food to one, to another is rank poison» strongly suggests an understanding of adverse reactions to foods over 2000 years ago. In the 17th century, case reports of food hypersensitivity reactions began to appear in medical literature; Jean Baptiste van Helmont reported asthmatic attacks following the ingestion of fish in his book published in 1662. Later, Robert Willan described urticaria following the ingestion of almonds, mushrooms, fish, crab, lobsters and mussels, and fatal anaphylaxis following ingestion of mussels and lobsters in his Treatise on Dermatology, (1798–1808).
[2] While various reports of reactions to foods appeared periodically in the medical literature, the classic experiment of Prausnitz in 1921 initiated the scientific investigation of food allergy and established the immunologic basis of allergic reactions. In his experiment, Prausnitz injected serum from a fish-allergic patient and a non-allergic control subject into his own skin, and on the following day, he injected fish extract into the same areas. A positive local reaction proved sensitivity could be transferred by a factor in serum (now known to be IgE antibodies) from an allergic to a non-allergic individual.
[3] In the early 1980's, the landscape of food allergy was very different from today: food allergy was less prevalent and there was little public awareness of the problem. Most clinicians were highly skeptical of the diagnosis, and there was little active research going on, primarily because many investigators did not consider the field to be a real science. Thirty-five years ago, the perceived prevalence of food allergy in the United States was similar to what is reported today, i.e. about 20%, but the actual prevalence then was thought to be less than 1% compared to more recent estimates today of 5% of the general population and 8% of the pediatric population. Severe food-allergic reactions were rare 35 years ago, but now they represent the single leading cause of anaphylaxis treated in American emergency departments. Data from the United States and Australia indicate that there has been a marked increase in hospitalizations due to food allergy in the past two decades. Many of the same diagnostic tools used today to diagnose food allergy were utilized 30 years ago, but these tools have been refined. Patient history and skin testing remain nevertheless the cornerstone for diagnosing food allergy.
[4] In another experiment, over 80 years ago, Grulee and Sanford reported that exclusive breast feeding in newborn infants reduced the development of skin allergies 7-fold compared to infants receiving cow's milk. This led to a series of studies in the late 1980's and 1990's demonstrating the benefit of exclusive breast feeding, use of extensively hydrolyzed infant formulas and/or avoidance of major allergenic foods from the mothers' and infants' diets in the prevention of skin and milk allergy. These studies supported the hypothesis that delaying the exposure to major food allergens (milk, egg, peanut and fish) would allow the infant's immune system to mature, respond appropriately to food antigens, and decrease the likelihood of the child developing food allergies.
[5] To conclude, the past three decades have witnessed a major expansion in funding and in the number of investigators pursuing food allergy research. We have seen an exponential growth in our knowledge about food allergies and in some promising therapeutic approaches that could become available in the clinic in the next few years. However, many questions remain. To move the field forward it is essential that we critically reassess published studies and retain strict adherence to the scientific method in future investigation. We need to seek a better understanding of the basic immunology of "tolerance" and immunopathogenic mechanisms of food allergy in man, and evaluate the structural properties of food allergens and effects of food processing and additives. Despite the great advances in the field of food allergy, the remaining questions will likely keep investigators occupied for at least the next three decades.

The primary purpose of the passage about allergies is to:

- A. report recent new findings
- B. contrast two conflicting views
- C. summarize the history of research
- D. contradict old research findings
- E. evaluate a recent study

According to paragraph **[2]**, Prausnitz's experiment:

- A. was done by consuming raw fish
- B. was repeated several times in 1921
- C. proved that allergies are not transmittable
- D. was carried out within 48 hours
- E. used fish as control subjects

According to paragraph **[3]**, allergies were ignored 35 years ago because:

- A. there were no food-allergy related cases in hospitals
- B. doctors did not think they were a health issue
- C. they were believed to be present only in Australia
- D. the study of allergies belonged to the field of clinical medicine
- E. 8% of the population was made up of children

Paragraph **[4]** establishes that skin allergies in babies can be reduced by:

- A. introducing a combination of dairy products at birth
- B. including peanuts and fish as early as possible
- C. using mother's milk exclusively
- D. using hydrolyzed milk from 6 months onwards
- E. including allergenic foods in the mothers' diet only

Paragraph **[5]** informs the reader that:

- A. current therapies are already showing positive results
- B. knowledge of food allergens is still limited
- C. food allergens in processed food are a vital aspect of future research
- D. researchers have not received enough funding
- E. there is a shortage of researchers in this field