Project Tycho

Preliminary data for the state of Arizona

Tycho database beta test version

The data presented in this report are of preliminary nature and should not be used for publication or other types of official use

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University of Pittsburgh Graduate School of Public Health

University of Pittsburgh

Table of Content

Acknowledgements

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We also acknowledge the help of many contributors that have contributed to the digitization and processing of weekly surveillance data included in this database. Digital Divide Data: Linda Thomas, Eric Gold, Heak Hok, Villa Kem and Hetel Patel. University of Pittsburgh Graduate School of Public Health: Steve Wisniewsky, Heather Eng, Sharon Crow, David Galloway, Jia Xu and Raaka Kumbhakar. University of Pittsburgh School of Information Sciences: Vladimir Zadorozhny, Ying-Feng Hsu, David Paul Koenig , Fatimah Ridwan and Divyasheel Sharma. Johns Hopkins Bloomberg School of Public Health: Derek Cummings. Pittsburgh Supercomputing Center: David Graham and Andrew Adams.

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Contact information

The Tycho database is currently being tested and a login account will be required to use the database and website (www.tycho.pitt.edu). All State Epidemiologists, CDC partners, other federal agencies and our research collaborators will be provided with user accounts. User accounts can also be provided upon specific request. Note that the quality of the data during the testing phase cannot be guaranteed to be sufficient for publication or official use.

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Introduction

Project Tycho started in 2009 as part of the Vaccine Modeling Initiative (VMI) at the University of Pittsburgh Graduate School of Public Health, funded by the Bill & Melinda Gates foundation. This project aims to contribute to the availability of public health data for research and policy making. The vision for this project as described in the next section is a central access point for public health data of a detailed spatial and temporal scale for all countries. Currently, the Tycho database contains 10 million records that each represent a weekly report from a location for a specific disease. These records were extracted from weekly US Nationally Notifiable Disease Surveillance Reports between 1888 and 2009 (6300 reports) using double data entry (200 million keystrokes). The current database includes a total of 90 million reported cases and 4 million reported deaths due to notifiable diseases in the United States for the last 122 years.

Project **Tycho** is named after the Danish nobleman Tycho Brahe (1546 – 1601), who meticulously collected astronomical data. After Brahe's death, his assistant Kepler used these data to develop area laws of planetary motion.

Background

"No health department, State or local, can effectively prevent or control diseases without knowledge of when, where and under what conditions cases are occurring"
(Quote stated above weekly surveillance reports published in the Public Health Reports, 1888-1951)

This quote has accompanied weekly reports on the prevalence of notifiable diseases in the United States as long as these were published in the Public Health Reports, emphasizing the importance of data for disease control policy making. In the current day and age, this statement has lost none of its significance. On the contrary, as infectious diseases continue to pose challenges to the global public health system in an increasingly interconnected global society. The public health system has responded to this challenge by evermore sophisticated disease surveillance systems. The availability of internet and information technology has facilitated collection of detailed data on infectious disease incidence, the spread of pathogens, disease determinants, health behavior, etc. New technologies such as remote sensing and mobile reporting systems have advanced measurement of these factors in both high and low resource settings. The enormous wealth of public health information that is currently being accrued also poses its own challenges for data storage, management, preservation and dissemination. Public health agencies will need to allocate resources and develop capacity to specifically address these issues.

Although the importance of public health data collection has been widely recognized, the dissemination of data has been neglected for many reasons. The above quote does not only imply data collection but also its use and dissemination as knowledge on disease occurrence can only be derived from data after processing and analysis. Not only has disease surveillance become more sophisticated, analytical tools have changed as well and now include computational models to assess disease transmission and to evaluate disease control options. These methods have introduced the opportunity for data intensive studies of fine spatial-temporal patterns using dynamic models. Disease surveillance data at such scale are often not available for analysis for multiple reasons. First, surveillance data are not collected for research purposes but for disease monitoring and planning. Secondly, public health staff often lack time or capacity to prepare these data for analysis. Third, surveillance methodology often lacks transparency and standardization, reducing options for scientific analyses. Fourth, disease surveillance data are often

kept confidential and ownership or data use requirements are often unclear. Finally, archiving and preservation of surveillance data are often not a priority and disaggregated records may get lost, losing the opportunity to ever use these data for analysis.

The Tycho project aims at overcoming some of these challenges by providing open access to large public health datasets of great spatial-temporal detail. Open access to these data will provide great opportunities for scientific analysis and better informed policy making on disease control.

The Tycho database and website

As described in the methods section, a large heterogeneity in reporting practice was observed over the past 122 years of weekly disease surveillance and substantial efforts were made to clean and standardize these data. The current online database includes all cleaned and standardized data in a format that allows comparisons across time and space. It does not include parts of the data that require additional cleaning and research such as classification of disease subcategories.

Each record in the database provides a reported number of cases or deaths due to a specific disease for a specific location, for a certain week. The database can be searched online (www.tycho.pitt.edu) by selecting a dataset, an aggregation method and an output format. Data can be viewed in tables, graphics and maps and these can be downloaded for further use.

Data availability

The data provided by the Tycho database reflect the weekly US Nationally Notifiable Disease Surveillance System between 1888 and 2009. It includes all diseases that were reported as part of this system, but it does not yet include records from other surveillance systems such as the annual system or disease specific subsystem (such as the influenza surveillance system).

The available data also reflects changes in reporting practices over time. This explains why city or state level reports are only available for a certain time period (1888-1953 for cities and 1927-2009 for states) and why morbidity and mortality reports are available for different time periods. We are currently working on inclusion of additional data as described in the section on collaboration.

Testing and release of the Tycho database

The Tycho database is currently in a beta testing phase that will start during the 2011 annual meeting of the Council of State and Territorial Epidemiologists (CSTE) in Pittsburgh June 12-16. This phase will end with a release to the general public in the fall of 2011. During the testing phase, invited users will be provided with login accounts that will enable full use of all features of the website and database. Invited users will include all state epidemiologists, partners in the CDC and other federal agencies as well as research collaborators. During this phase, data cleaning and standardization will continue. The quality of the data will not be sufficient for publication or official use during this phase.

Future developments

After optimization of the database and website during the testing phase, the first version of the Tycho database will be released to the general public. After that, efforts to clean and standardize the data will continue and more data will be released in subsequent versions. In addition, ongoing and new collaborations for inclusion of new data will allow gradual expansion of the dataset over time and increased opportunities for data driven analysis and policy making.

Vision and goal

The vision for project Tycho is based on the value of open access to detailed, disaggregated public health data for scientific analysis and policy making. Starting with 122 years of weekly US surveillance data, it is our hope that this example will convince public health authorities worldwide of the value of this resource and will stimulate similar contributions from other countries.

In the past, data sharing and archiving have not been a priority in public health or among health sciences in general. Continuous and diligent public health data collection has led to a large pool of disaggregated data scattered over the world including the internet, ranging from paper archives to basements of local health departments. The need for open access to a central repository of public health data has been recognized and both benefits and challenges of open access to data in general have been well described. Open access to data could lead to increased accountability, transparency, innovation, collaboration, cost-effectiveness, replication of results, the development of new methods and insights, and a narrower data access gap between low- and higher income countries. Ultimately, this would result in the advancement of science and technology to the benefit of all.

Challenges to open access include inconsistent formats, lack of annotation or metadata, lack of information technology (IT) capacity, a lack of incentive, and cultural norms around data ownership. Open access to public health data in particular is confronted by decentralized archiving of disease reports, lack of time and capacity for data management, degraded physical format of records and archives, and governmental level legal constraints. Multiple principles and requirements for a central open access repository for public health data have been described and include (1) capacity building for data management in low- and middle income countries, (2) feedback loops to data contributors, (3) sustainability, (4) common standards, (5) interoperability, and (6) user-friendliness.

The ultimate goal of the Tycho project is to provide a central global public health data access point. Historical as well as current public health data are of great value if archived and accessible for research and analysis. Open access will enable the use of analytical capacity from around the globe which will lead to new discoveries of disease patterns and control policies. Furthermore, a central data access point will facilitate data archiving and preservation into the future which will be an increasing need in a data rich public health environment.

Collaboration

The application of the surveillance data from the Tycho database as well as the inclusion of new data will require a wide range of collaborations with public health offices in the US and abroad. The Tycho project has currently made the first step of digitizing 122 years of weekly US surveillance reports that had already been published. The next step will be the completion of the existing dataset as well as the inclusion of new data from unpublished sources.

This report provides an overview of data available from the Tycho database for the state of Arizona. This includes all data that has ever been published at state or city level for Arizona in the weekly US Nationally Notifiable Disease Surveillance System. As you will find, the data availability will vary greatly over time, between city and state level reports, between diseases and between morbidity vs. mortality reports.

The Tycho development team would look forward to work with state health departments in the US to:

1. Better understand the current Tycho data for each state (eg. by collecting historic documentation)
2. Provide better usability and applications of current Tycho data for each state by continued joint development of website and database features.
3. Collect and/or digitize official, confirmed data to validate the current (preliminary) weekly data.
4. For each state, collect and/or digitize new data that has not yet been included. For example all city level reports discontinued in 1953 and completion of city level data until 2009 would greatly increase opportunities for analysis of disease patterns and trends.
5. Provide support to state health offices to manage, preserve and provide access to public health data.

Summary of methods

Detailed documentation on the methods used for the Tycho database has been provided on the website (www.tycho.pitt.edu). This section describes these methods in short.

Data collection

Weekly reports that contain tables on the occurrence of nationally notifiable diseases have been published since 1888 by public health authorities at the Federal level in various journals. Table 1 provides the list of publications and the responsible agency since 1888. All weekly nationally notifiable disease reports between 1888 and 1951 could be retrieved from the PubMed Central repository of the National Library of Medicine [1]. For 1995 to 2009, these reports could be retrieved from the MMWR digital archive on the CDC website [2]. Most weekly reports between 1952 and 1995 could be retrieved from the HathiTrust Digitial Library [3] [4], but many could not be found and had to be copied from hard copies of MMWR issues in the University of Pittsburgh library.

Table 1, publications and responsible Federal agencies for nationally notifiable disease reports

Time period	Publication title	Responsible federal agency
1888-1889	Weekly Abstract of Sanitary Reports	US Marine Hospital Service
1890-1895	Abstract of Sanitary Reports	US Marine Hospital Service
1896-1901	Public Health Reports	US Marine Hospital Service
1902-1911	Public Health Reports	US Public Health and Marine Hospital Service
1912-1951	Public Health Reports	US Public Health Service
1952-1960	Morbidity and Mortality Weekly Report	National Office of Vital Statistics, US Public Health Service
1961-1969	Morbidity and Mortality Weekly Report	Communicable Disease Center
1970-1991	Morbidity and Mortality Weekly Report	Center for Disease Control
1992-2009	Morbidity and Mortality Weekly Report	Centers for Disease Control and Prevention

Inclusion criteria

Weekly reports of each year were reviewed systematically to assess the diseases reported. We included all tables that provided disease specific information by week for US cities, townships, counties or states. Tables that provided summary or aggregated information by month, year or at the national level were not included. Similarly, tables that did not contain disease specific information (such as all cause mortality) were not included.

Data entry

Weekly reports were downloaded or scanned as PDF files and selected tables with notifiable disease reports were entered into computer spreadsheets in a highly standardized fashion using double data entry. During the second round of data entry, operators could not see what had been entered in the first round and could not continue if the system detected a discrepancy between the second and first entry

[1] http://www.pubmedcentral.nih.gov/tocrender.fcgi?journal=333&action=archive
[2] http://www.cdc.gov/mmwr
[3] http://catalog.hathitrust.org/Record/003910026
[4] http://catalog.hathitrust.org/Record/003843660

for a specific value. Such discrepancies could only be resolved by checking the PDF file and try again or discussion with the group leader and verification of a value in the source documents.

Quality control for data entry
The accuracy of data entry was checked at various levels. First, completeness of data was verified by comparing the content of entered data with PDF sources files. Secondly, accuracy of data entry was verified by multiple rounds of comparing random samples of entered files with PDF source files. Thirdly, data formatting was verified by various checks to ensure appropriate formatting for data loading.

Data loading and standardization
All data was entered in Excel spreadsheets and various components of these spreadsheets were loaded in data files. Table titles, column headers, place names and reported numbers were loaded in separate files. These files were used to extract information on each reported number, including:

1. the disease reported
2. the disease subcategory reported
3. cases or deaths reported
4. the reporting location (name, state and type of location)
5. the time period for which a number was reported
6. the date of publication of the original weekly report associated with a reported number

Integration
All reported numbers and extracted information was integrated in one database with one record per reported number and associated information.

Post-processing quality control
After integration of all data in one database, checks were performed to detect duplicate reports and data inconsistencies. Duplicate records were removed and inconsistencies resolved by verification with original PDF source files.

Data filtering
The digitized version of all historical weekly US nationally notifiable disease surveillance records is a very heterogeneous dataset. It took a substantial number of data processing protocols to standardize time and space variables as well as disease names. All standardized records have been separated from non-standard records by a filter. All remaining heterogeneity in non-standard records is inherent to the surveillance system and can only be standardized after further analysis will have been completed (eg. remaining heterogeneity in reporting periods for reports before 1953 and standardization of disease subcategories). The largest proportion of data (>4 million records) has been standardized however and has been made available in the current testing version.

Data visualization
Figures in this reports were made with the R system, version 2.9.2 and the maps were generated by the GAIA platform developed at the University of Pittsburgh Graduate School of Public Health in collaboration with the Pittsburgh Supercomputing Center (PSC). See http://midas-pitt.psc.edu/gaia for more information.

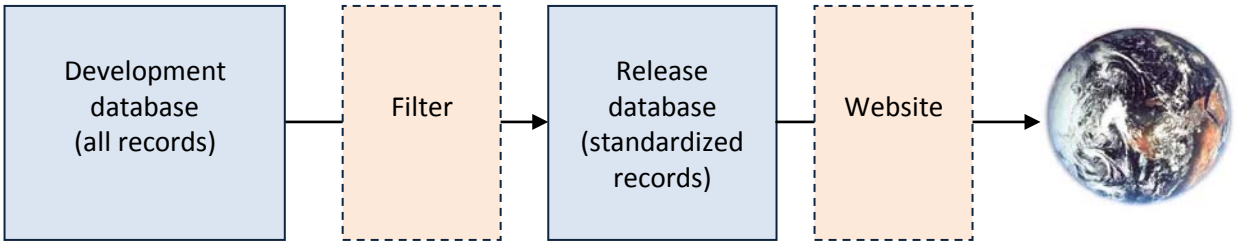

Figure 1, Schematic of the Tycho data architecture. Access to a consistent, standardized subset of the digitized US weekly surveillance reports will be provided for beta testing through a website that will allow querying and downloading of data. Data from the development database will be pushed through a filter to feed the Tycho database.

The current Tycho database will provide the reported number of cases or deaths reported by city or state health authorities to the federal health agency for all weeks between 1888 and 2009. Currently, only standardized, consistent data are being released for testing, according to the following criteria:

1. Only weekly reports are provided (reports for other periods such as 10 days, 2 weeks, 1 month, 1 year) are currently not included due to lack of comparability with the weekly reports.
2. Only reports that were published in the same year as the reporting period were included (this excludes updates or comparisons that were published more than a year after the original reporting period)
3. Only numbers were included for which information about the location, time period and disease could be extracted.
4. Only numbers or time periods for which no disease subcategories were reported were included.

Each of the steps described above have been described in detailed protocols that are posted in the documentation part of the Tycho website (www.tycho.pitt.edu).

Website

The Tycho website features simple and advanced searches of the data, visualizations and downloading of machine readable files. A dataset can be selected by specifying: 1) the disease of interest, 2) the location(s) of interest and 3) the time period. In a second step, the type of aggregation and length of increments can be specified and in a third step, the type of output (table, graphic or map) can be selected. After output has been generated, data can be downloaded.

As mentioned above, data availability varies largely by disease, time period and location. We aimed to restrict selection options by data availability to avoid "no results available.

Access to the most of the website will be password protected during the testing phase. For invited users after login, full functionality of the database and website will be available. During this phase however, the data quality will not be sufficient for publication or official use.

Overview of data available for the state of Arizona

In this section, an overview of data available for the state of Arizona will be provided. As described earlier, data availability depends entirely on historical reporting practices in the weekly US Nationally Notifiable Disease Surveillance System between 1888 and 2009. For this report, we only included morbidity reports (cases) to improve the format and limit the size of this report. As mentioned earlier, the analysis and standardization of has not been completed yet for all records in the database and preliminary data are provided here that may not yet be available in the online database.

This section will provide a general overview of data availability. The next sections will provide disease specific data from state and city level reports of Arizona. Data for a maximum of 3 major cities were provided depending on availability (city data was only reported until 1953). Some summary data will be provided at the end of this report, for a subset of diseases for which data was fragmented over time.

Table 1 lists the number of weekly state or city reports that are available for Arizona per each disease and subcategory.

Table 1, Number of weekly state or city reports per disease and subcategory

Disease	City	State
Aids	-	941
Anthrax	-	143
Brucellosis [undulant fever]	8	257
Chickenpox [varicella]	229	81
Chlamydia	-	675
Coccidioidomycosis	-	322
Cryptosporidiosis	-	491
Diphtheria	319	1614
Dysentery		
Amebic	-	212
Bacillary	-	204
Unspecified	-	325
Encephalitis		
Lethargic	51	-
Post infectious	-	171
Primary [infectious] including unspecified	2	885
Escherichia coli		
EHEC 0157	-	172
EHEC non-0157	-	20
O157:H7 NETSS	-	156
O157:H7 PHLIS	-	262
STEC	-	174
Giardiasis	-	370

Table 1, Number of weekly state or city reports per disease and subcategory, *continued*

Disease	City	State
Gonorrhea		
Civilian	-	756
Unspecified	-	1052
Haemophilus influenzae		
Age <5 non-serotype B	-	178
Age <5 serotype B	-	75
Age <5 unknown serotype	-	141
All ages all serotypes	-	634
Hepatitis		
Acute type A	-	362
Acute type B	-	331
Acute type C	-	86
Acute type NA NB [including C]	-	28
All types, all ages	17	681
Type A [infectious]	-	1652
Type B [serum]	-	1261
Type NA NB [including C]	-	849
Type unspecified	-	867
Influenza	142	1110
Legionellosis	-	989
Leprosy	-	324
Listeriosis	-	150
Lyme disease	-	322
Malaria		
Civilian	-	12
Unspecified	-	1679
Measles		
Imported	-	223
Indigenous	-	501
Unspecified	393	2771
Meningitis		
Aseptic	-	646
Meningococcus	45	1145
Unspecified	17	5

Table 1, Number of weekly state or city reports per disease and subcategory, *continued*

Disease	City	State
Meningococcal disease		
All serogroups	-	44
Invasive all serogroups	-	174
Invasive serogroup unknown	-	40
Other serogroup	-	2
Serogroup A C Y and W-135	-	2
Serogroup B	-	41
Serogroup unspecified	13	2150
Mumps	228	1380
Pellagra	50	-
Pneumonia	3	169
Poliomyelitis		
Non paralytic	-	134
Paralytic	-	344
Total	113	1725
Psittacosis	-	3
Rabies in animals	3	2284
Rocky mountain spotted fever	-	517
Rubella	-	1222
Salmonellosis		
NETSS	-	123
PHLIS	-	127
Unspecified	-	372
Scarlet fever		
Including streptococcal sore throat	90	554
Unspecified	321	1240
Shigellosis		
NETSS	-	125
PHLIS	-	127
Unspecified	-	374
Streptococcal disease, invasive group a	-	363
Streptococcal sore throat	-	96
Streptococcus pneumoniae invasive disease		
Drug resistant all ages	-	4
Non drug resistant <5 years	-	139
Syphilis		
Civilian primary and secondary	-	715
Congenital	-	157
Primary and secondary	-	1083
Tetanus	-	198
Toxic shock syndrome	-	292

Table 1, Number of weekly state or city reports per disease and subcategory, *continued*

Disease	City	State
Trichiniasis	-	19
Tuberculosis [phthisis pulmonalis]		
New active	-	139
Unspecified	1	1465
Tularemia	-	555
Typhoid fever [enteric fever]		
Including paratyphoid fever	-	621
Unspecified	314	2196
Typhus fever		
Endemic	-	24
Unspecified	5	176
West nile disease		
Neuroinvasive	-	149
Non-neuroinvasive	-	100
Whooping cough [pertussis]	353	2196

The diseases included in the weekly US Nationally Notifiable Disease Surveillance System varied largely over time and reflected the historical social-political priorities of each time period. Note that the diseases in the weekly system were a subset of all diseases included in the annual Notifiable Disease Surveillance System (that was not entered as part of this project).

The number of locations reporting diseases also varied over time depending on the type of reports submitted. Figure 1 on the next page provides an overview of the weeks for which a report was available per disease at the state or city level. Colors indicate the total number of reporting locations.

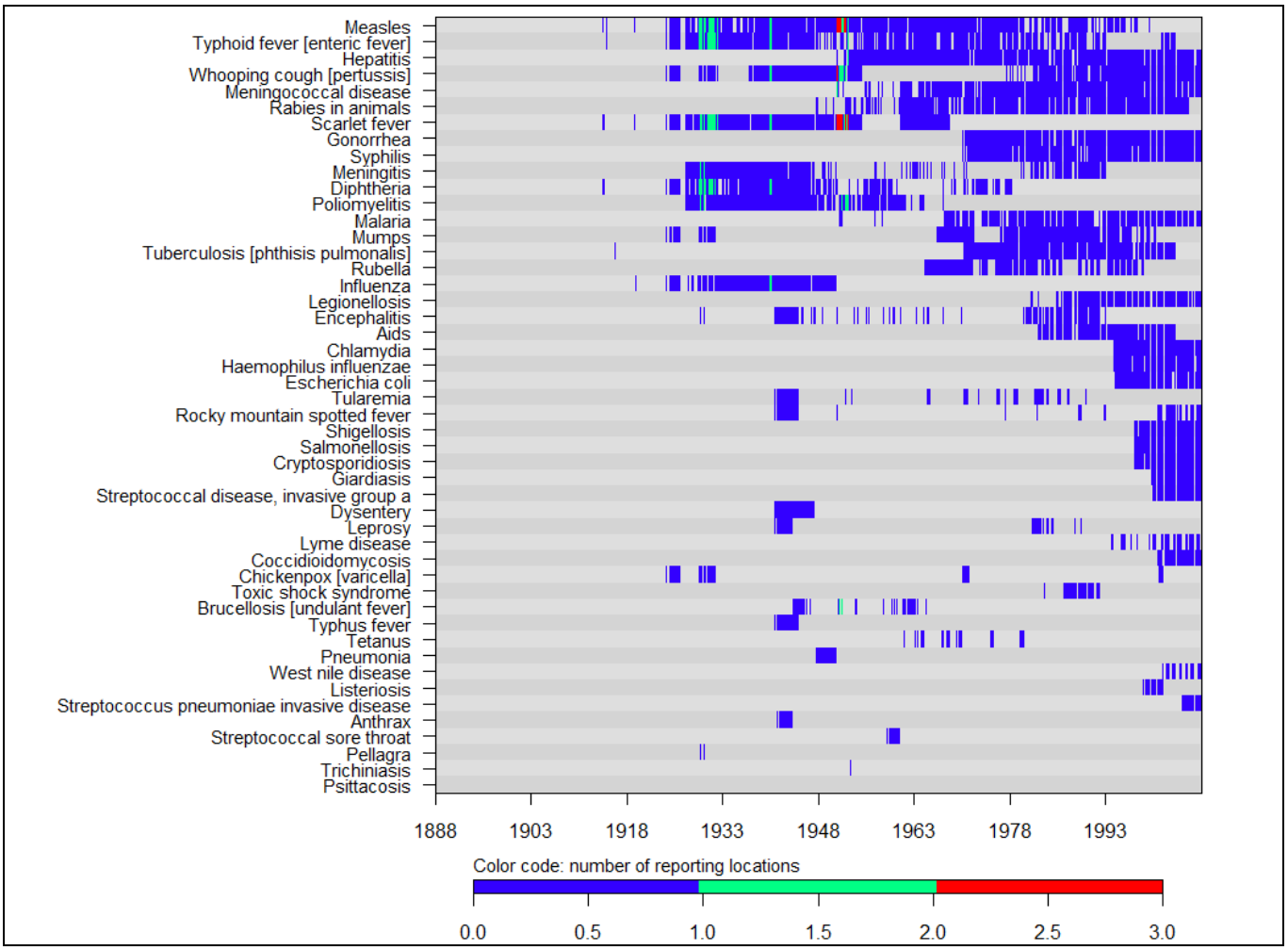

Figure 1, The number of locations (in color code) reporting on each disease per week between 1888 and 2009

The map in figure 2 (next page) illustrates the geographical distribution of the available city data. It displays the number of weekly reports for any disease available per location that was included (and for which coordinates could be derived)

Figure 3 below provides an overview of the number of diseases for which a weekly report was included at the state state level and for individual cities. All cities for which at least 100 weekly reports were available have been listed. For most states, it shows a major drop in the number of cities after 1925 and after 1953, city reports were discontinued except for New York City, which became its own reporting jurisdiction.

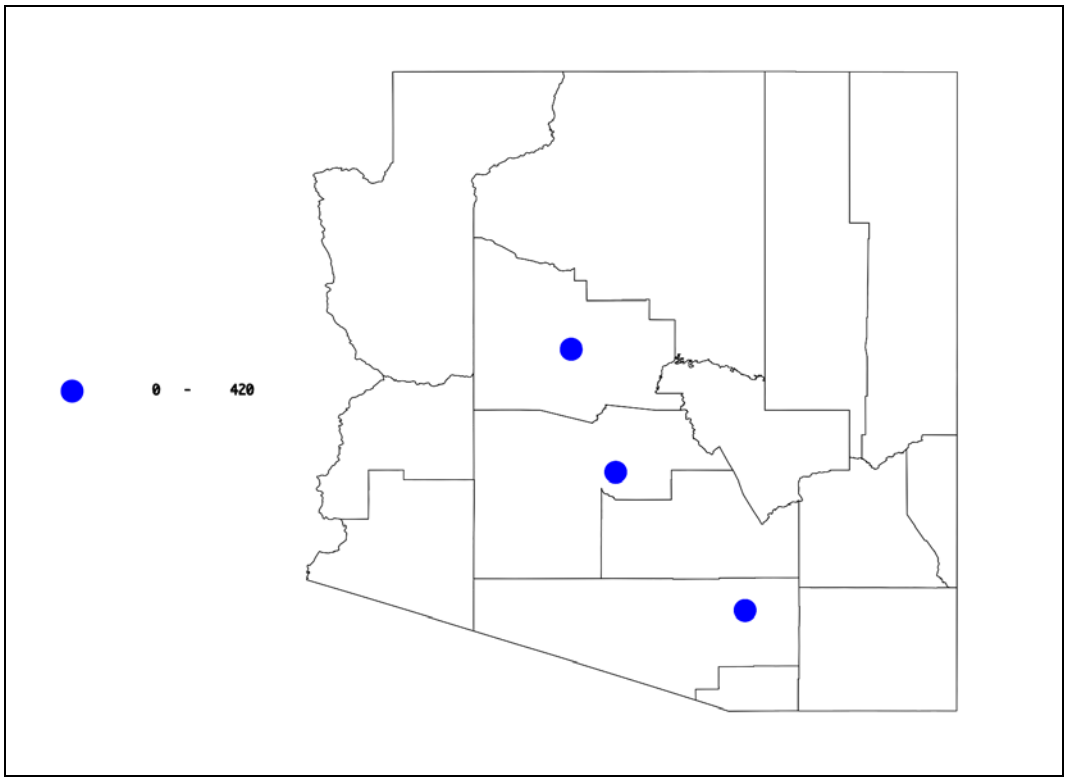

Figure 2, This map displays the number of weekly reports available for any disease per city (note that city reports were only available until 1953)

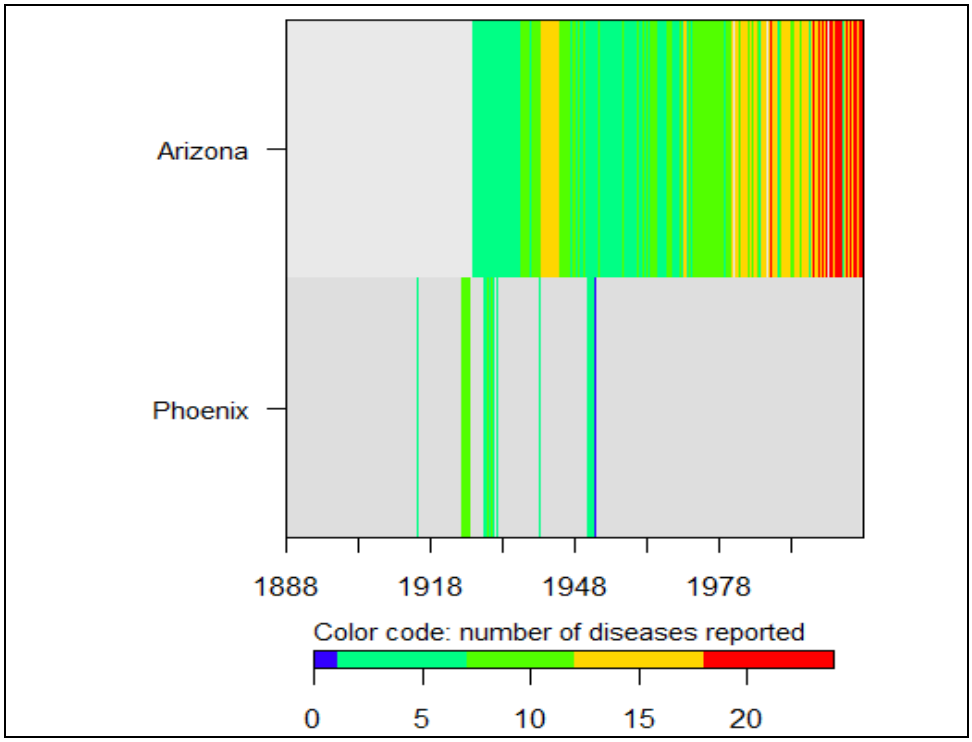

Figure 3, The number of diseases (in color code) that were reported for the state and city level (state on top row) for each week between 1888 and 2009

Disease specific data for Arizona

AIDS

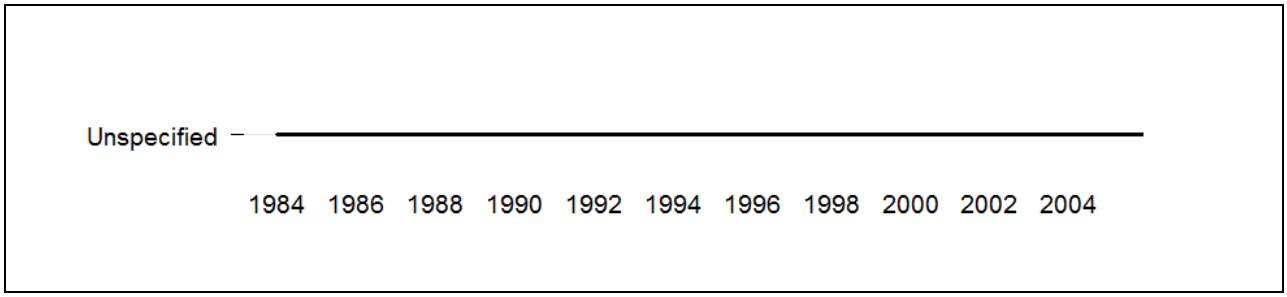

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for AIDS

Indicator	Arizona
Report period	1984-2005
Total weeks	941
Total cases	9,028
Max. cases per year	1,176
Year (max)	1993
Max. cases per week	768
Week (max)	1993, wk 15
Average cases per year	410
95%CI	(292-528)
Average cases per week	10
95%CI	(8-12)

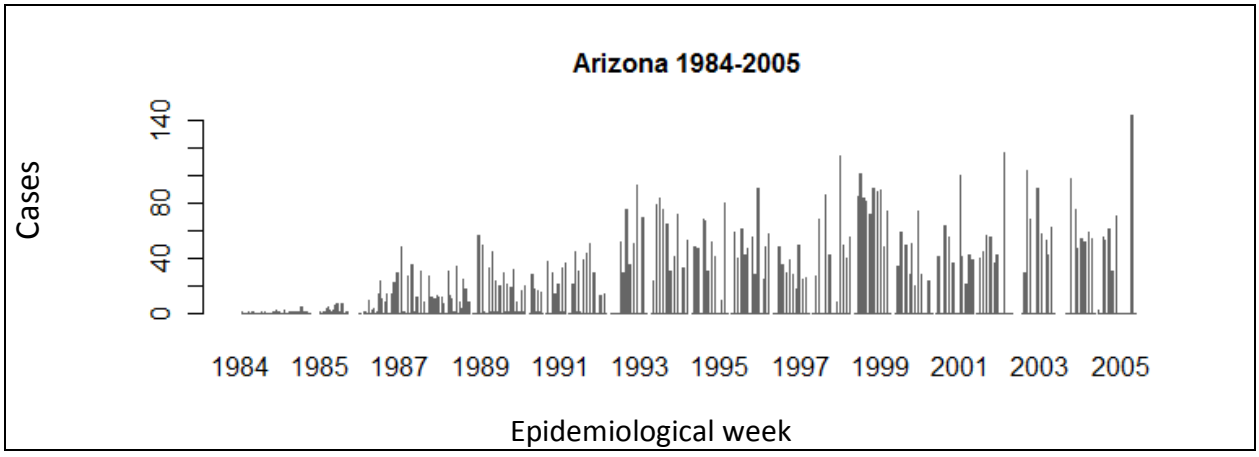

Figure D2, Number of cases reported for AIDS per epidemiological week

Chickenpox

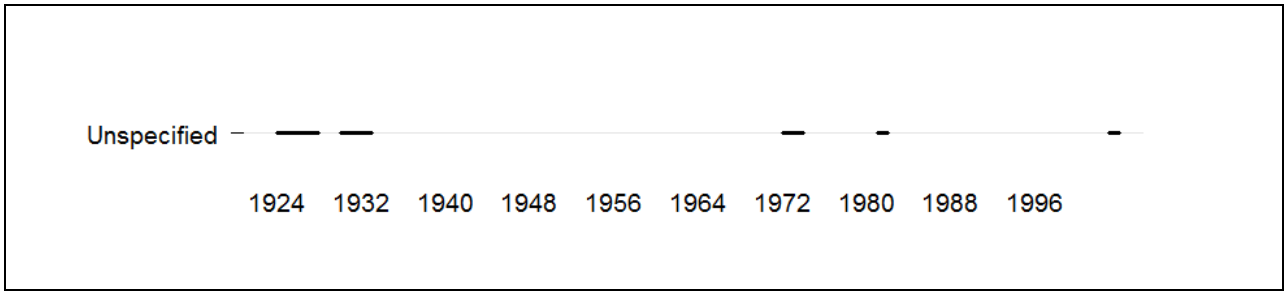

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Chickenpox

Indicator	Phoenix
Report period	1924-1932
Total weeks	229
Total cases	112
Max. cases per year	52
Year (max)	1930
Max. cases per week	8
Week (max)	1931, wk 07
Average cases per year	
before 1995	16
95%CI	(0-32)
Average cases per week	
before 1995	0
95%CI	(0-0)

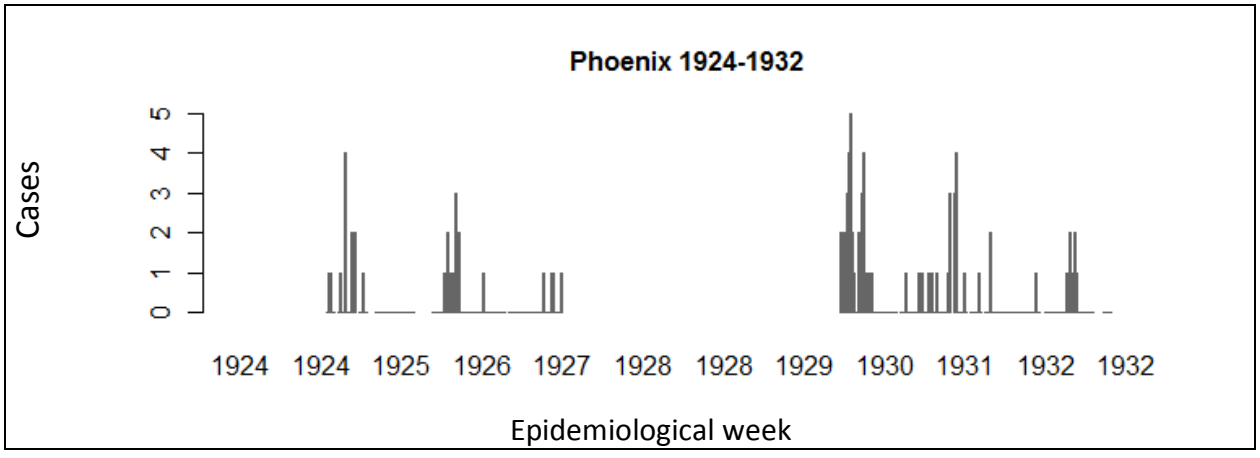

Figure D2, Number of cases reported for Chickenpox per epidemiological week

Chlamydia

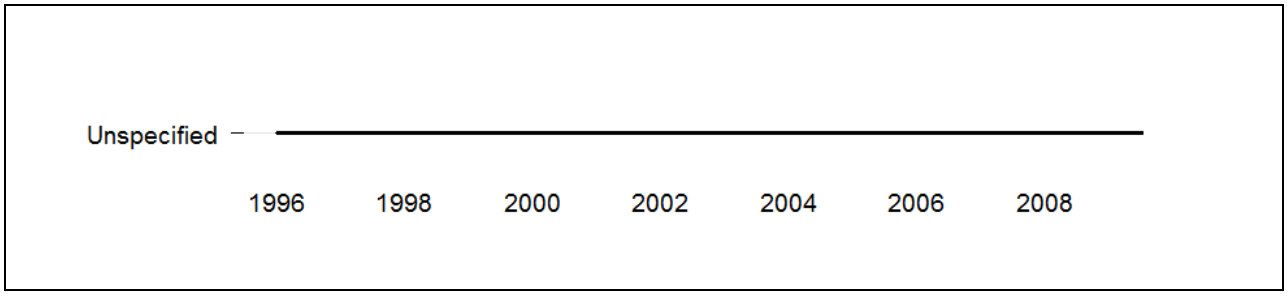

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Chlamydia

Indicator	Arizona
Report period	1996-2009
Total weeks	675
Total cases	178,765
Max. cases per year	21,929
Year (max)	2007
Max. cases per week	4,773
Week (max)	2004, wk 23
Average cases per year	12,769
95%CI	(9,974-15,564)
Average cases per week	265
95%CI	(237-293)

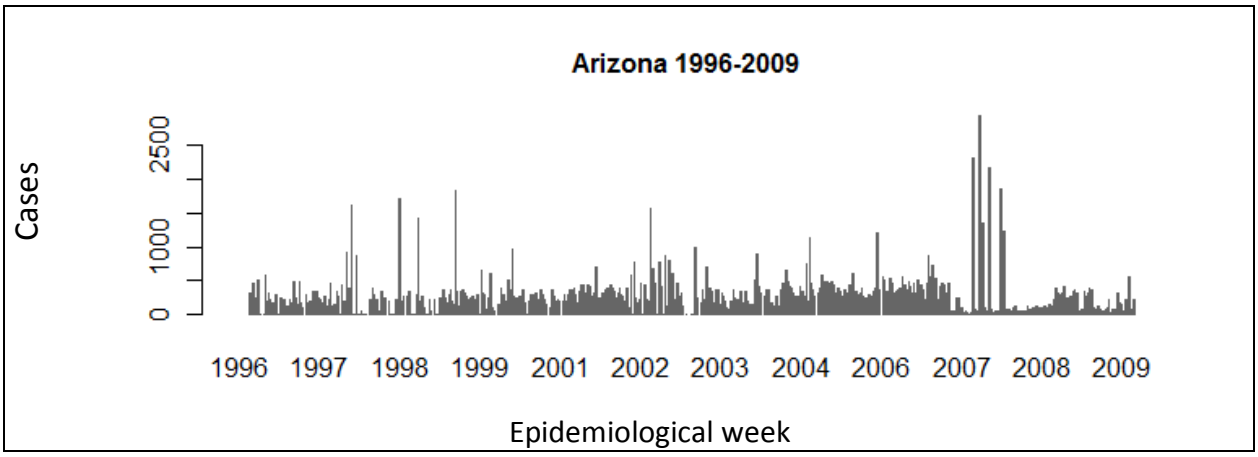

Figure D2, Number of cases reported for Chlamydia per epidemiological week

Coccidioidomycosis

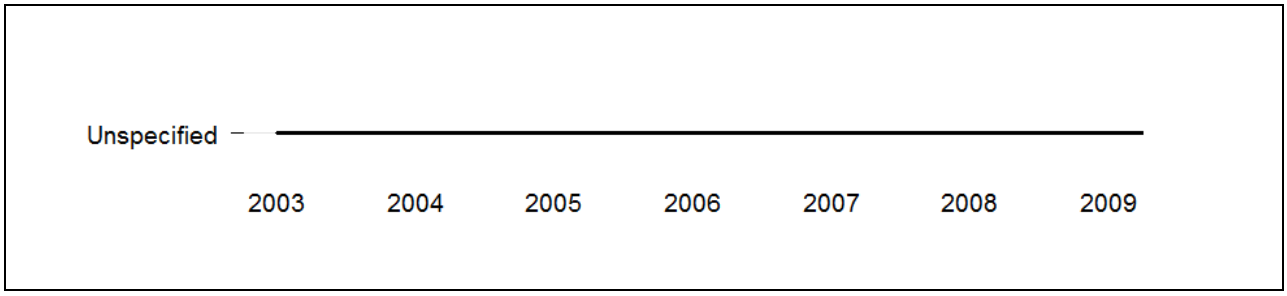

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Coccidioidomycosis

Indicator	Arizona
Report period	2003-2009
Total weeks	322
Total cases	28,975
Max. cases per year	5,723
Year (max)	2007
Max. cases per week	1,343
Week (max)	2004, wk 23
Average cases per year	4,139
95%CI	(3,105-5,173)
Average cases per week	90
95%CI	(77-103)

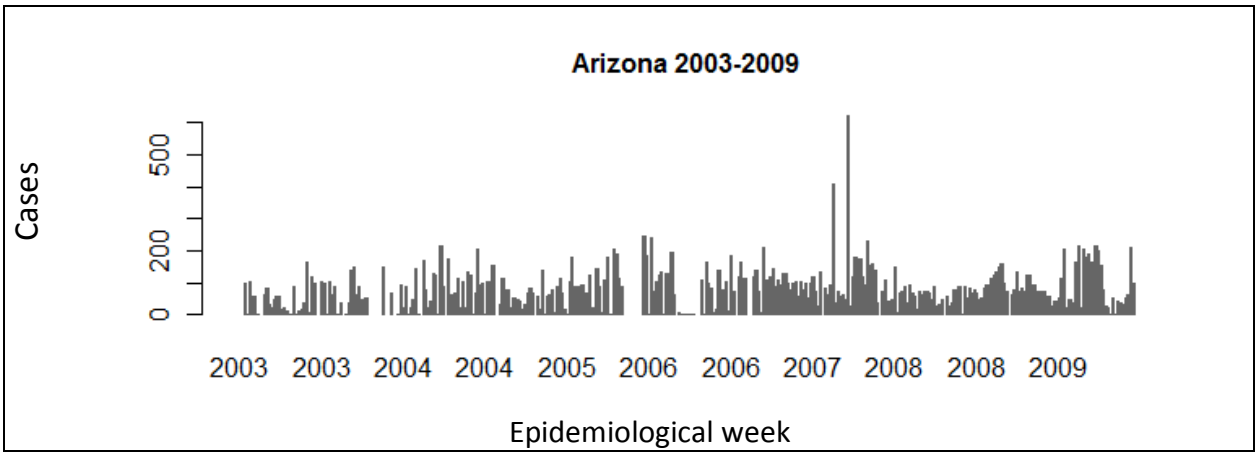

Figure D2, Number of cases reported for Coccidioidomycosis per epidemiological week

Cryptosporidiosis

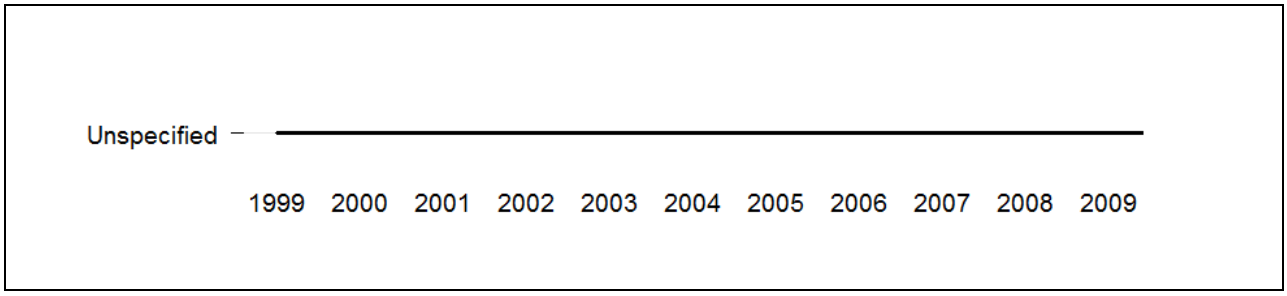

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Cryptosporidiosis

Indicator	Arizona
Report period	1999-2009
Total weeks	491
Total cases	243
Max. cases per year	66
Year (max)	2008
Max. cases per week	7
Week (max)	2006, wk 31
Average cases per year	22
95%CI	(9-35)
Average cases per week	0
95%CI	(0-0)

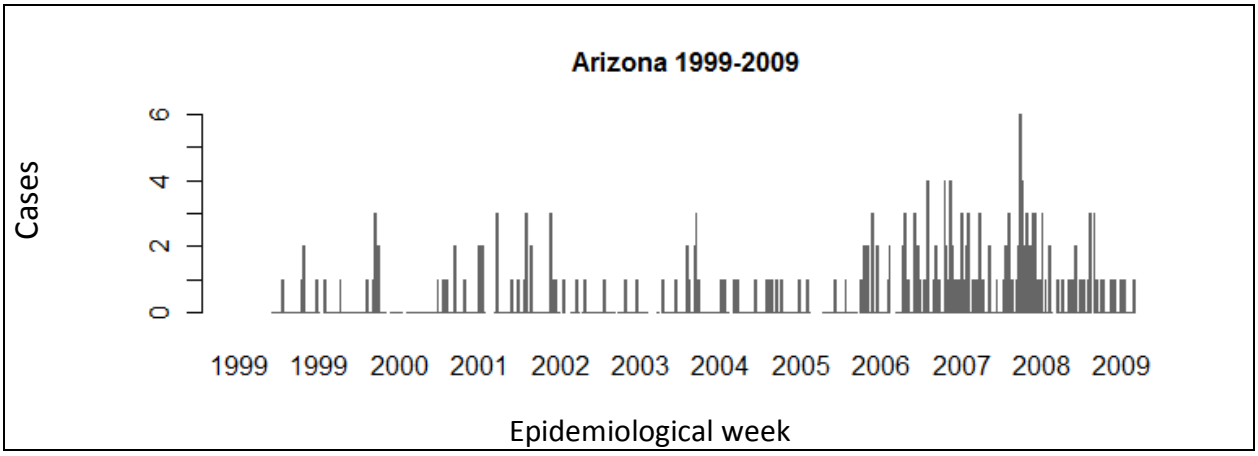

Figure D2, Number of cases reported for Cryptosporidiosis per epidemiological week

Diphtheria

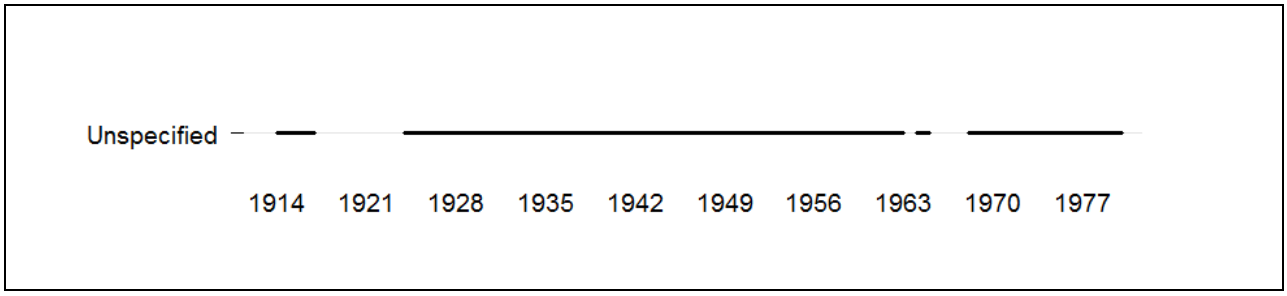

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Diphtheria

Indicator	Arizona
Report period	1927-1979
Total weeks	1,614
Total cases	4,489
Max. cases per year	484
Year (max)	1970
Max. cases per week	448
Week (max)	1970, wk 44
Average cases per year	
before 1940	179
95%CI	(134-224)
after 1940	57
95%CI	(25-89)
Average cases per week	
before 1940	4
95%CI	(4-4)
after 1940	2
95%CI	(1-3)

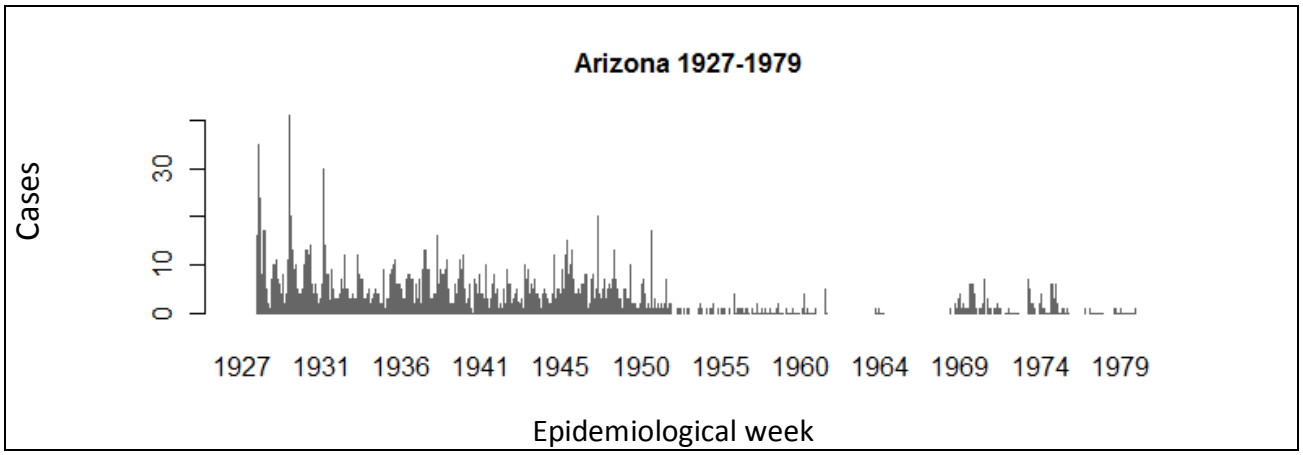

Figure D2, Number of cases reported for Diphtheria per epidemiological week

Escherichia Coli

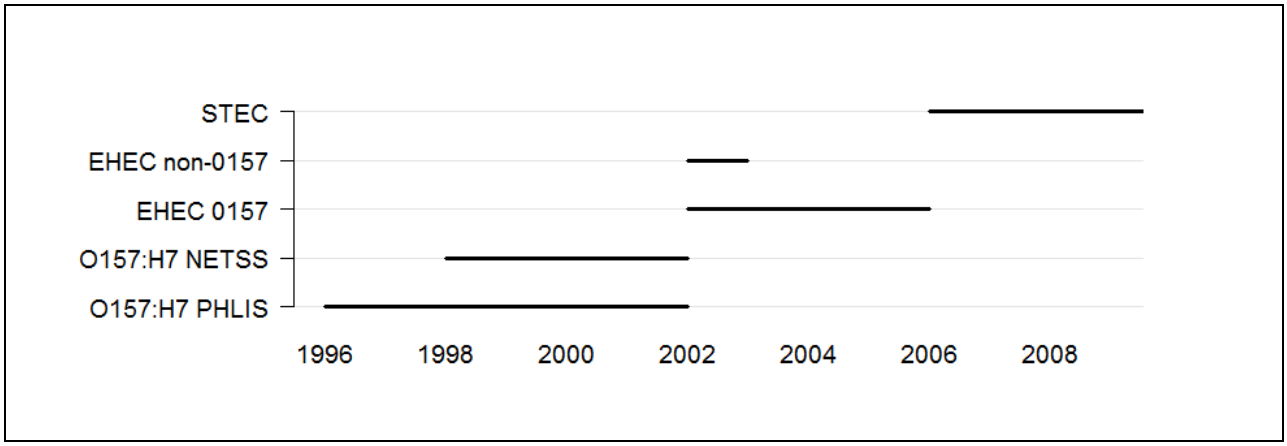

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Escherichia Coli (0157:H7 PHLIS, EHEC 0157, and STEC)

Indicator	Arizona
Report period	1996-2009
Total weeks	608
Total cases	654
Max. cases per year	126
Year (max)	2007
Max. cases per week	33
Week (max)	2006, wk 31
Average cases per year	47
95%CI	(28-66)
Average cases per week	1
95%CI	(1-1)

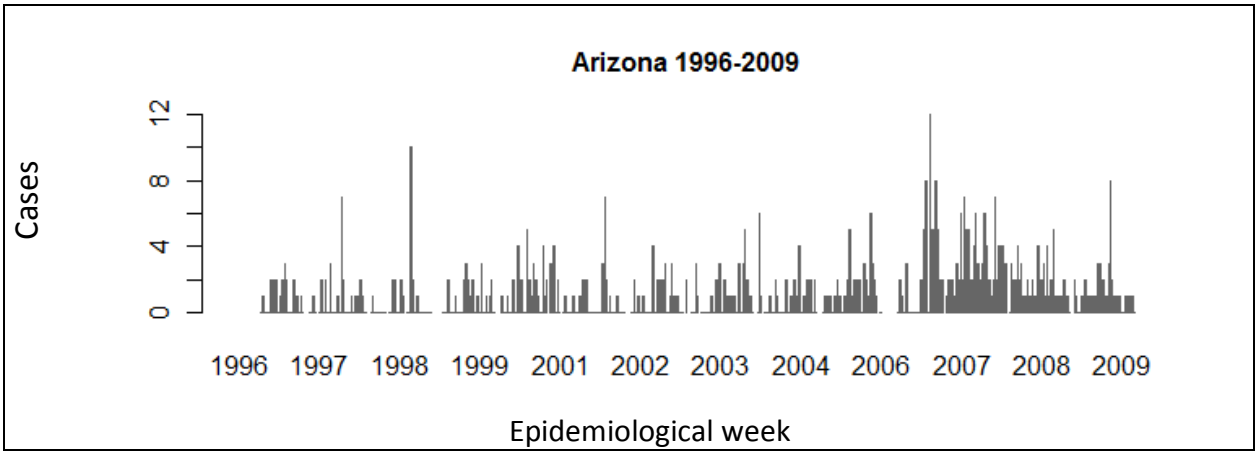

Figure D2, Number of cases reported for Escherichia Coli per epidemiological week

Giardiasis

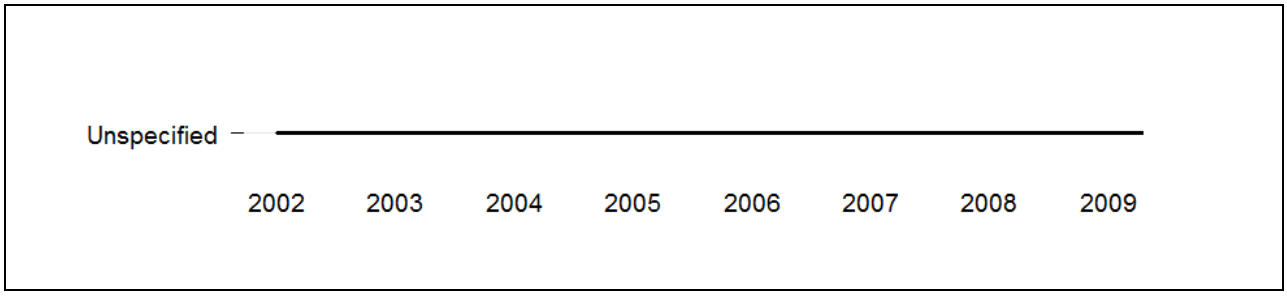

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Giardiasis

Indicator	Arizona
Report period	2002-2009
Total weeks	369
Total cases	1,292
Max. cases per year	238
Year (max)	2003
Max. cases per week	57
Week (max)	2007, wk 41
Average cases per year	162
95%CI	(113-211)
Average cases per week	4
95%CI	(3-5)

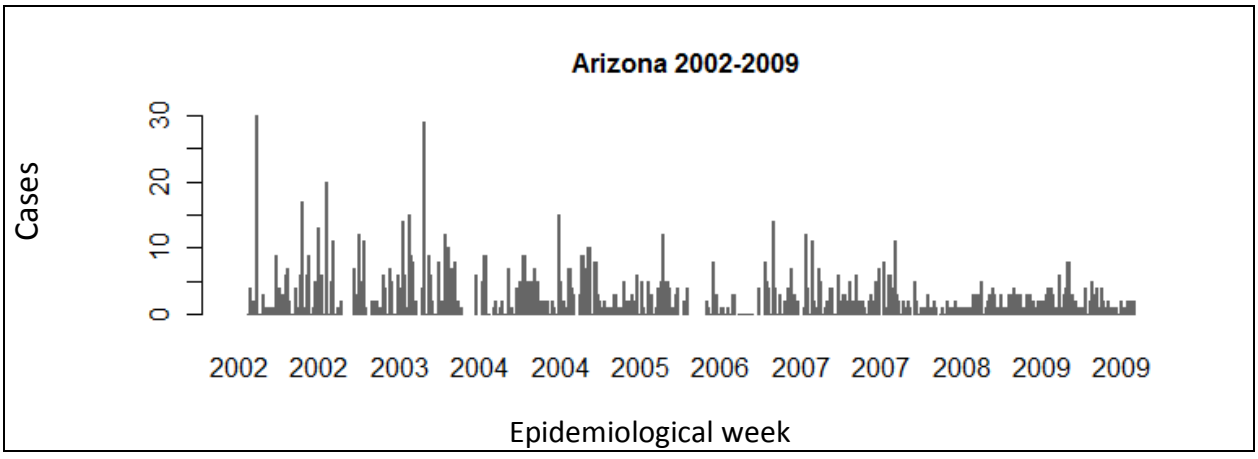

Figure D2, Number of cases reported for Giardiasis per epidemiological week

Gonorrhea

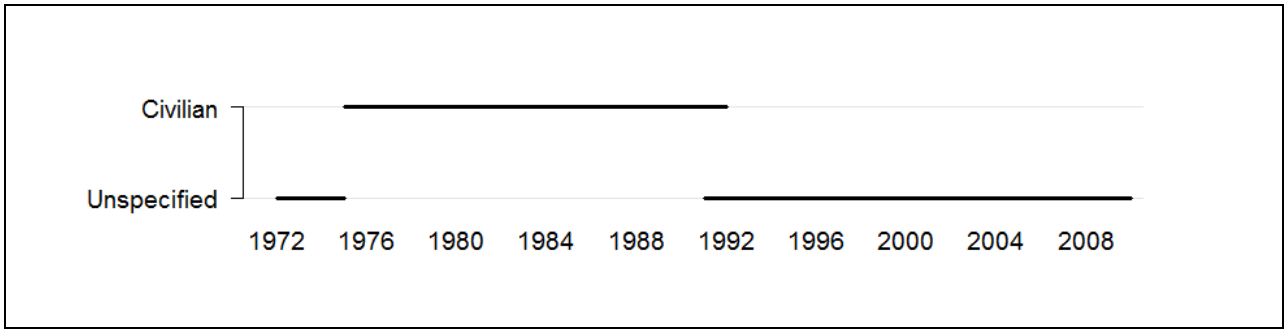

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Gonorrhea (Unspecified and Civilian)

Indicator	Arizona
Report period	1972-2009
Total weeks	1,808
Total cases	217,057
Max. cases per year	11,308
Year (max)	1979
Max. cases per week	3,297
Week (max)	2001, wk 44
Average cases per year	5,712
95%CI	(4,765-6,659)
Average cases per week	120
95%CI	(114-126)

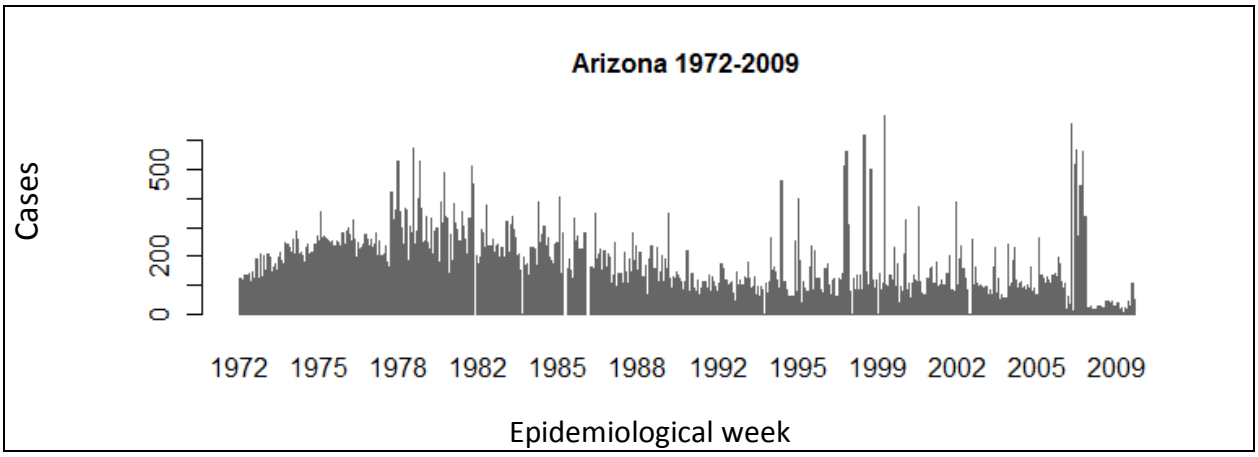

Figure D2, Number of cases reported for Gonorrhea per epidemiological week

Haemophilus Influenzae

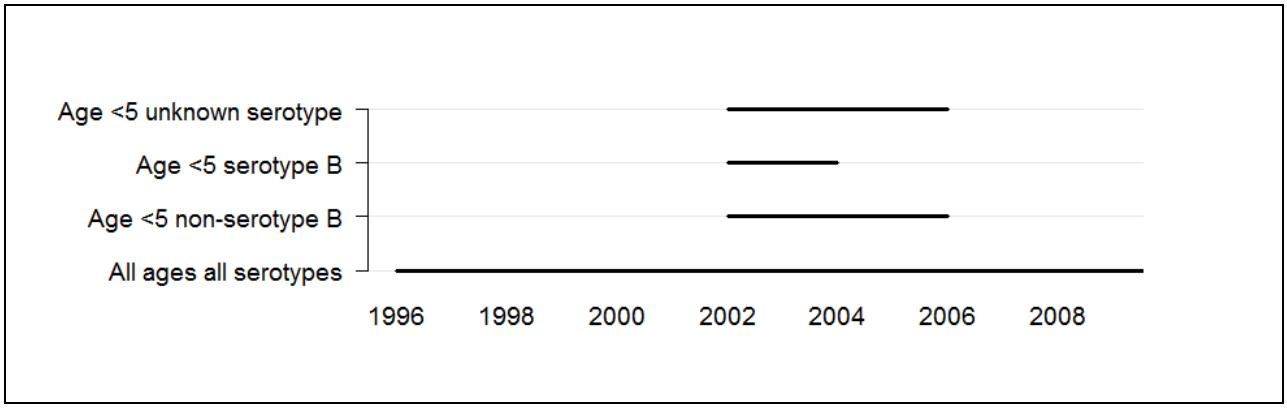

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Haemophilus Influenzae (All ages all serotypes)

Indicator	Arizona
Report period	1996-2009
Total weeks	634
Total cases	1,119
Max. cases per year	181
Year (max)	2005
Max. cases per week	87
Week (max)	2008, wk 29
Average cases per year	80
95%CI	(52-108)
Average cases per week	2
95%CI	(2-2)

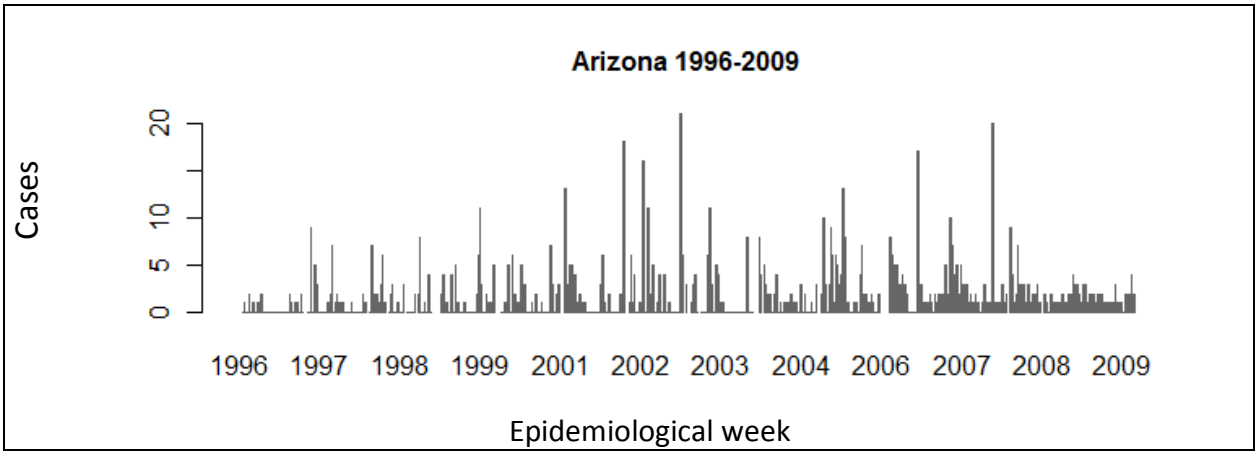

Figure D2, Number of cases reported for Haemophilus Influenzae per epidemiological week

Hepatitis

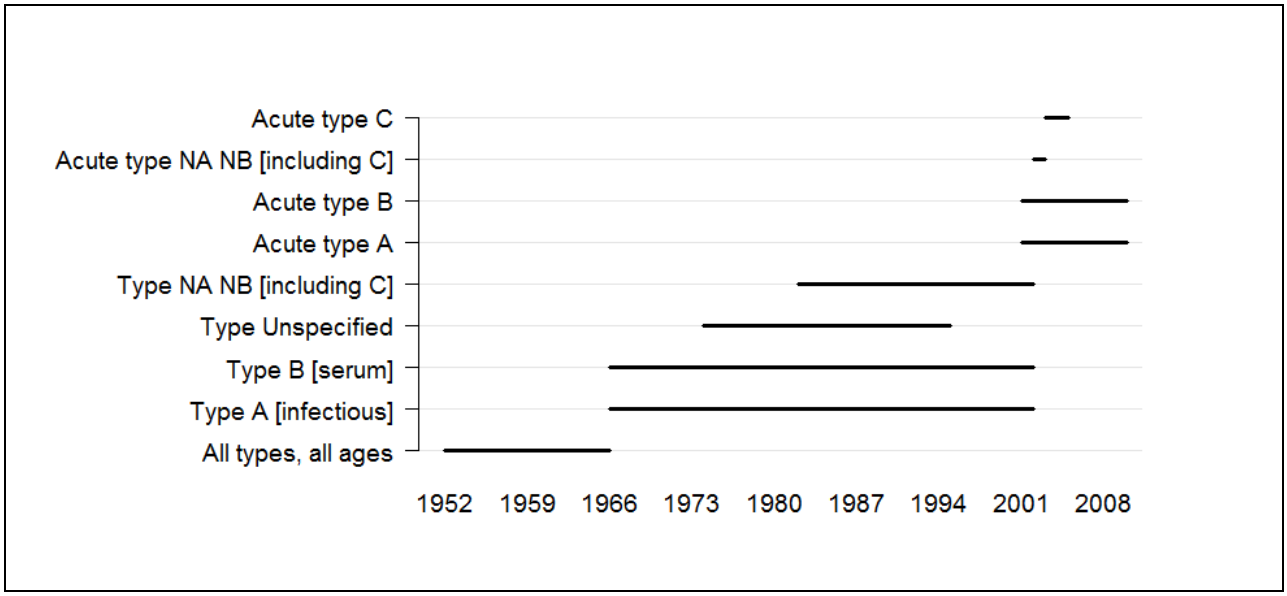

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Hepatitis (Type A [Infectious], Acute type A, Type B [Serum], and Acute type B)

Indicator	**Arizona**
Report period	1966-2009
Total weeks	2,034
Total cases	26,146
Max. cases per year	1,437
Year (max)	1989
Max. cases per week	399
Week (max)	1970, wk 44
Average cases per year	
before 1990	679
95%CI	(530-828)
after 1990	482
95%CI	(325-639)
Average cases per week	
before 1990	15
95%CI	(14-16)
after 1990	10
95%CI	(9-11)

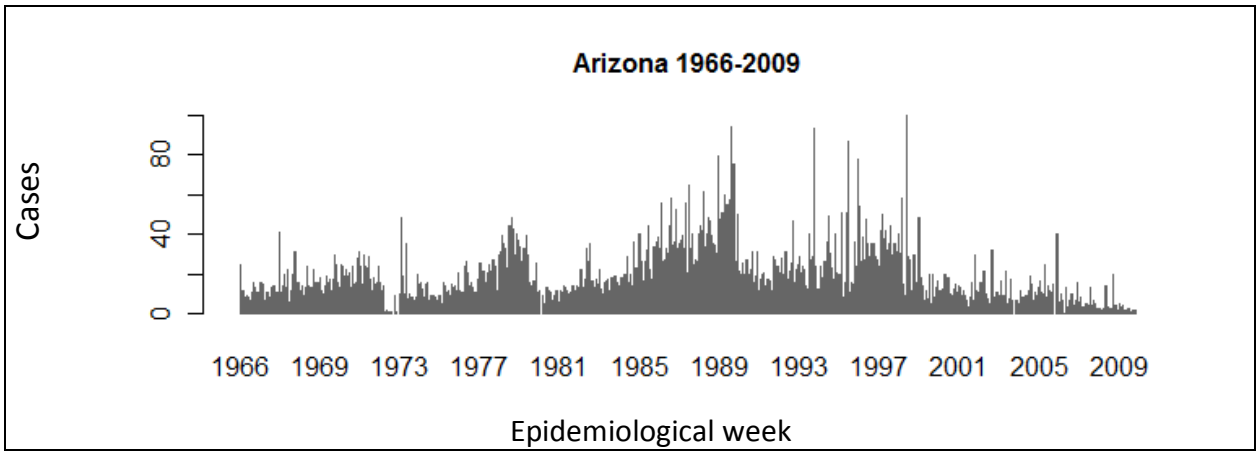

Figure D2, Number of cases reported for Hepatitis per epidemiological week

Influenza

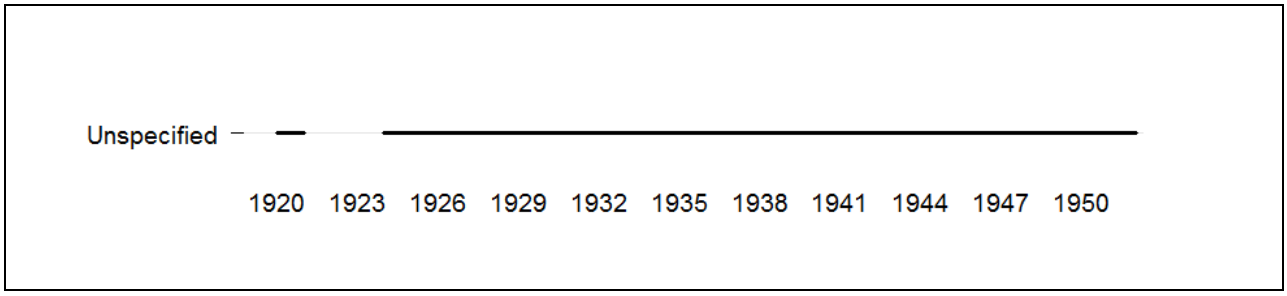

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Influenza

Indicator	Arizona
Report period	1927-1951
Total weeks	1,110
Total cases	118,963
Max. cases per year	17,934
Year (max)	1951
Max. cases per week	2,795
Week (max)	1951, wk 11
Average cases per year	4,759
95%CI	(3,057-6,461)
Average cases per week	107
95%CI	(93-121)

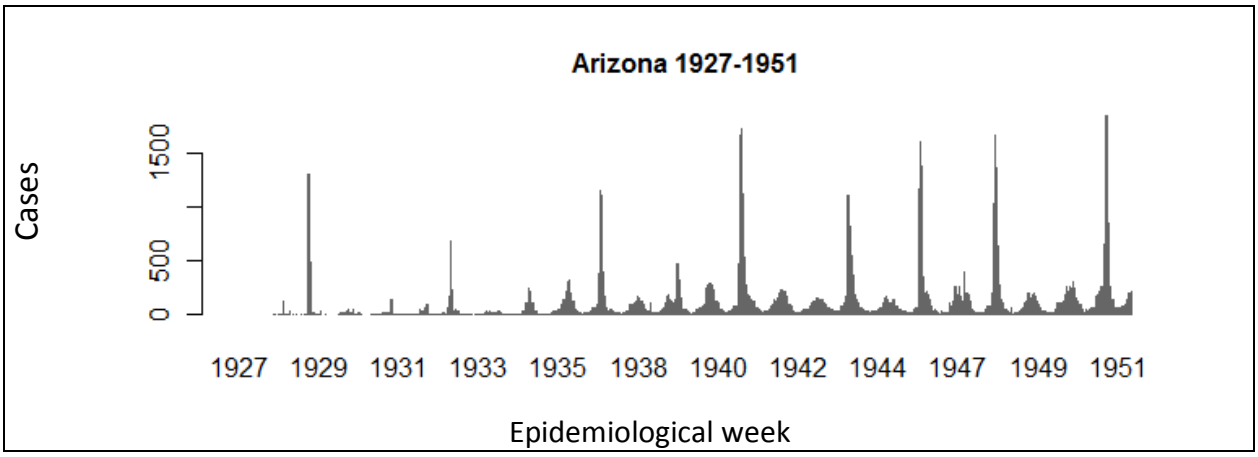

Figure D2, Number of cases reported for Influenza per epidemiological week

Legionellosis

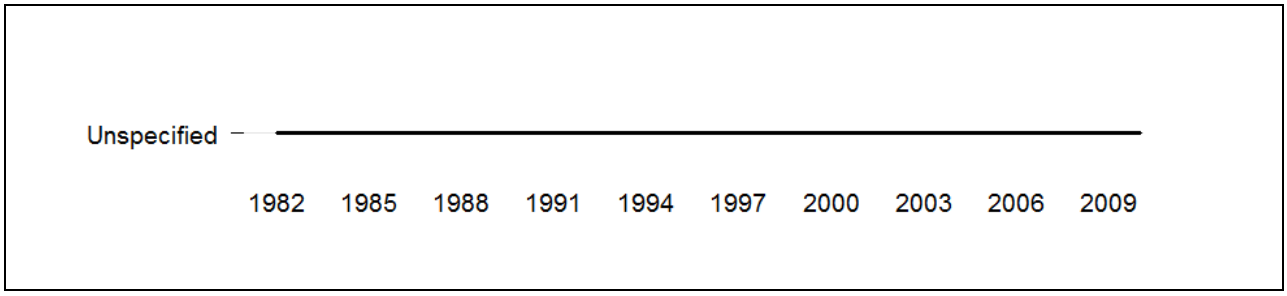

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Legionellosis

Indicator	Arizona
Report period	1982-2009
Total weeks	989
Total cases	566
Max. cases per year	47
Year (max)	2007
Max. cases per week	17
Week (max)	1995, wk 12
Average cases per year	20
95%CI	(15-25)
Average cases per week	1
95%CI	(1-1)

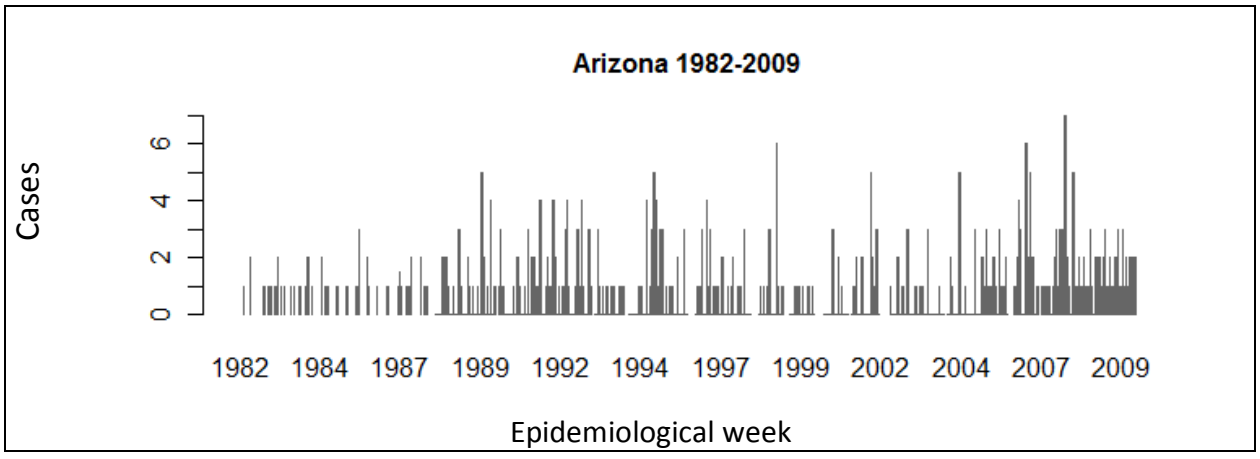

Figure D2, Number of cases reported for Legionellosis per epidemiological week

Listeriosis

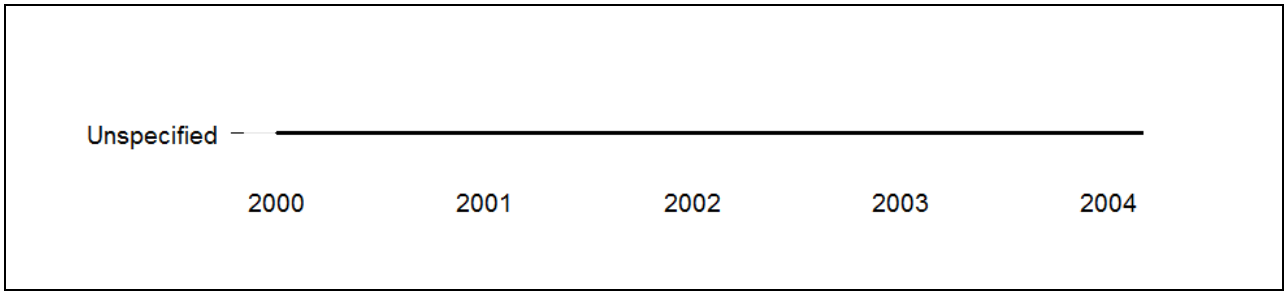

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Listeriosis

Indicator	Arizona
Report period	2000-2004
Total weeks	150
Total cases	39
Max. cases per year	13
Year (max)	2002
Max. cases per week	4
Week (max)	2000, wk 52
Average cases per year	8
95%CI	(2-14)
Average cases per week	0
95%CI	(0-0)

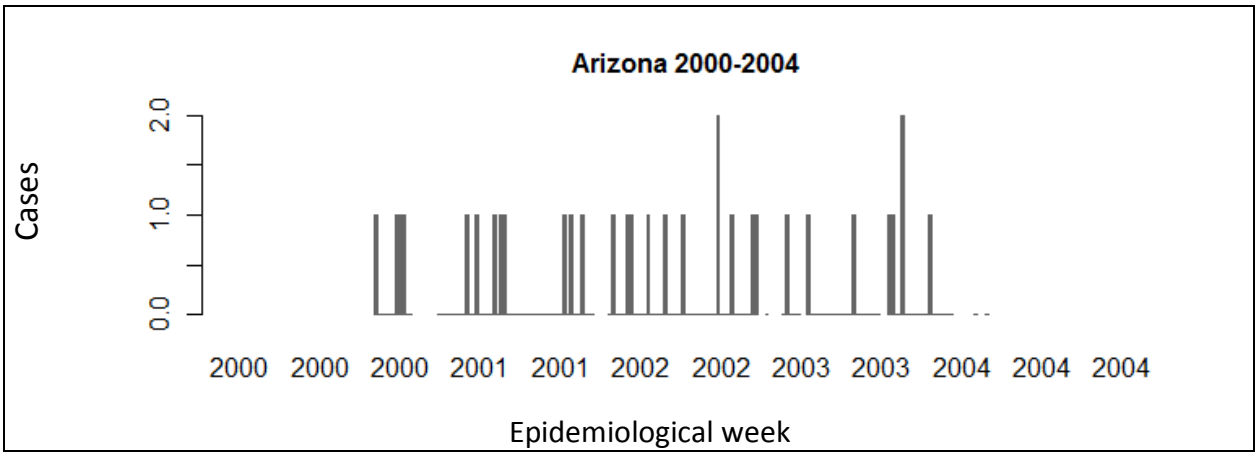

Figure D2, Number of cases reported for Listeriosis per epidemiological week

Malaria

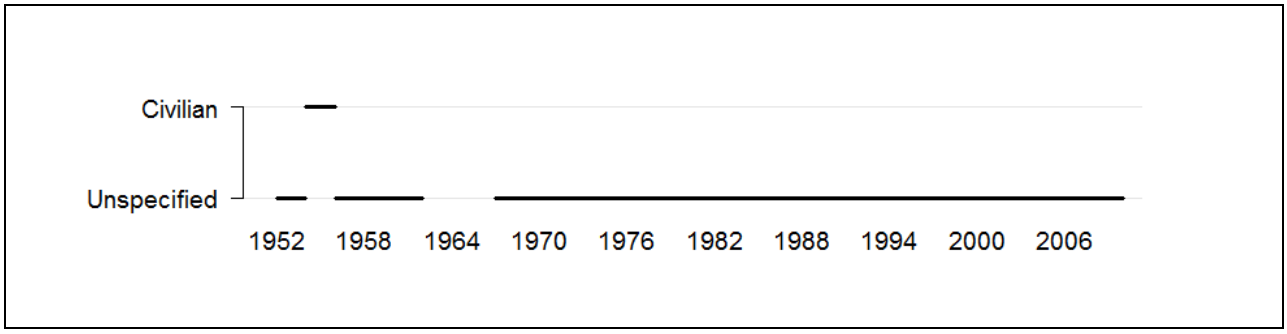

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Malaria (Unspecified)

Indicator	Arizona
Report period	1952-2009
Total weeks	1,679
Total cases	526
Max. cases per year	70
Year (max)	2004
Max. cases per week	58
Week (max)	2004, wk 10
Average cases per year	10
95%CI	(6-14)
Average cases per week	0
95%CI	(0-0)

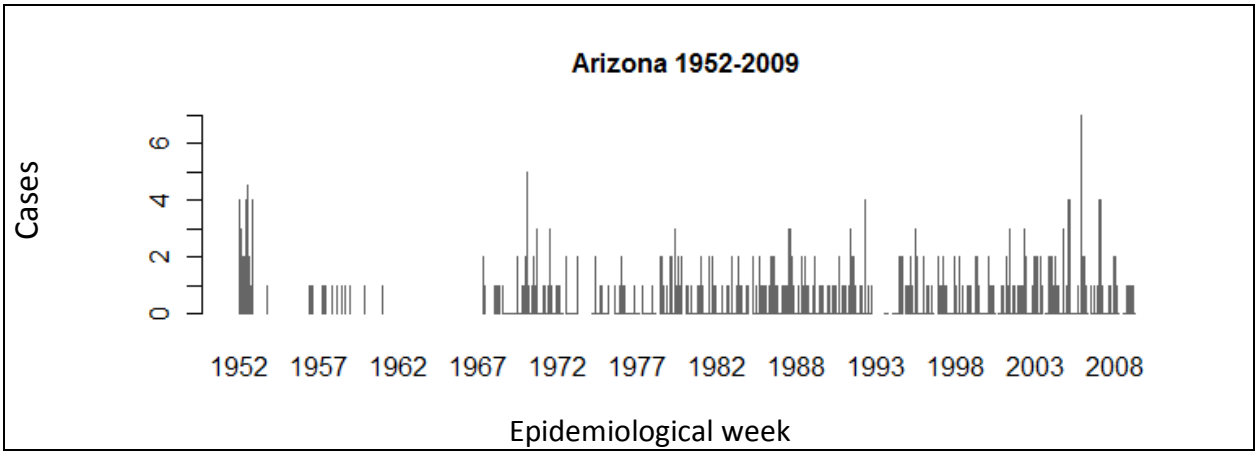

Figure D2, Number of cases reported for Malaria per epidemiological week

Measles

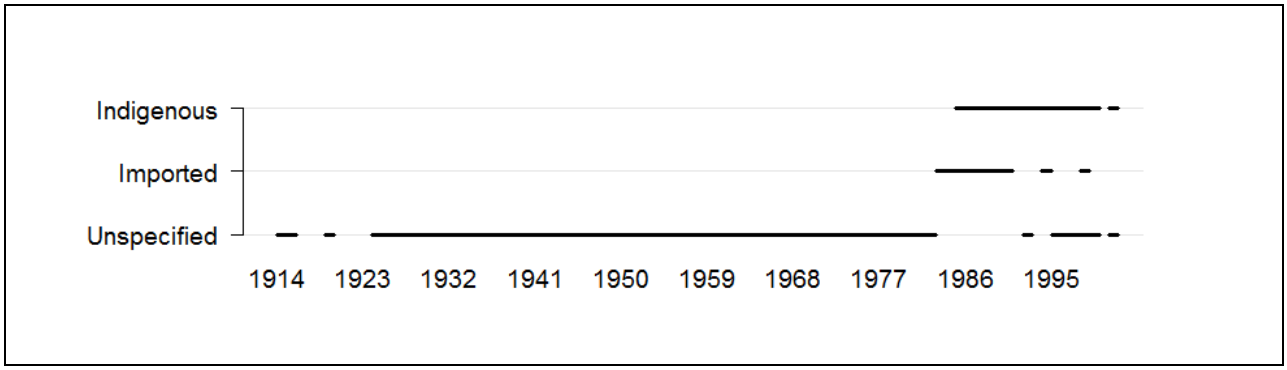

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Measles (Unspecified)

Indicator	Arizona
Report period	1927-2001
Total weeks	2,771
Total cases	158,548
Max. cases per year	10,100
Year (max)	1955
Max. cases per week	977
Week (max)	1958, wk 20
Average cases per year	
before 1970	3,536
95%CI	(2,609-4,463)
after 1970	156
95%CI	(43-269)
Average cases per week	
before 1970	75
95%CI	(70-80)
after 1970	4
95%CI	(3-5)

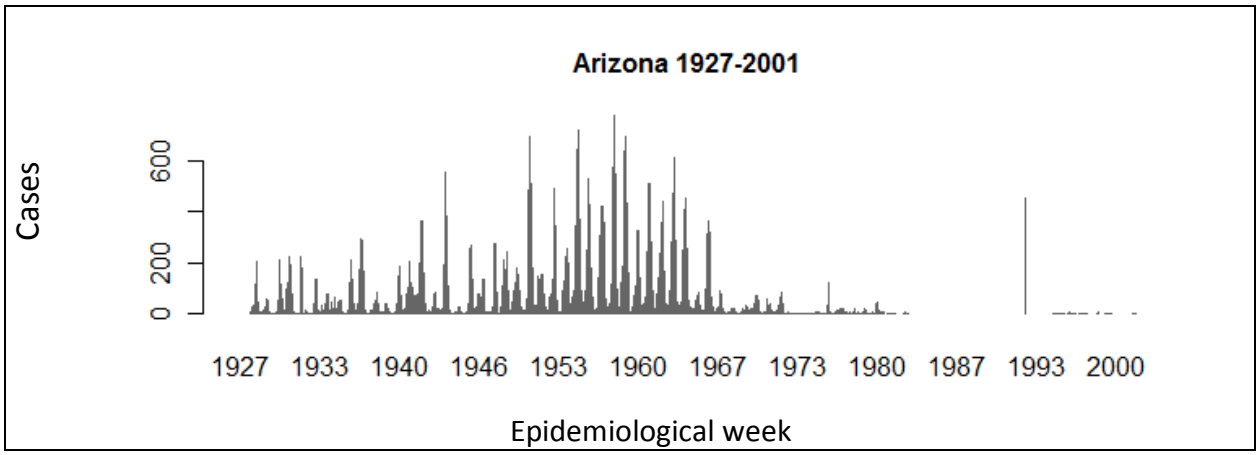

Figure D2, Number of cases reported for Measles per epidemiological week

Meningitis

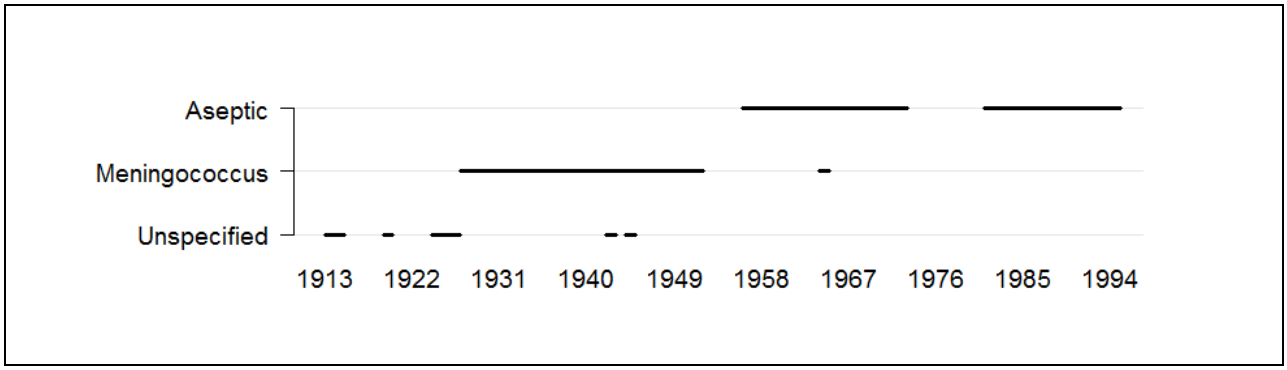

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Meningitis (Meningococcus)

Indicator	Arizona
Report period	1927-1964
Total weeks	1,145
Total cases	1,079
Max. cases per year	277
Year (max)	1929
Max. cases per week	25
Week (max)	1930, wk 02
Average cases per year	42
95%CI	(18-66)
Average cases per week	1
95%CI	(1-1)

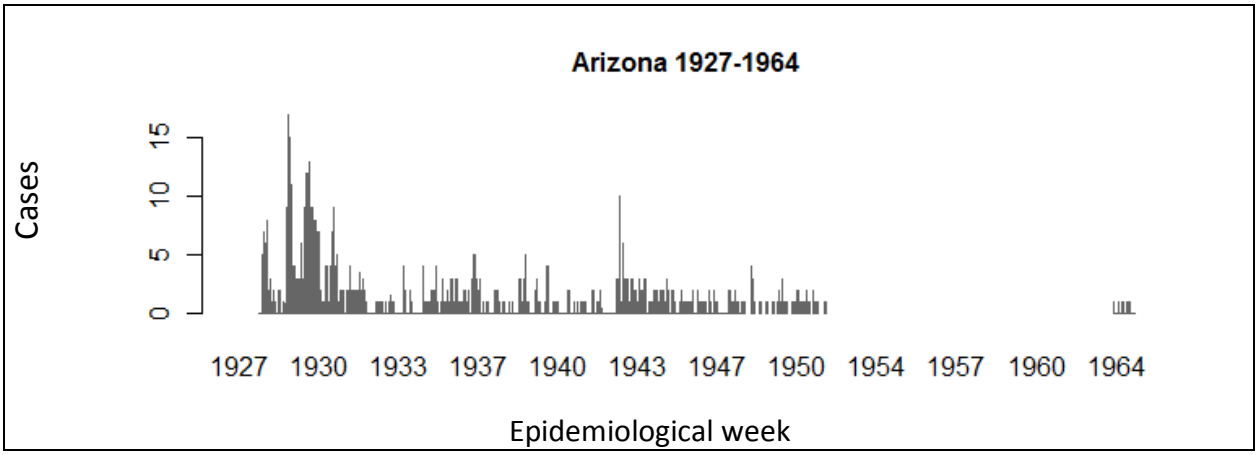

Figure D2, Number of cases reported for Meningitis per epidemiological week

Meningococcal Disease

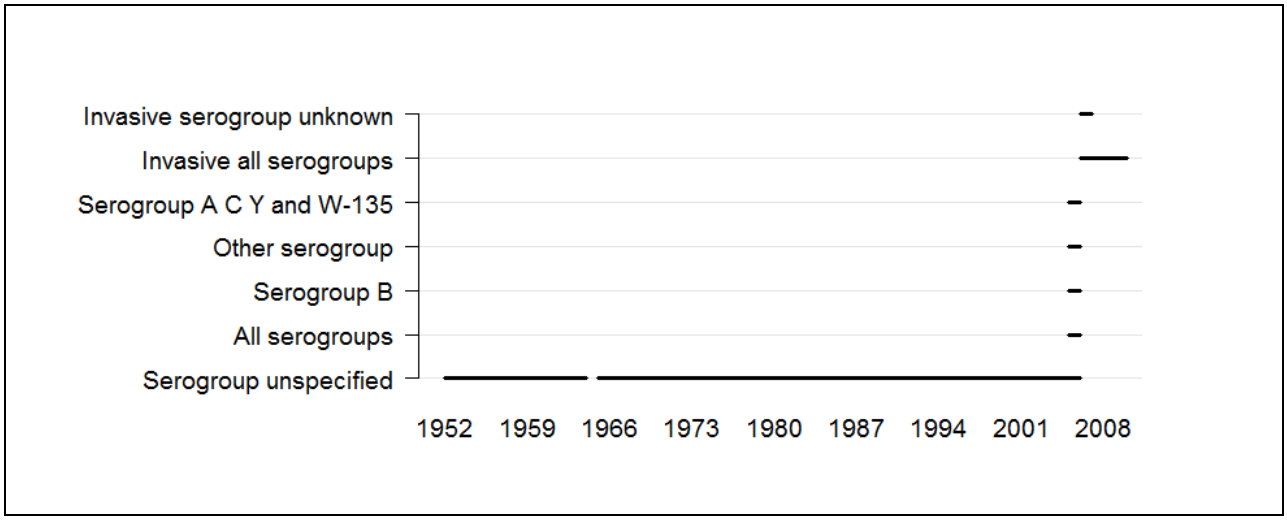

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Meningococcal Disease (Serogroup unspecified and Invasive all serogroups)

Indicator	**Arizona**
Report period	1952-2009
Total weeks	2,324
Total cases	1,522
Max. cases per year	190
Year (max)	1953
Max. cases per week	125
Week (max)	1953, wk 01
Average cases per year	
before 1980	24
95%CI	(9-39)
after 1980	29
95%CI	(22-36)
Average cases per week	
before 1980	1
95%CI	(1-1)
after 1980	1
95%CI	(1-1)

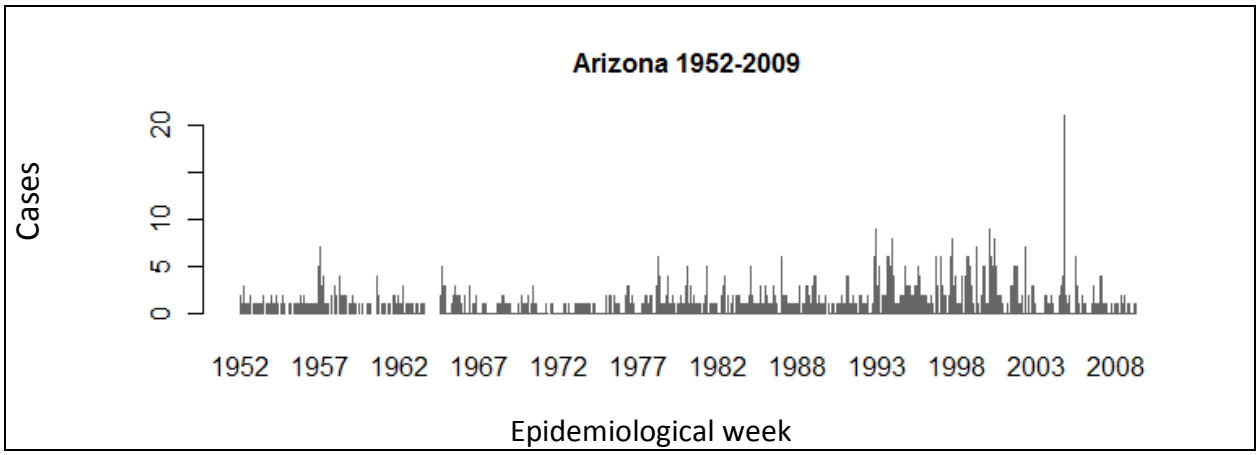

Figure D2, Number of cases reported for Meningococcal Disease per epidemiological week

Mumps

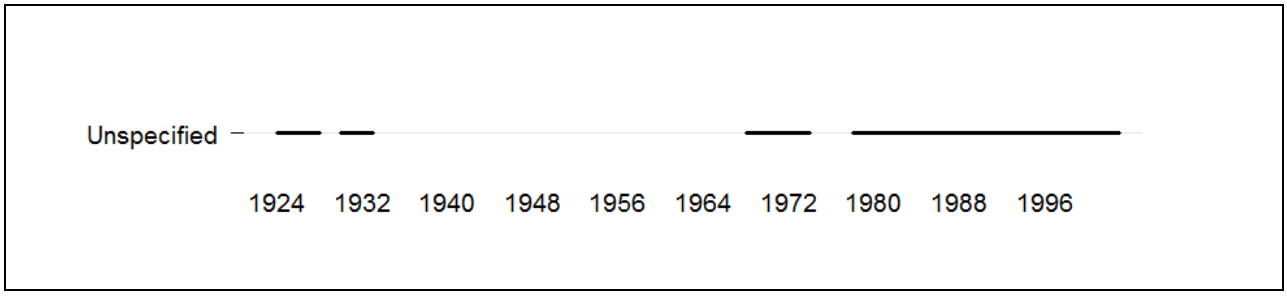

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Mumps

Indicator	Arizona	Phoenix
Report period	1968-2002	1924-1932
Total weeks	1,380	228
Total cases	9,279	43
Max. cases per year	2,102	32
Year (max)	1969	1930
Max. cases per week	123	6
Week (max)	1969, wk 18	1930, wk 04
Average cases per year		
before 1980	846	6
95%CI	(208-1,484)	(-5-17)
after 1980	76	-
95%CI	(45-107)	-
Average cases per week		
before 1980	17	0
95%CI	(15-19)	(0-0)
after 1980	2	-
95%CI	(2-2)	-

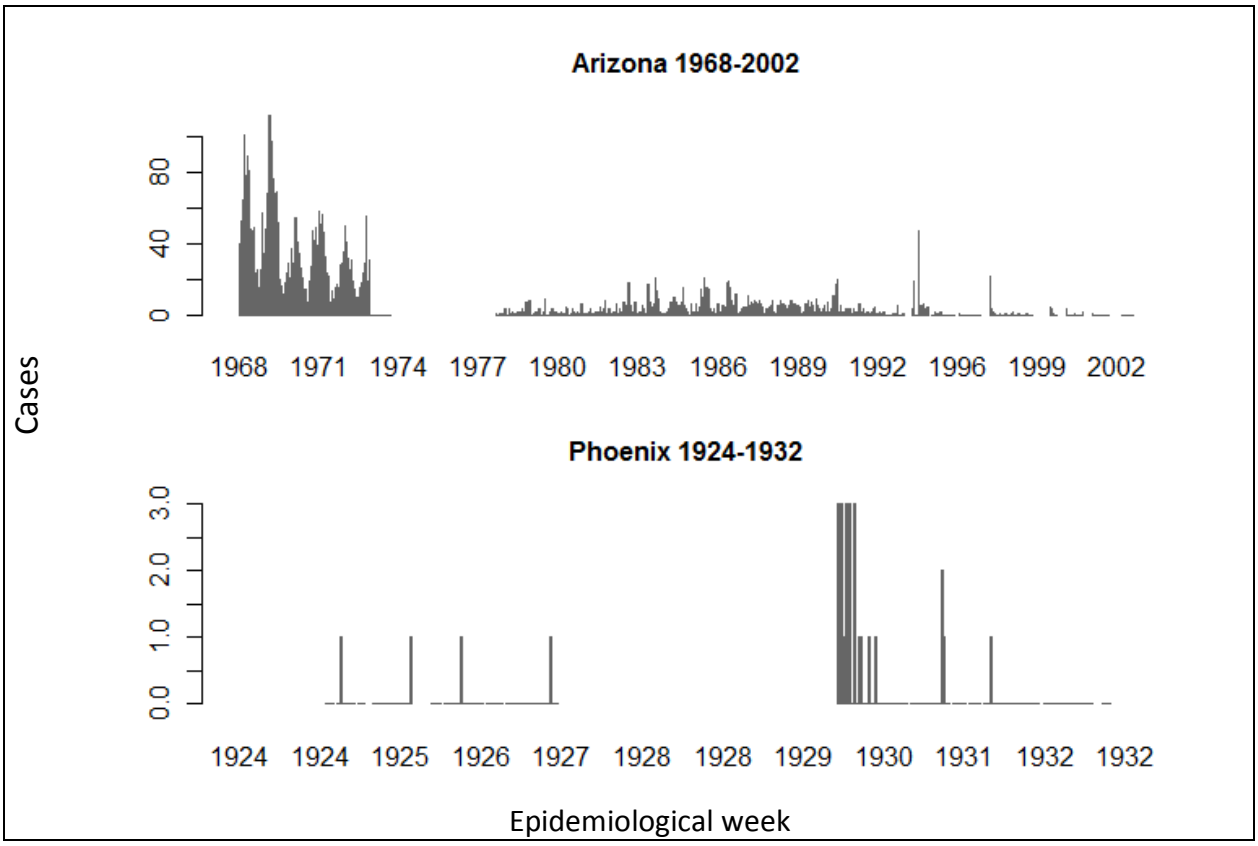

Figure D2, Number of cases reported for Mumps per epidemiological week

Pneumonia

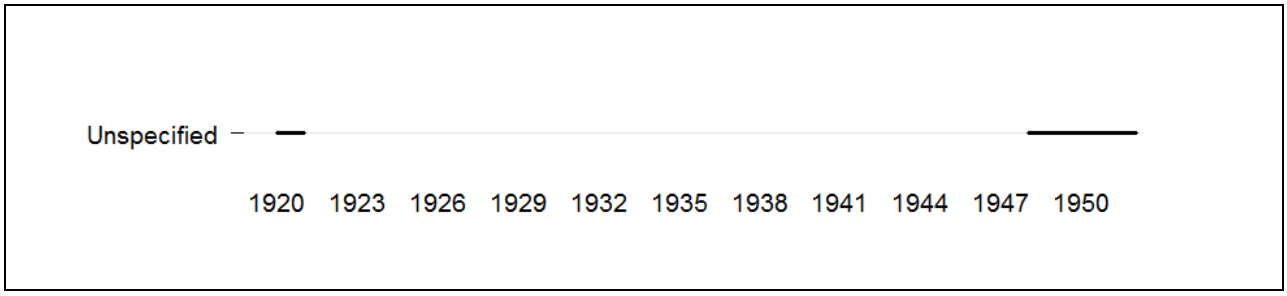

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Pneumonia (Unspecified)

Indicator	Arizona
Report period	1948-1951
Total weeks	169
Total cases	3,423
Max. cases per year	1,468
Year (max)	1951
Max. cases per week	113
Week (max)	1951, wk 09
Average cases per year	856
95%CI	(83-1,629)
Average cases per week	20
95%CI	(17-23)

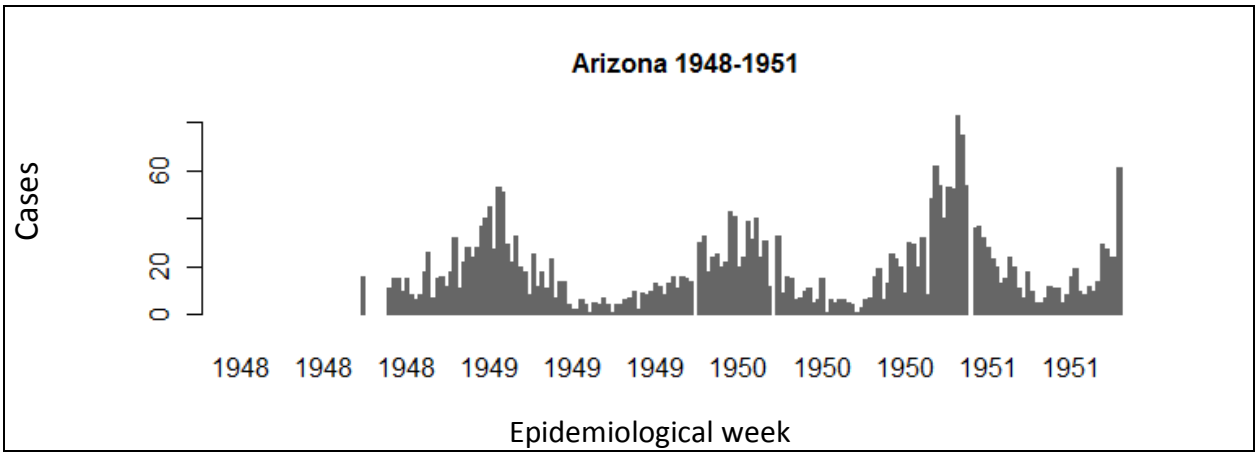

Figure D2, Number of cases reported for Pneumonia per epidemiological week

Poliomyelitis

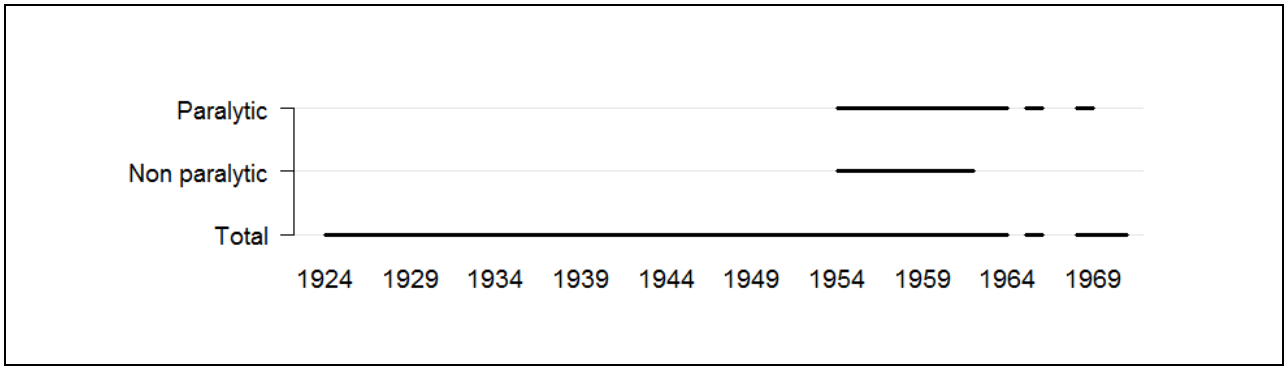

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Poliomyelitis (Total)

Indicator	Arizona
Report period	1927-1970
Total weeks	1,725
Total cases	2,959
Max. cases per year	389
Year (max)	1953
Max. cases per week	53
Week (max)	1953, wk 33
Average cases per year	
before 1960	86
95%CI	(50-122)
after 1960	5
95%CI	(1-9)
Average cases per week	
before 1960	2
95%CI	(2-2)
after 1960	0
95%CI	(0-0)

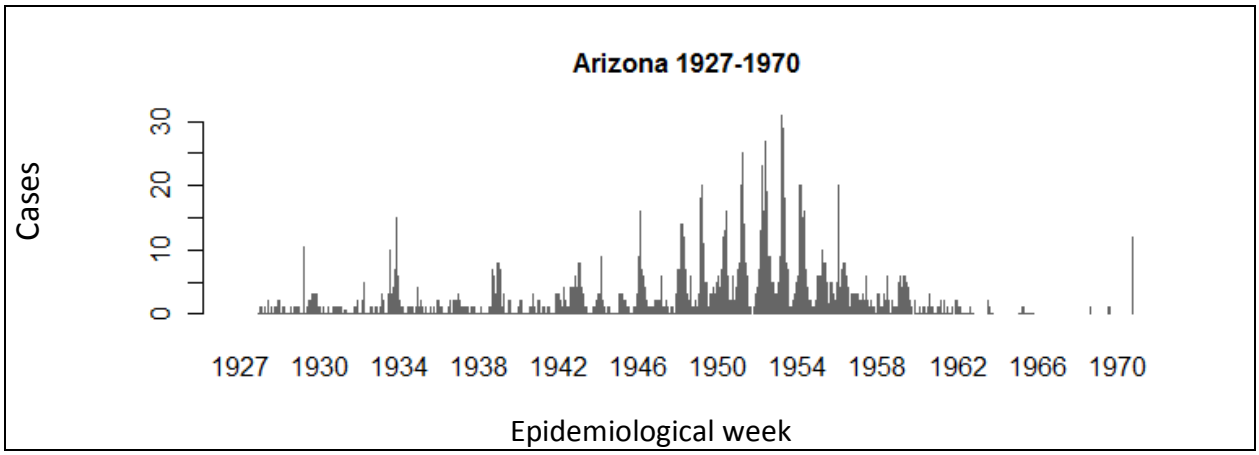

Figure D2, Number of cases reported for Poliomyelitis per epidemiological week

Rabies in Animals

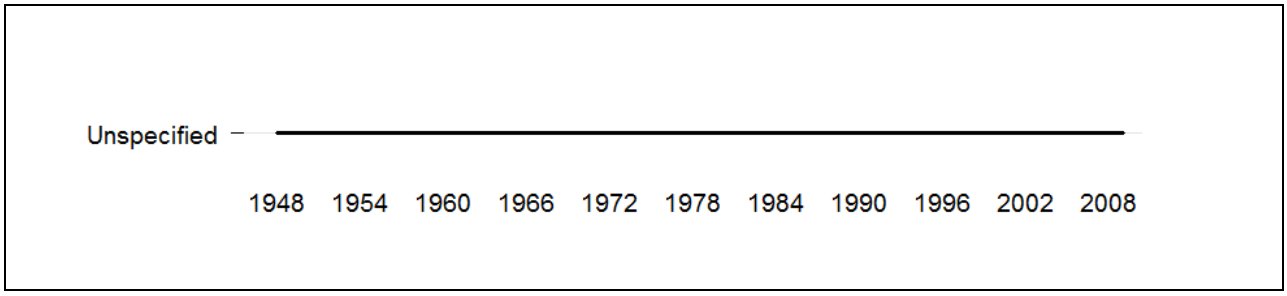

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Rabies in Animals

Indicator	Arizona
Report period	1948-2008
Total weeks	2,284
Total cases	3,049
Max. cases per year	256
Year (max)	2005
Max. cases per week	126
Week (max)	2005, wk 50
Average cases per year	50
95%CI	(39-61)
Average cases per week	1
95%CI	(1-1)

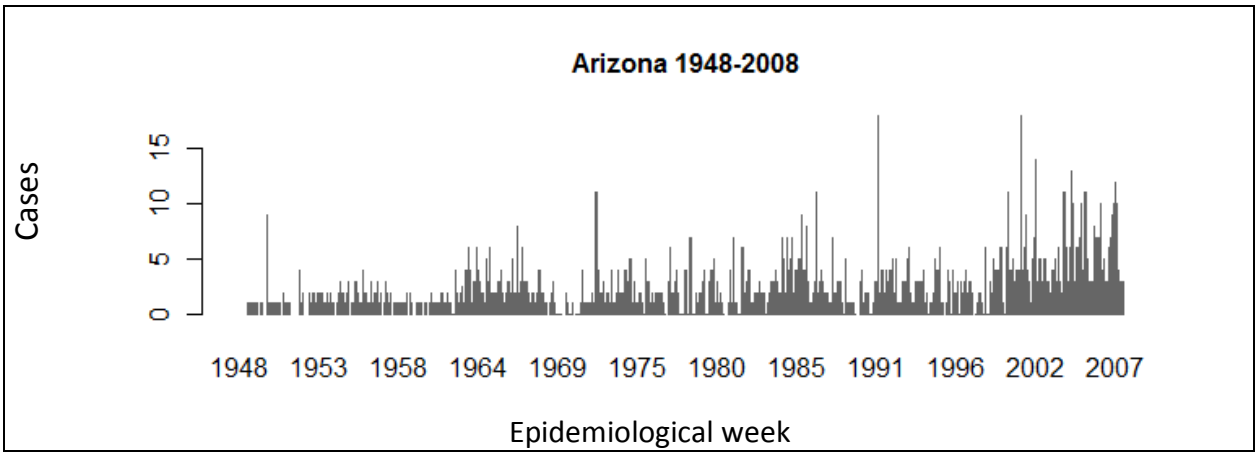

Figure D2, Number of cases reported for Rabies in Animals per epidemiological week

Rubella

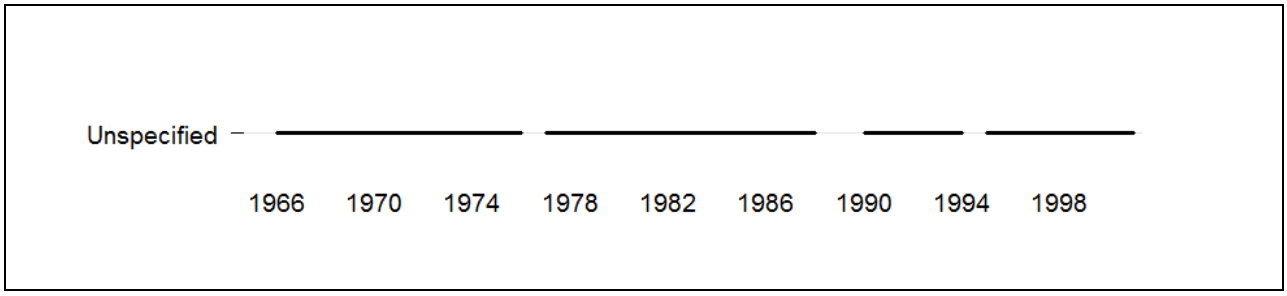

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Rubella

Indicator	Arizona
Report period	1966-2000
Total weeks	1,222
Total cases	6,867
Max. cases per year	2,559
Year (max)	1966
Max. cases per week	162
Week (max)	1966, wk 05
Average cases per year	
before 1970	1,131
95%CI	(125-2,137)
after 1970	47
95%CI	(6-88)
Average cases per week	
before 1970	23
95%CI	(19-27)
after 1970	1
95%CI	(1-1)

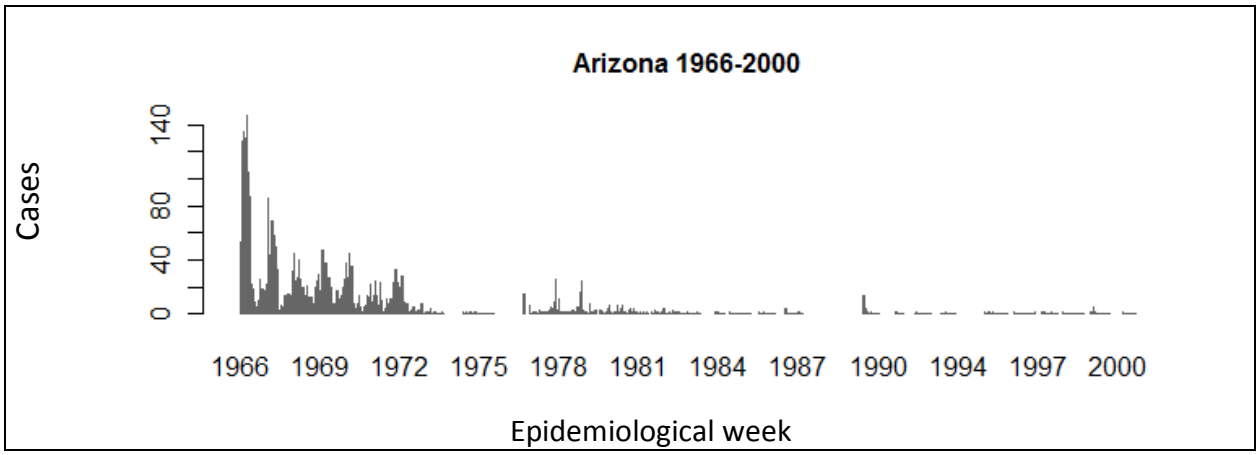

Figure D2, Number of cases reported for Rubella per epidemiological week

Salmonellosis

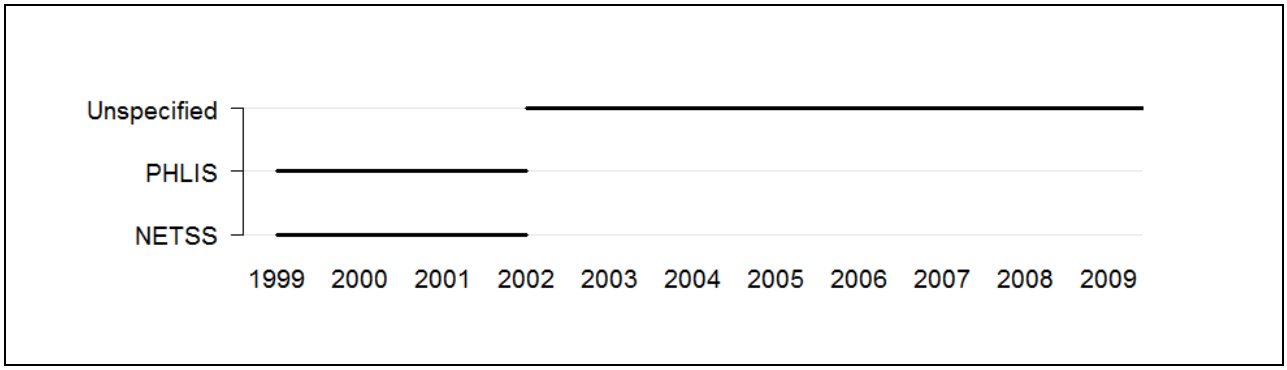

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Salmonellosis (PHLIS and Unspecified)

Indicator	Arizona
Report period	1999-2009
Total weeks	499
Total cases	8,373
Max. cases per year	1,329
Year (max)	2005
Max. cases per week	681
Week (max)	2005, wk 50
Average cases per year	761
95%CI	(587-935)
Average cases per week	17
95%CI	(14-20)

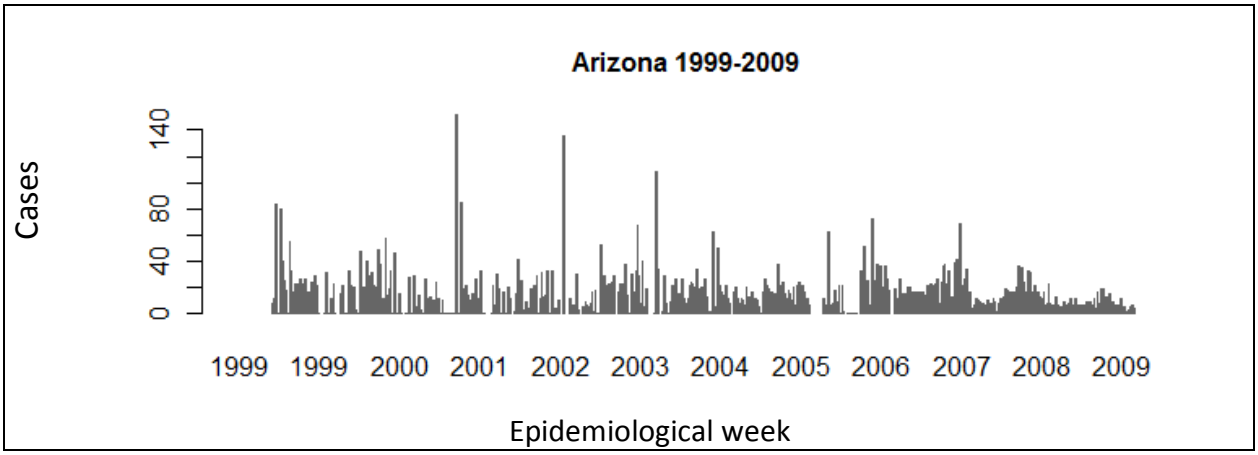

Figure D2, Number of cases reported for Salmonellosis per epidemiological week

Scarlet Fever

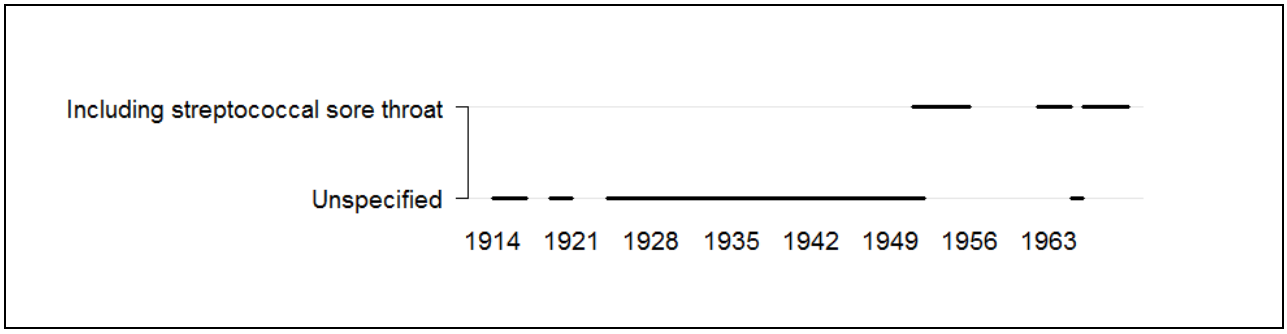

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Scarlet Fever (Including streptococcal sore throat and Unspecified)

Indicator	Arizona
Report period	1927-1969
Total weeks	1,793
Total cases	82,577
Max. cases per year	9,627
Year (max)	1954
Max. cases per week	379
Week (max)	1965, wk 06
Average cases per year	2,232
95%CI	(1,235-3,229)
Average cases per week	46
95%CI	(43-49)

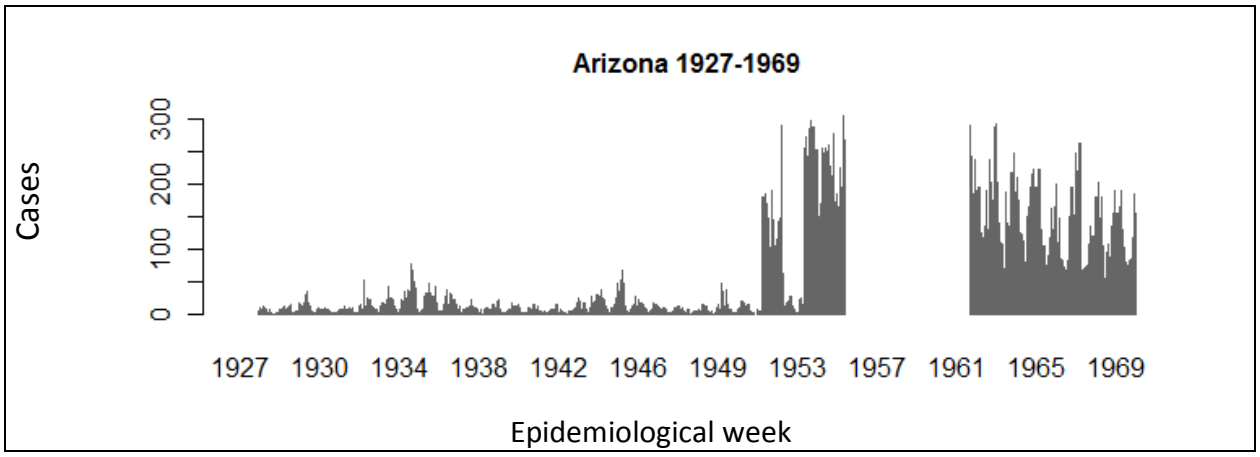

Figure D2, Number of cases reported for Scarlet Fever per epidemiological week

Shigellosis

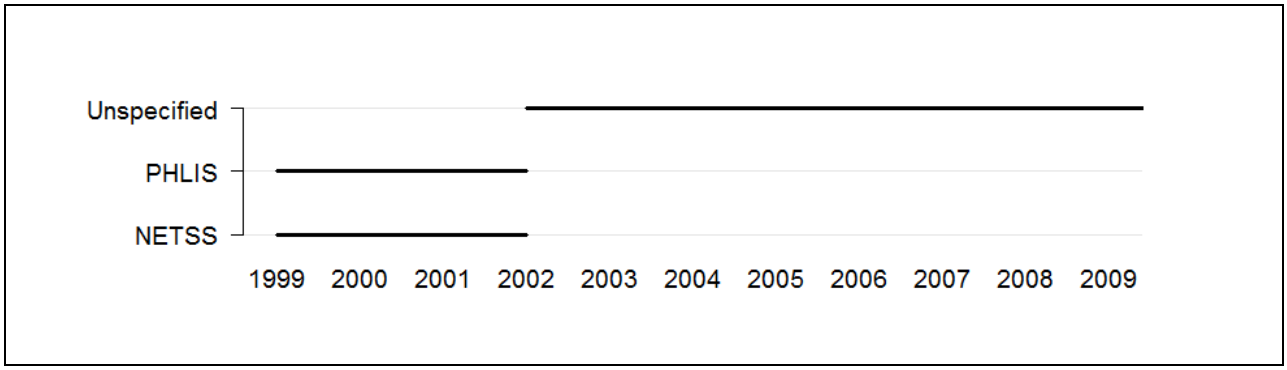

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Shigellosis (Unspecified and PHLIS)

Indicator	Arizona
Report period	1999-2009
Total weeks	501
Total cases	5,808
Max. cases per year	1,016
Year (max)	2005
Max. cases per week	516
Week (max)	2005, wk 50
Average cases per year	528
95%CI	(395-661)
Average cases per week	12
95%CI	(9-15)

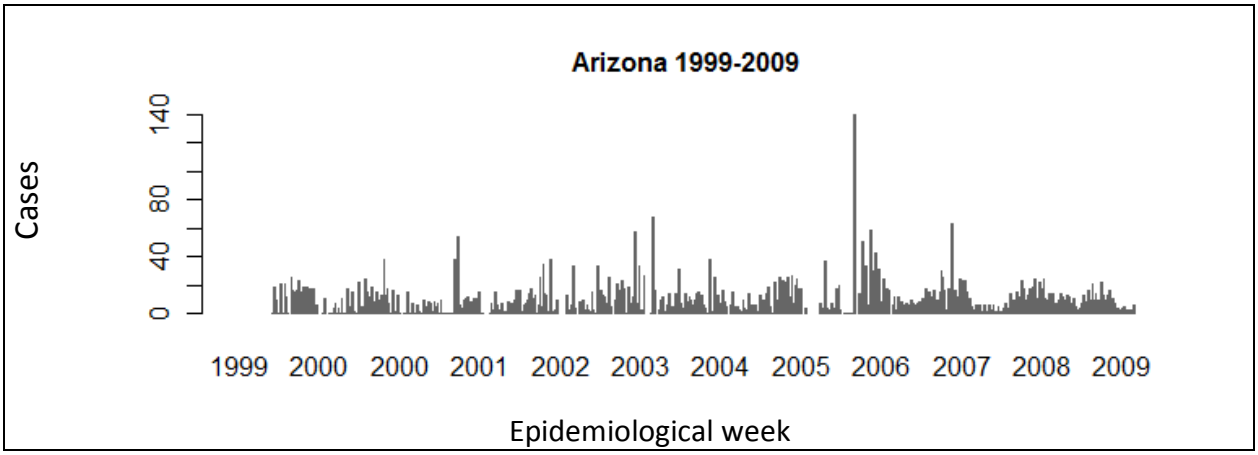

Figure D2, Number of cases reported for Shigellosis per epidemiological week

Streptococcal Disease, Invasive Group A

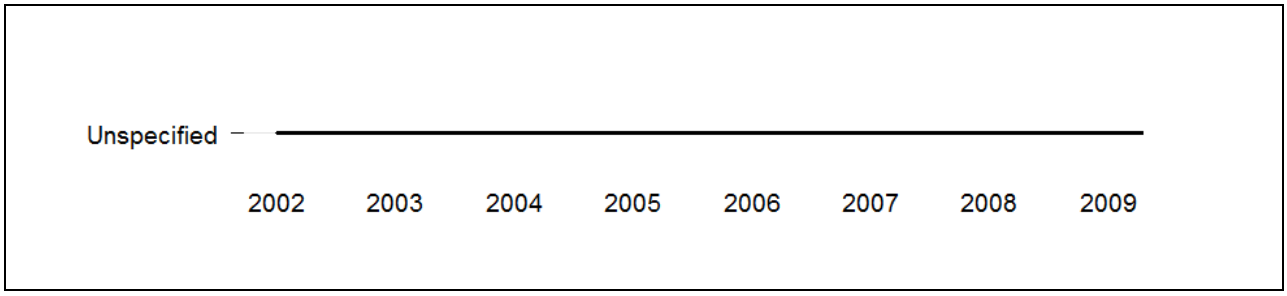

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Streptococcal Disease, Invasive Group A

Indicator	Arizona
Report period	2002-2009
Total weeks	363
Total cases	1,667
Max. cases per year	304
Year (max)	2006
Max. cases per week	60
Week (max)	2002, wk 17
Average cases per year	208
95%CI	(146-270)
Average cases per week	5
95%CI	(4-6)

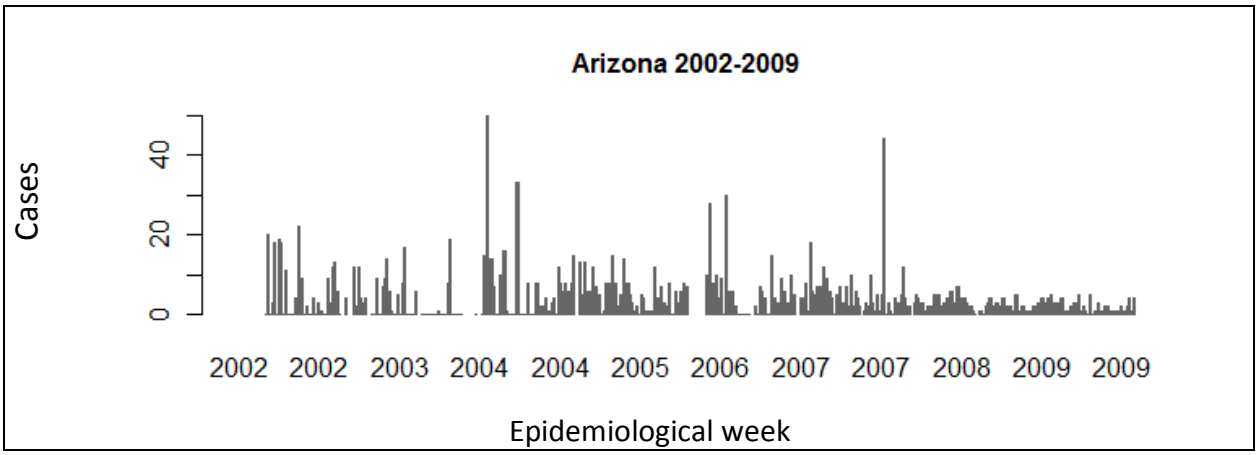

Figure D2, Number of cases reported for Group A Streptococcal Disease per epidemiological week

Streptococcal Sore Throat

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Streptococcal Sore Throat

Indicator	Arizona
Report period	1960-1961
Total weeks	96
Total cases	17,009
Max. cases per year	8,561
Year (max)	1961
Max. cases per week	334
Week (max)	1960, wk 03
Average cases per year	8,504
95%CI	(7,786-9,222)
Average cases per week	177
95%CI	(165-189)

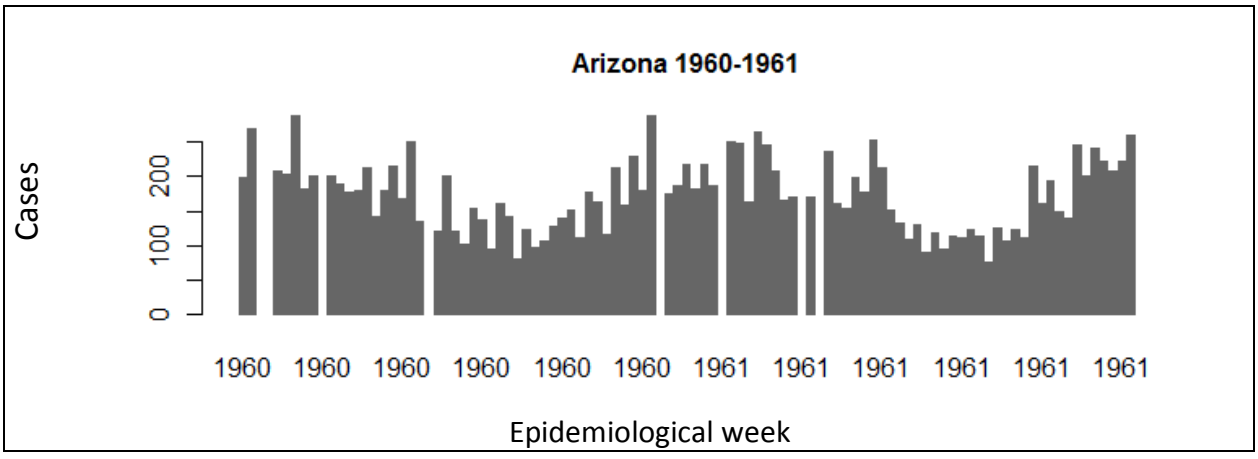

Figure D2, Number of cases reported for Streptococcal Sore Throat per epidemiological week

Syphilis

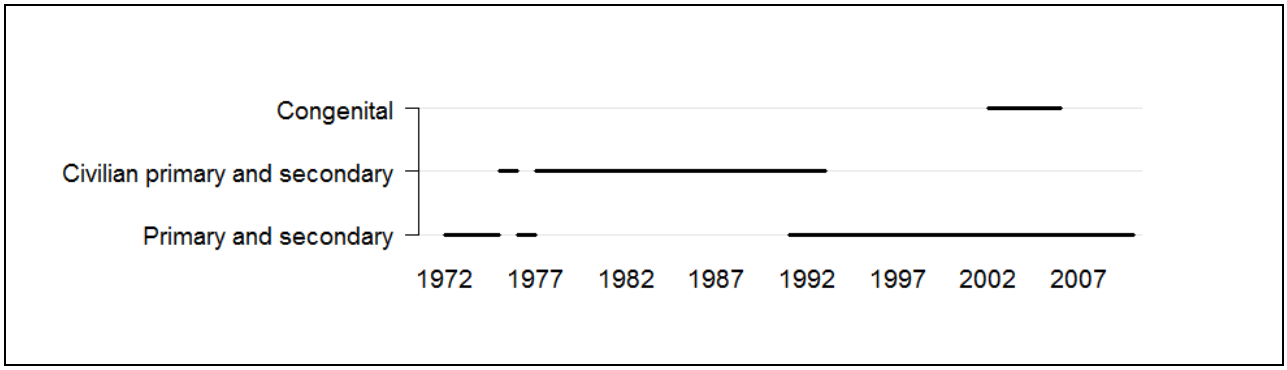

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Syphilis (Primary and secondary and Civilian primary and secondary)

Indicator	Arizona
Report period	1972-2009
Total weeks	1,799
Total cases	6,906
Max. cases per year	575
Year (max)	1990
Max. cases per week	211
Week (max)	1991, wk 30
Average cases per year	182
95%CI	(146-218)
Average cases per week	4
95%CI	(4-4)

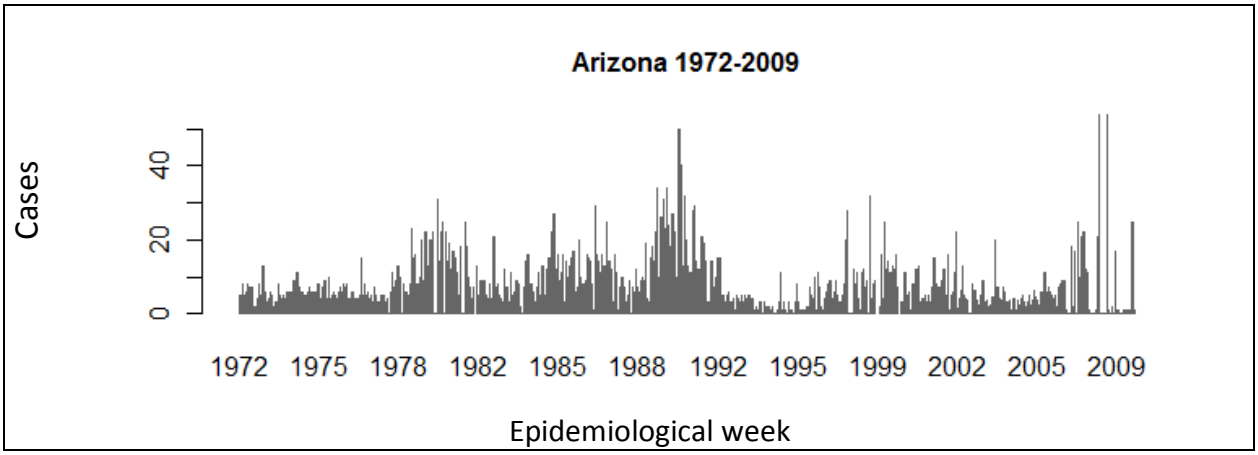

Figure D2, Number of cases reported for Syphilis per epidemiological week

Tuberculosis

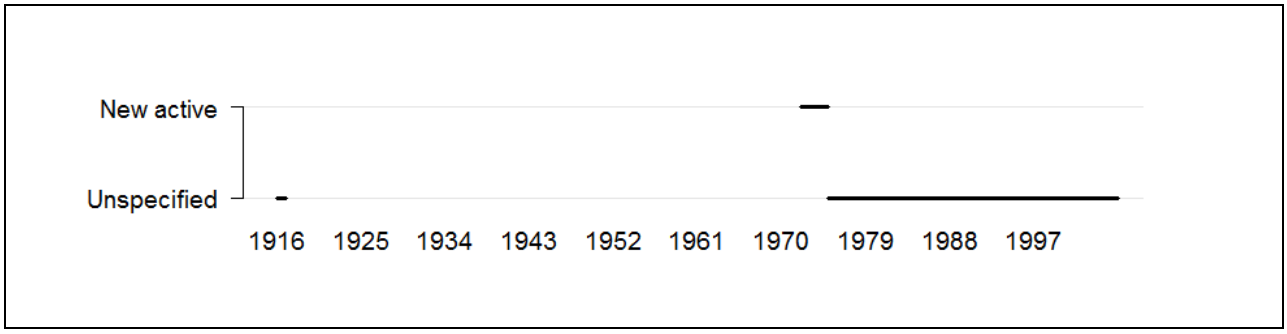

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Tuberculosis (Unspecified)

Indicator	Arizona
Report period	1975-2005
Total weeks	1,465
Total cases	8,359
Max. cases per year	429
Year (max)	1975
Max. cases per week	155
Week (max)	1991, wk 30
Average cases per year	270
95%CI	(242-298)
Average cases per week	6
95%CI	(6-6)

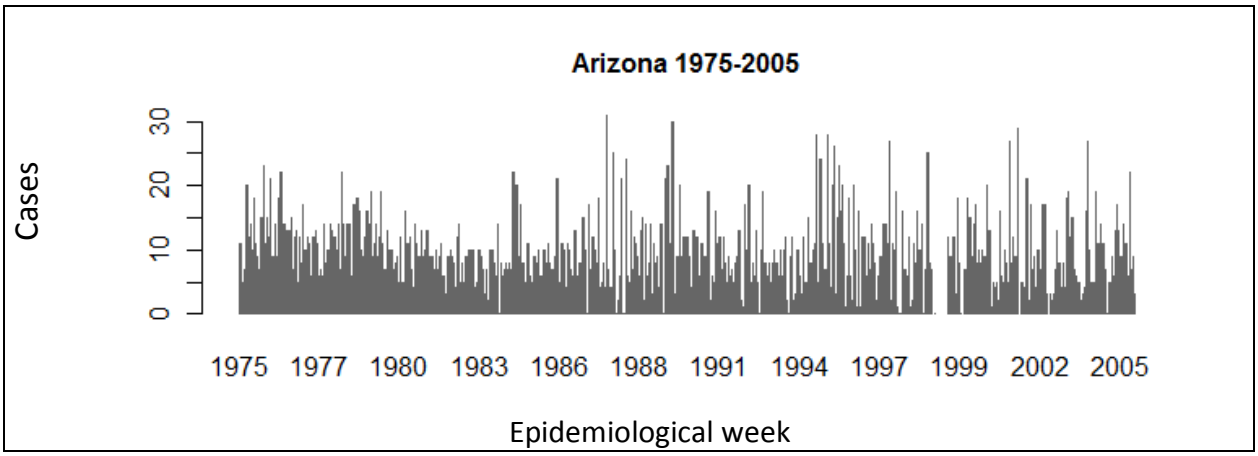

Figure D2, Number of cases reported for Tuberculosis per epidemiological week

Typhoid Fever

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Typhoid Fever (Unspecified and Including paratyphoid fever)

Indicator	Arizona
Report period	1927-2005
Total weeks	2,817
Total cases	2,574
Max. cases per year	200
Year (max)	1930
Max. cases per week	102
Week (max)	1953, wk 02
Average cases per year	
before 1950	81
95%CI	(61-101)
after 1950	13
95%CI	(4-22)
Average cases per week	
before 1950	2
95%CI	(2-2)
after 1950	0
95%CI	(0-0)

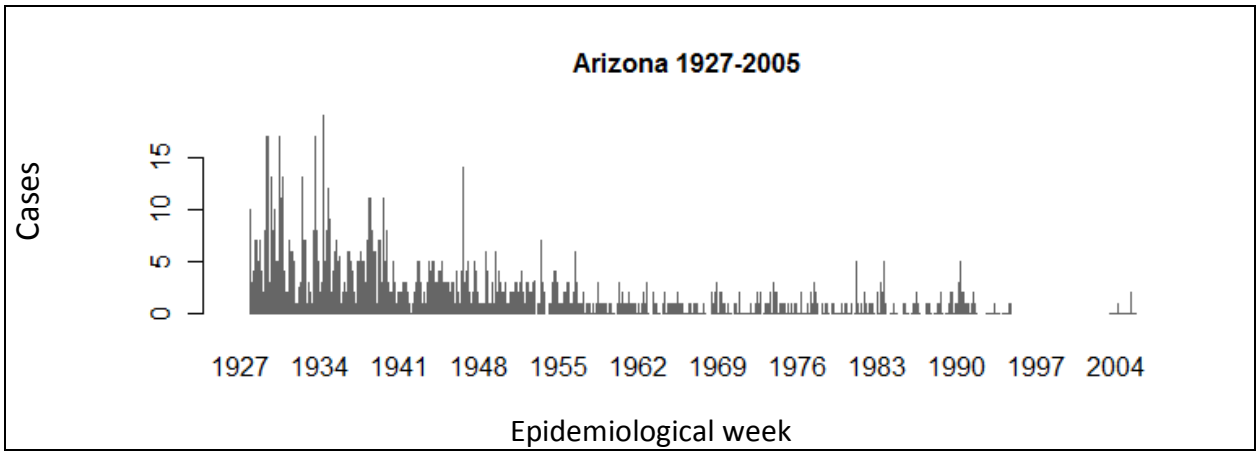

Figure D2, Number of cases reported for Typhoid Fever per epidemiological week

Whooping Cough

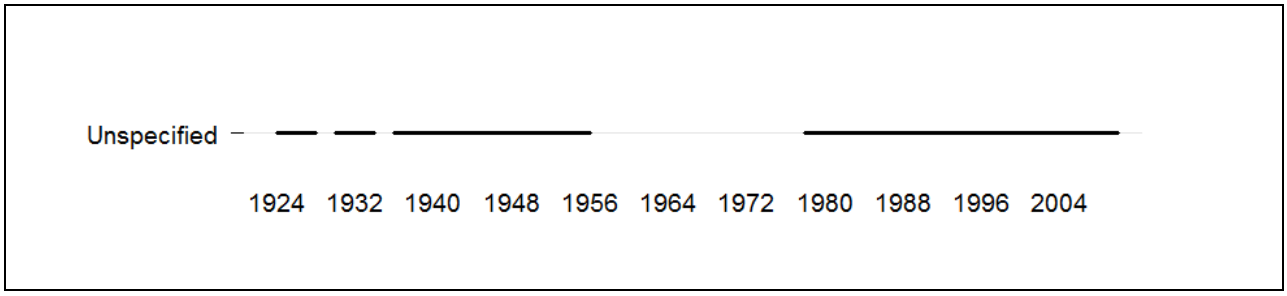

Figure D1, Weeks between 1888 and 2009 for which data on the disease and subcategories (if applicable) are available in the Tycho database. If no subcategory was reported, a subcategory of "Unspecified" was assigned.

Table D1, Summary information for Whooping Cough

Indicator	**Arizona**
Report period	1937-2009
Total weeks	2,196
Total cases	28,378
Max. cases per year	2,837
Year (max)	2006
Max. cases per week	2,403
Week (max)	2006, wk 27
Average cases per year	
before 1960	1,030
95%CI	(796-1,264)
after 1960	275
95%CI	(68-482)
Average cases per week	
before 1960	22
95%CI	(21-23)
after 1960	7
95%CI	(3-11)

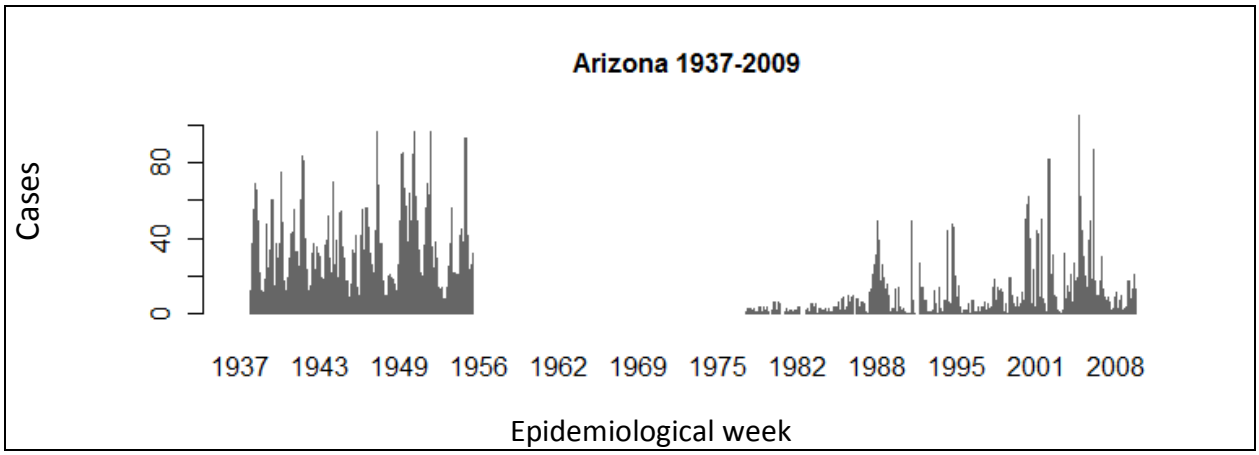

Figure D2, Number of cases reported for Whooping Cough per epidemiological week

Diseases with fragmented data over time

For a number of diseases, only fragmented data was available for Arizona. This was due to the inclusion of these diseases in the weekly surveillance system for short periods or widely dispersed periods of time. Due to these wide gaps or limited data, data for these diseases were not presented in separate sections but in the table below. Work will continue to include more data in the Tycho database and complete data sets for each disease where possible. Collaborations with local, state and federal public health agencies will be made to explore data availability and opportunities to include these in the Tycho database.

Table 2, Summary information on the occurrence of diseases with fragmented data in Arizona

Disease	Report type	Report period	Number of reports	Total cases
Anthrax	State	1942-1945	143	0
Brucellosis [undulant fever]	City	1952-1953	8	8
Brucellosis [undulant fever]	State	1943-1981	257	1133
Dysentery	State	1942-1948	332	4739
Encephalitis	City	1952-1952	2	2
Encephalitis	State	1942-1994	885	406
Leprosy	State	1942-1990	324	13
Lyme disease	State	1991-2009	322	48
Pellagra	City	1924-1932	50	2
Psittacosis	State	1956-1960	3	3
Rocky mountain spotted fever	State	1942-2009	517	152
Tetanus	State	1962-1981	198	17
Toxic shock syndrome	State	1983-1994	292	94
Trichiniasis	State	1954-1955	19	41
Tularemia	State	1942-1991	555	45
Typhus fever	City	1924-1925	5	0
Typhus fever	State	1942-1956	200	3
West nile disease	State	2003-2009	155	394

Project Tycho

This report provides preliminary data for the state of Arizona available in the Tycho database. This database is currently being beta tested and these data cannot be used for publication or other official use at this time. An open access release to the general public is planned for later in 2011.

Please visit the Tycho website for more information and to query the database at: www.tycho.pitt.edu. For further information regarding the Tycho project, contact Dr. Wilbert van Panhuis at the University of Pittsburgh Graduate School of Public Health.

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