DEPARTMENT OF HEALTH

Minnesota FluSurv-NET

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Influenza Surveillance in MN

- Influenza is a reportable condition in Minnesota (MN)
- Various surveillance programs exist to track influenza activity outside of EIP FluSurv-NET
  - ILINet
    - Participating outpatient clinics in MN
    - Aggregate counts of patients seen and counts of patients with ILI
  - MLS data (MN Laboratory Survey)
    - Participating laboratories in MN
    - Aggregate counts of influenza tests performed and number of positive results
  - School and Long-Term Care facility outbreaks
    - Skilled nursing facilities report outbreaks as defined by CDC
    - K-12 schools report based on a syndromic definition and percent ILI absences

2018-2019 Summary Statistics

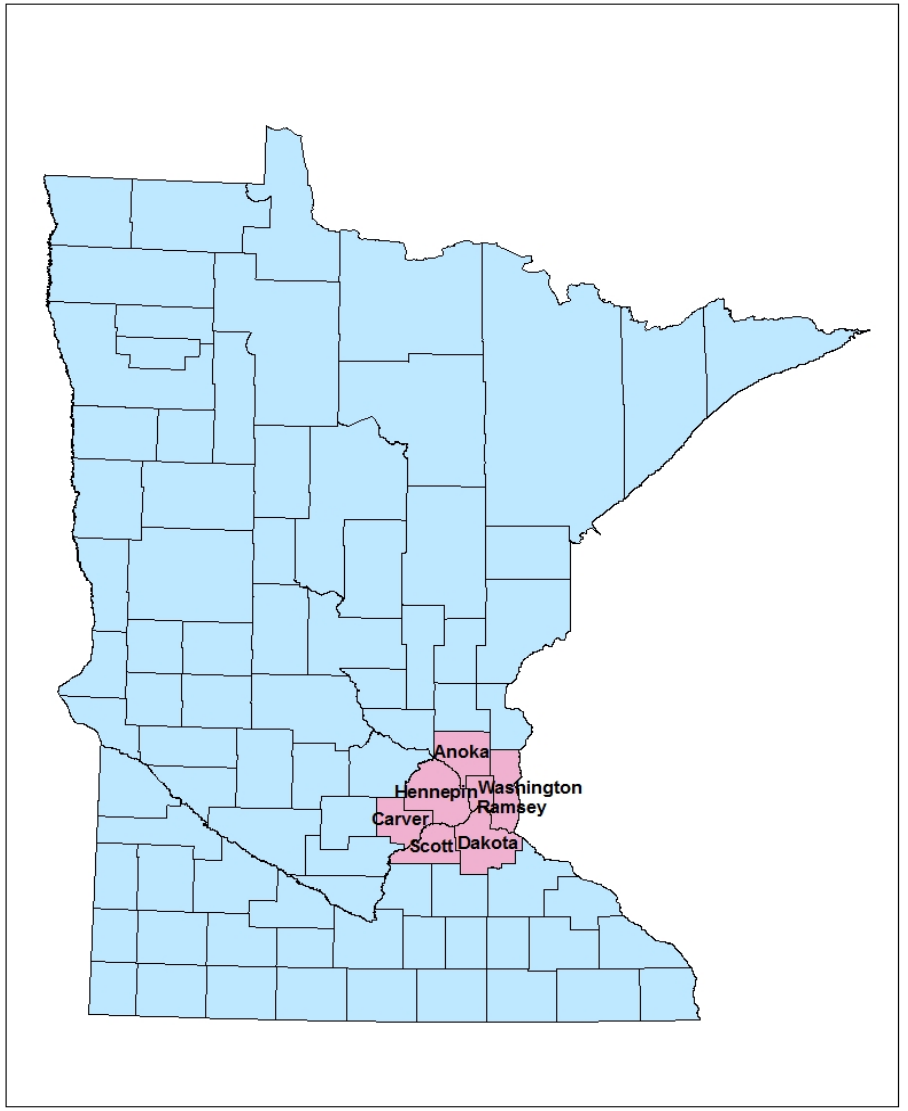
- 2,522 laboratory confirmed hospitalizations statewide (median age 62 years)
  - 1,306 EIP hospitalizations
- 126 influenza-associated deaths (median age 74 years)
  - 2 influenza-associated deaths in children <18 years
  - 67 also EIP hospitalizations
- 384 ILI outbreaks in K-12 schools
- 60 laboratory confirmed outbreaks in Long-term Care (LTC) facilities
- Season at-a-glance
  - Fairly late start; sustained activity into June
  - Dominant strain began as influenza A/H1 (H1N1pdm09), transitioned to influenza A/H3; very little influenza B
  - Vaccine efficacy overall at end of season 29% (estimates of 47% in February) - emergence of new H3 clade not matched to vaccine

EIP in Minnesota

- MN became an Emerging Infections Program (EIP) site in 1995
  - At this time, surveillance included ABCS (bacterial infections surveillance) and FoodNET (foodborne illness surveillance)
- FluSurv-NET began for the 2003-04 influenza season
  - At this time, surveillance was restricted to pediatric hospitalizations (<18 years) in the EIP catchment area
  - Surveillance expanded to all ages in catchment for the 2005-06 season
  - MN expanded statewide for the 2008-09 season
  - EIP catchment in MN is defined as the 7-county Twin Cities metropolitan area

MN EIP FluSurv-NET catchment area

- 7-county Twin Cities metropolitan area
- Includes St. Paul and Minneapolis
- Contains 55% of MN's population (3.1 million of 5.6 million total population)
- More diverse in race, SES, land use compared to MN as whole
- Contains 26 acute care hospitals from 11 health systems (of roughly 150 hospitals and 20 health systems total statewide)



FluSurv-NET Structure and Funding

- FluSurv-NET operates in 14 EIP sites, most within health departments (9)
  - Also 3 universities and 2 independent EIP sites
- EIP funds Flu-Surv-NET staff and support staff at MDH
  - 1 full-time (1 FTE) epidemiologist
  - 1 full-time (1 FTE) laboratorian
  - 3 half-time (1.5 FTE) student workers (epidemiology)
  - 2 part-time (0.2 FTE) support staff
- Also funding for fringe, travel, supplies, and laboratory reagents and testing supplies
- All influenza surveillance and FluSurv-NET activities are centralized at MDH/state level

FluSurv-NET and Associated EIP Studies

- Hospitalized influenza surveillance
- Disease severity (optional)
- Geocoding/census tract assignment
- Influenza-associated death surveillance
- RSV surveillance
- Disease burden estimation
- Laboratory capacity surveys
- Novel influenza surveillance

Hospitalized Influenza Surveillance

- FluSurv-NET
  - Case-based surveillance for hospitalized/inpatient cases of influenza
  - Case definition is any inpatient with a positive influenza lab result within 14 days before admission through discharge, admitted 10/1 – 4/30
  - Full medical chart abstraction performed for each case, and vaccination history collected
  - Collect ~350 variables that are sent to CDC (as of 2018-19)
- All inpatient rapid and un-subtyped positive PCR flu specimens are requested to be forwarded to MDH-PHL for subtyping
  - PHL can perform Flu A subtyping and lineage determination for Flu B
  - MDH-PHL receives an average of 5,000 specimens per year

Statewide Hospitalization Data (Non-EIP Project)

- Statewide data is collected year-round
- Case definition is still lab-confirmed influenza in inpatients residing in MN
  - Under the FluSurv-NET umbrella, but chart reviews are not done for non-EIP MN cases
  - More limited data, but still have demographics, hospitalization information, and influenza testing results
- Reported on MDH website each week during influenza season (MMWR week 40– 20)
  - Link: www.mdhflu.com (https://www.health.state.mn.us/diseases/flu/stats/index.html)
  - Report also includes other influenza surveillance programs at MDH
    - Influenza-associated deaths
    - ILINet
    - MLS laboratory data
    - RSV

Data Collection and Reporting

- Inpatient cases are reported to MDH in various ways
  - Most are reported by hospital infection prevention staff
    - These can be reported via electronic line list, ELR, faxed reports, or phone calls
  - Many are reported via lab reports and/or testing
    - These can be reported via ELR, faxed reports, or PHL testing
    - All PHL test results readily available
  - Perform audits at catchment-area hospitals to ensure complete EIP case ascertainment
  - Initial reports and data are collected and EIP cases are reported to CDC in real time
  - Patient reports take an average of 5 minutes per case

Data Collection for EIP Hospitalized Influenza

- Chart abstraction
  - Most of our health systems have granted us remote access to their records
    - A few others send prepared charts via email/mail
    - One system requires on-site review
  - Chart abstraction data are not collected or provided in real-time, but are due by the end of the yearly cycle
  - Up-to-date data are provided to CDC on a weekly basis
    - Each week's submission is cumulative
  - Chart abstraction takes an average of 30 minutes per case

Data collected for Statewide vs. EIP cases

- Statewide Cases:
  - Patient name/DOB/address
  - Race/ethnicity
  - Influenza test type, result, and lab facility
  - Hospital
  - Admit and discharge dates (may not always get discharge date)
  - Patient outcome (survived vs died)
  - We will collect ICU admission, antiviral treatment, and vaccination history if it is provided, but that info is not always included in initial reports

- EIP Cases:
  - All data elements collected for statewide cases
  - Signs/symptoms at onset/onset date
  - Patient vitals
  - Pre-existing medical conditions
  - ICU admission
  - Bacterial and viral pathogen testing
  - Antiviral treatment
  - Chest x-ray results
  - Discharge diagnoses, including ICD-10 discharge codes
  - Vaccination history

Disease Severity

- Starting for the 2017-18 season, CDC EIP requested additional information to be collected on EIP cases to develop a method for determining severity of illness as an optional project
- Additional data included patient vitals on admission, lab values, and some additional data on interventions
- MN agreed to collect these extra data elements for every 4th case where we have access to electronic records
- Disease severity data takes an average of 10-15 minutes per case

Geocoding

- Another extra requirement from CDC EIP is that all cases are geocoded and assigned to a census tract
  - CDC does not have access to patient address or exact location
  - Census tracts are more useful in neighborhood-level geographical analyses using poverty, SES, crowding, or race/ethnicity data by census tract
  - Census tracts are more useful than zip code for these types of analyses, since they are more homogenous
- Project takes around one week to complete, since address data is collected upon case report
  - Majority of this time is spent cleaning the address data
  - Actual geocoding and data preparation takes a few hours

Death Ascertainment

- In addition to the routine influenza-associated death surveillance performed in MN, CDC EIP has a special study to ensure complete ascertainment of deaths following influenza hospitalization
  - Matches death records with influenza hospitalizations to find any cases who have died after discharge (within 30 days)
  - Collects additional information on cause(s) of death
- Project takes a few hours to complete, as the matching is entirely done using SAS code

MN Influenza Death Surveillance (Non-EIP Project)

- Influenza-associated deaths are reportable in MN. While there is a special requirement for pediatric deaths, data are collected for all ages.
- Influenza-associated deaths are typically reported by Vital Records (MDH) and hospitalized influenza surveillance.
- Case definition includes:
  - Hospitalized influenza patients who die inpatient, or within 30 days of discharge
  - Individuals with “Influenza” listed as a cause of death
  - Individuals who test positive for influenza post-mortem
  - Individuals associated with a LTCF ILI outbreak (with or without flu testing)
  - Individuals who die within 60 days of a positive influenza test, without recovery from influenza symptoms

RSV Surveillance

- The FluSurv-NET surveillance platform was used to launch hospitalized RSV surveillance in 2016
  - Retrospective surveillance was done for adults for the 2014-15 and 2015-16 influenza seasons
  - Real-time surveillance began in 2016 for pediatric cases, then for all ages
- Case ascertainment and chart abstraction for RSV use influenza surveillance model
- Multiple special studies combine influenza and RSV to streamline the process

Disease Burden Estimation

- In order to create multipliers to estimate the true burden of influenza and RSV, CDC EIP requests data on influenza and RSV testing practices
  - This special study involves pulling lists of all patients diagnosed with P&I (pneumonia and influenza) ICD-10 codes from the previous year's season
    - MN collects these lists directly from participating hospitals, as we do not have a statewide discharge database
  - Influenza and RSV testing and results are recorded for a selection of these cases
  - The frequency of testing is used to determine multipliers that can correct for under-detection of influenza and RSV
- Project takes a few weeks, including waiting for ICD pulls, merging datasets and creating lists of randomly selected charts, and reviewing charts

Laboratory Capacity Surveys

- Hospital labs in the MN EIP catchment area are surveyed each year prior to start of flu season
- The survey includes questions on:
  - Test kits they use and/or have available
  - What kits are typically used
  - Their capacity for subtyping or PCR testing for influenza and RSV
- Survey data are used to:
  - Determine the capacity for influenza and RSV testing at hospital labs
  - Track changes in laboratory testing practices
  - Target messaging for specimen submission to labs that only have rapid testing available
- Project takes about 2 weeks, including sending surveys and reminders, following up with missing data, and compiling data in REDCap

Novel Influenza Surveillance

- Surveillance for novel/variant influenza strains is year-round.
- Novel/variant strains are typically identified via our routine influenza surveillance programs.
  - Any influenza A subtyping done at our state lab (PHL) that is returned as "unsubtypeable" is forwarded to CDC for characterization.
  - Testing at our PHL is done through hospitalized influenza surveillance, ILINet (outpatient surveillance), and MLS specimen submission.
  - Positive cases have a chart abstraction and case interview performed.
- Special surveillance is done each year at the State Fair – 4H participants with ILI are tested at PHL to monitor for influenza.

Surveillance Timelines/Due Dates for 2019-20 Influenza Season

Project	Due Date
MN Database changes	10/1/2019
Laboratory survey responses	10/1/2019
Initial case report data	Data collection begins 10/1/2019, and reporting continues in "Real-time" (ideally within 7 days of admission) through 4/30/2019
Chart review data	9/15/2020, with all data cleaning edits completed by 10/1/2020 (50% done by July, 75% done by August)
Vaccine history and ICD-10 discharge codes	10/31/2020
Disease severity data	11/1/2020
Geocoding/census tract data	12/31/2020, but ideally by 10/1/2020
Death Ascertainment data	3/1/2021
Disease Burden data	12/31/2020

Surveillance improvements/evolution of surveillance methods

- Chart abstraction data elements change from year to year
  - Mostly small changes each year, but there were significant additions to the CRF in 2011 and 2014
  - Fields are also retired if it is determined that they do not provide useful and/or usable data
  - Adding 100+ pre-existing conditions for the upcoming flu season
- Special studies are added or discontinued from season to season
- Data collection tools and methods have improved with increased use of technology and access
  - Initial reports can now be imported directly into our surveillance database if they are sent as an electronic line list
  - We are able to remotely access patient charts from most of our facilities

MN Database

- MN has used Maven software (MEDSS – Minnesota Electronic Disease Surveillance System) for influenza data since 2010
  - We can also keep all data (statewide cases, deaths, etc.) from all seasons in the same database, and only report the current EIP case data to CDC
  - This database system allows us to collect data not included in the CDC EIP dataset
  - We can create our own surveillance and database tools
  - We can create multiple reports that pull the data fields of interest for specific needs over multiple seasons
  - MEDSS allows for access to diseases based on jurisdiction, such as county
- CDC EIP has historically used Access to store FluSurv-NET data, and is in the process of switching to REDCap
  - A new database is created for each season
  - There are separate tables for adult and pediatric cases that have to be merged in order to analyze the complete dataset

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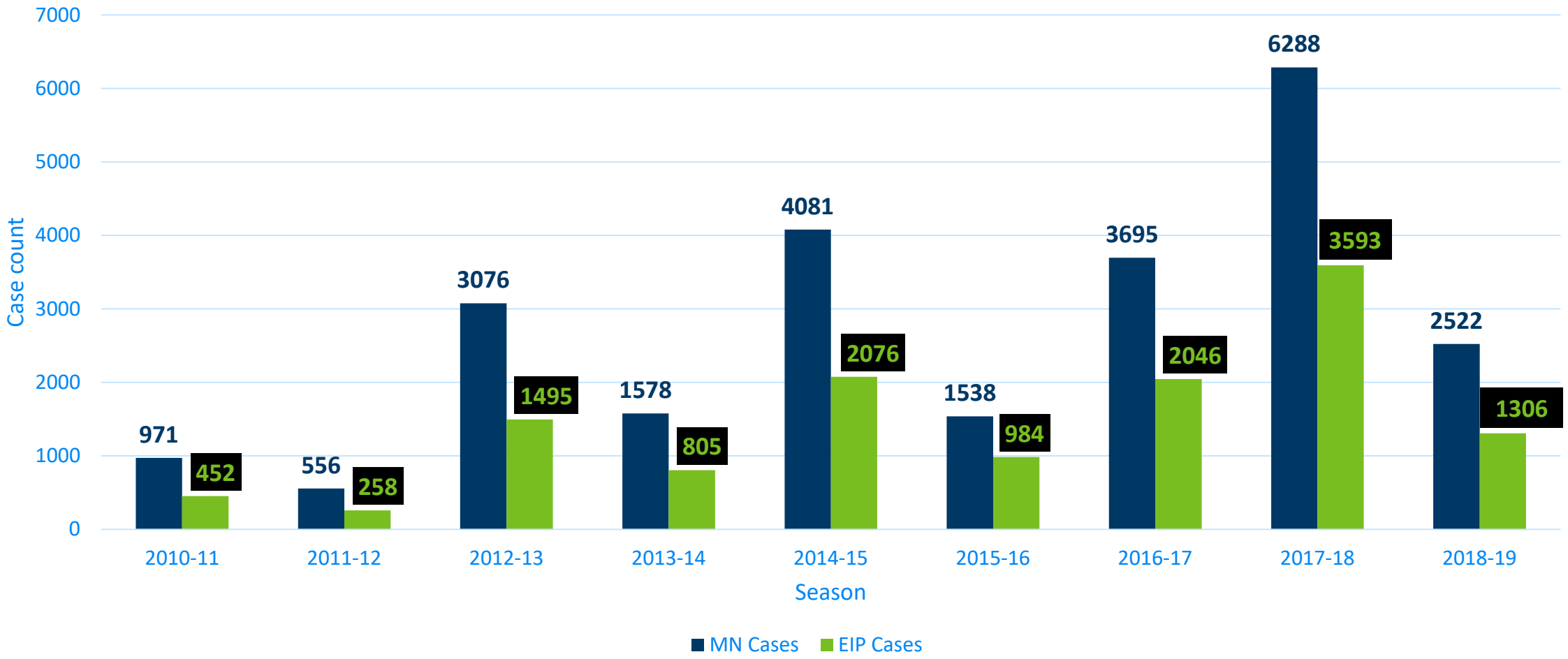
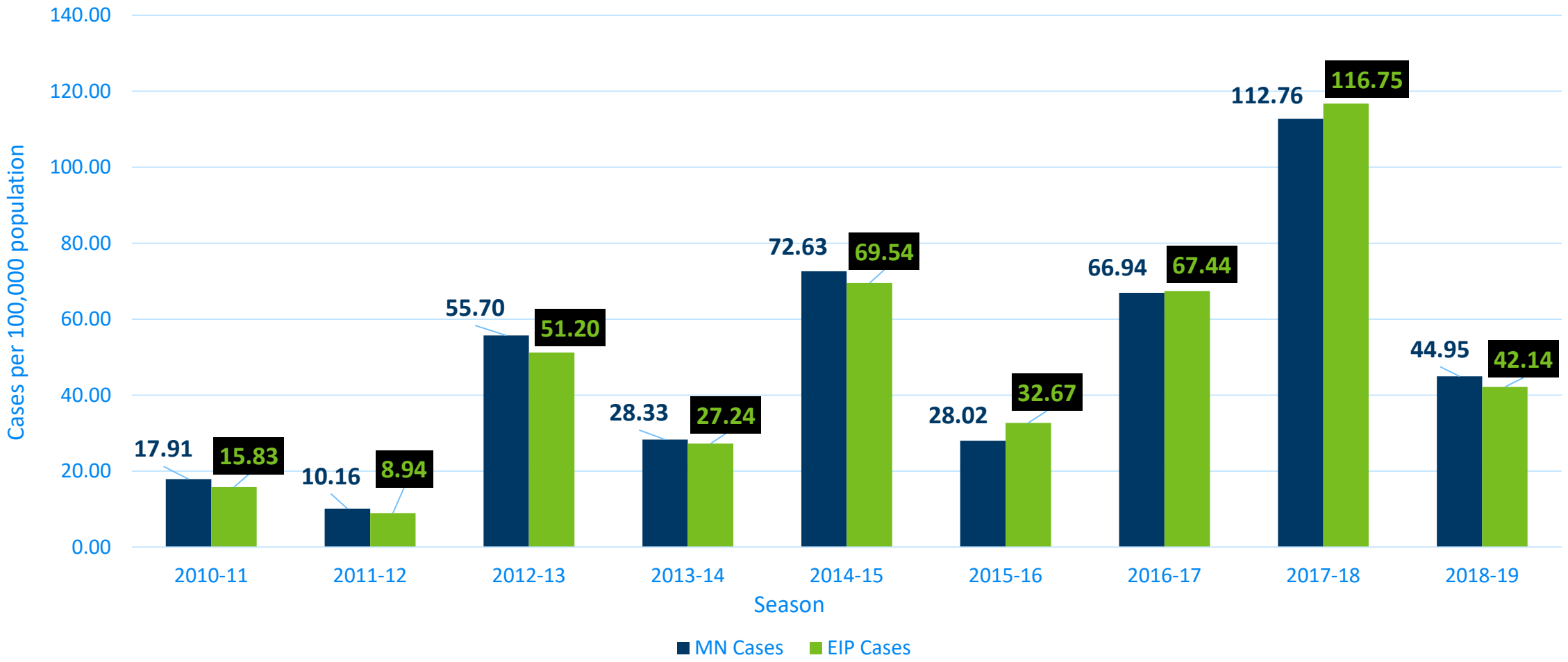
MN Influenza Data

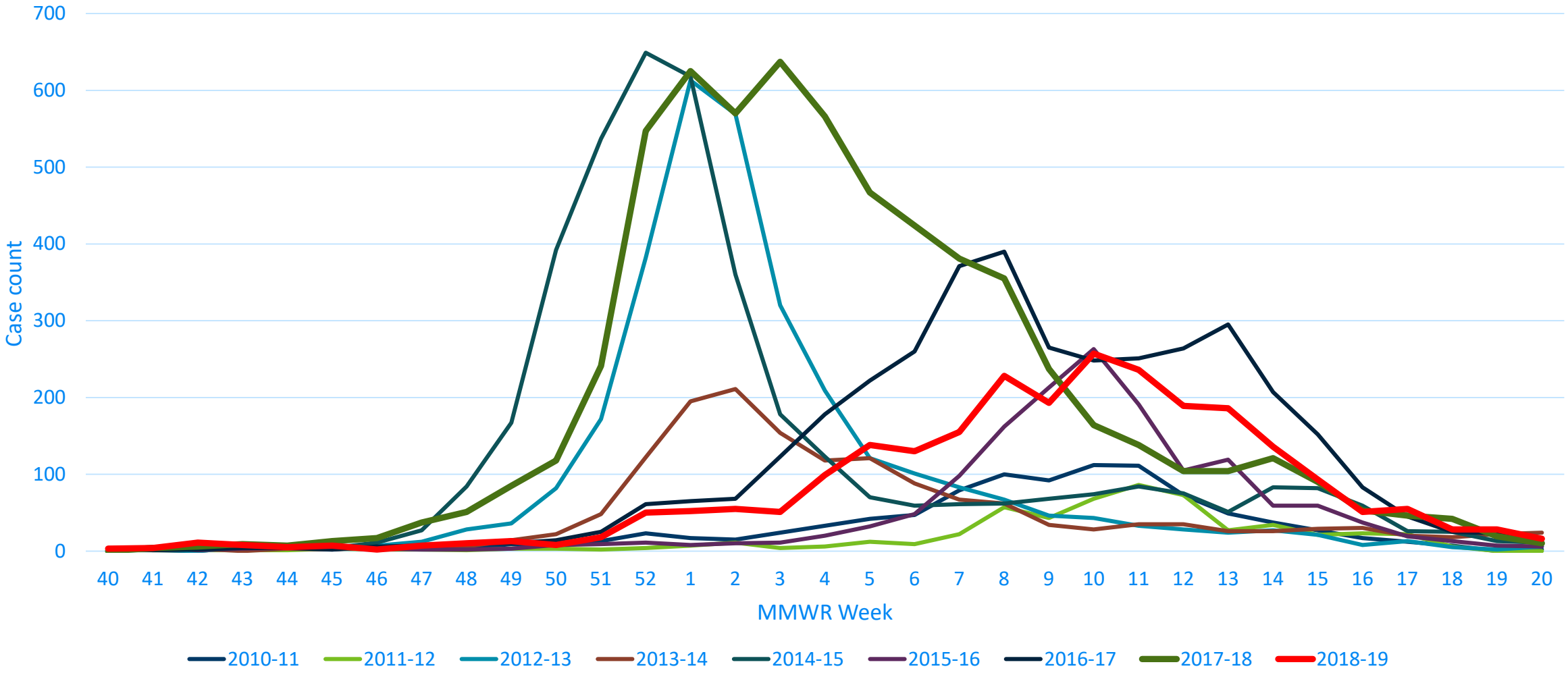
Hospitalized Influenza Cases by Season, 2010-2019



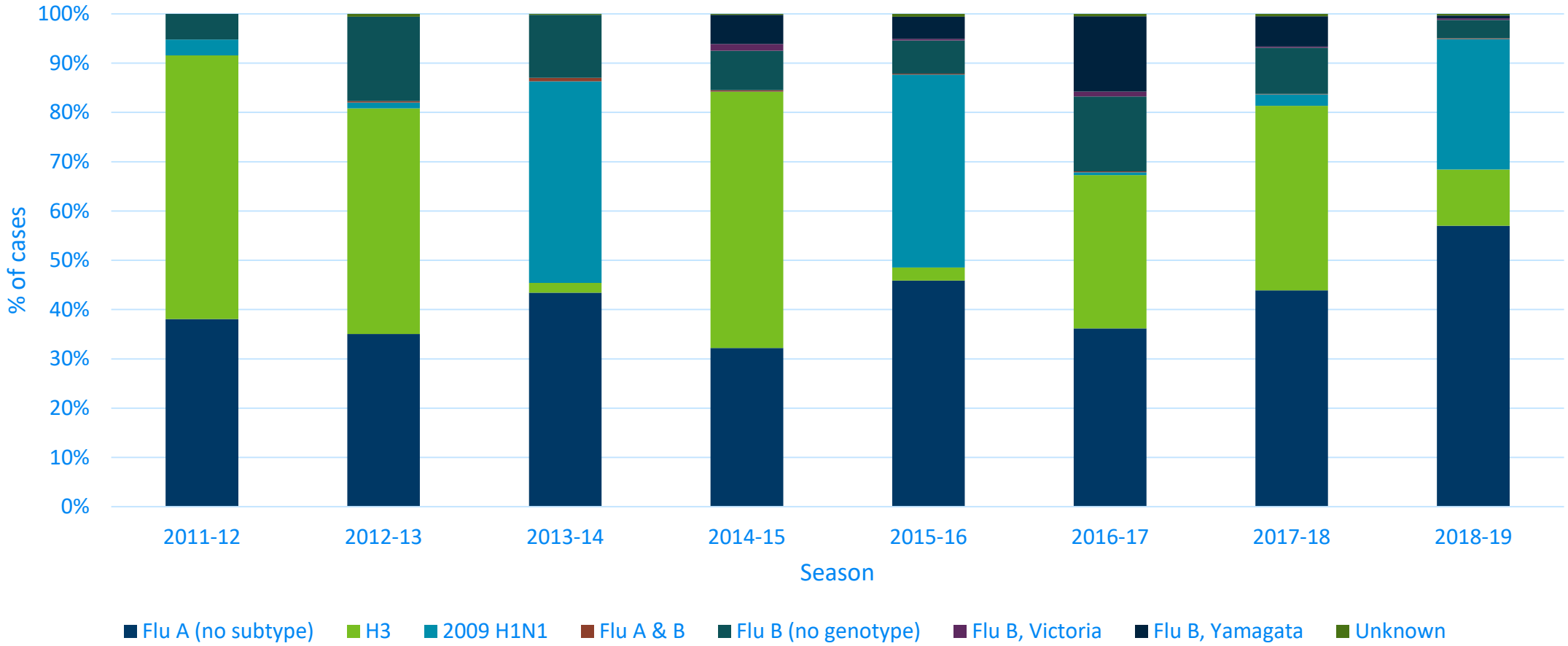
Rates by Season, 2010-2019



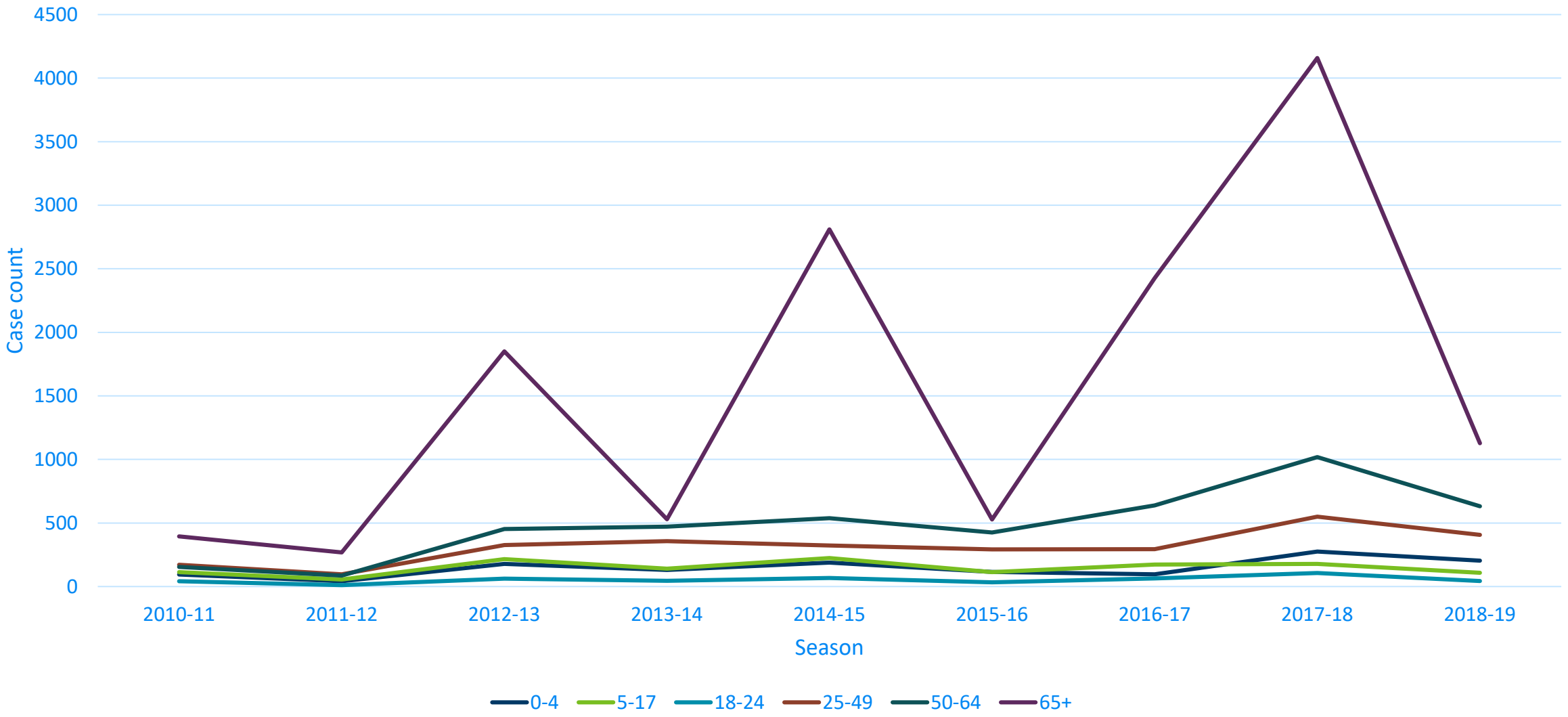
MN Hospitalizations Per Week 2010-2019



MN Hospitalizations by Flu Type, 2011-2019



MN Hospitalizations by Age Group, 2010-2019



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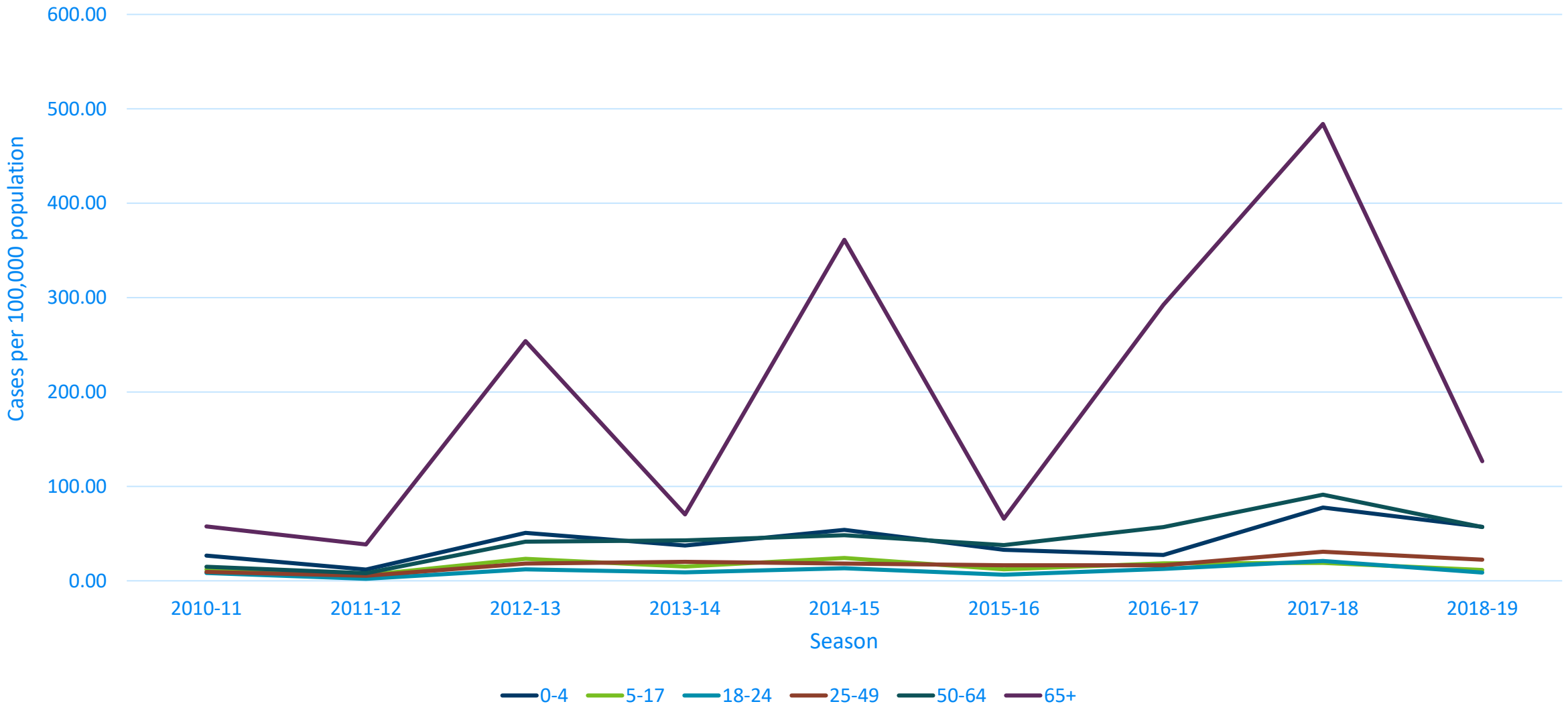
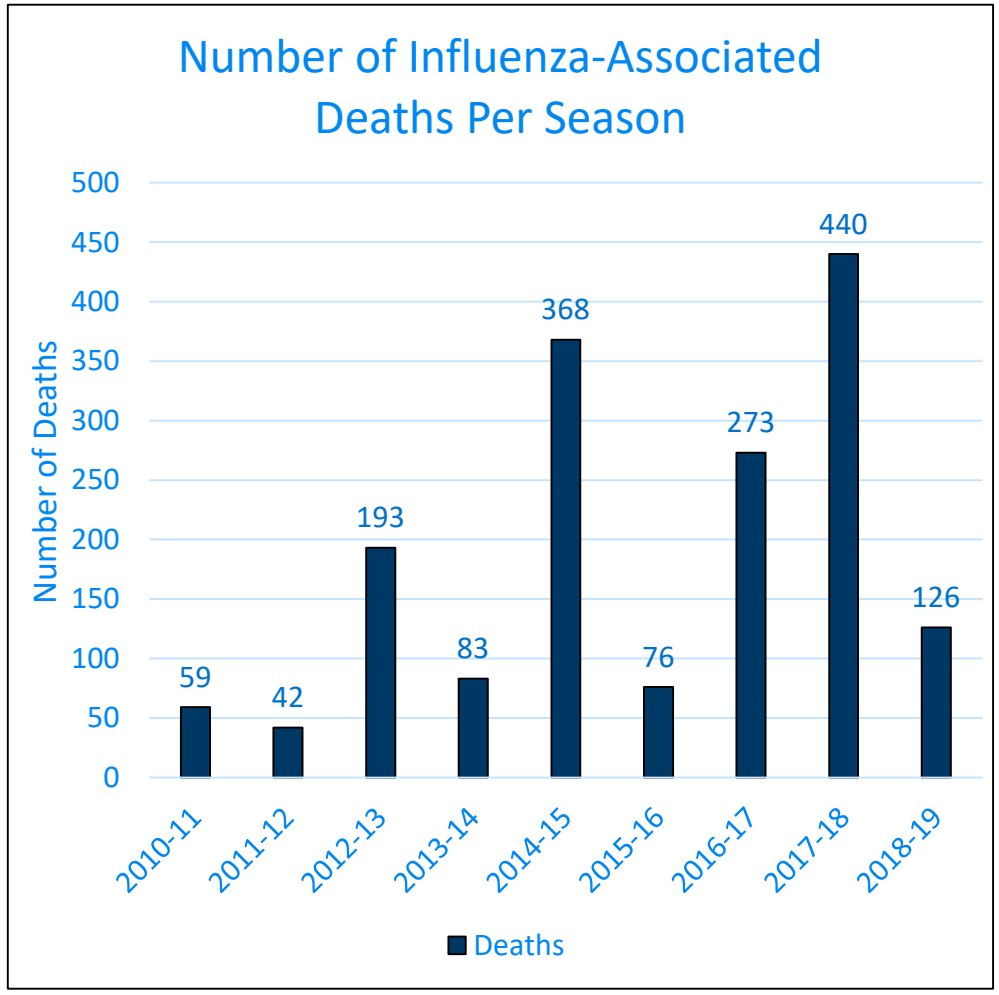
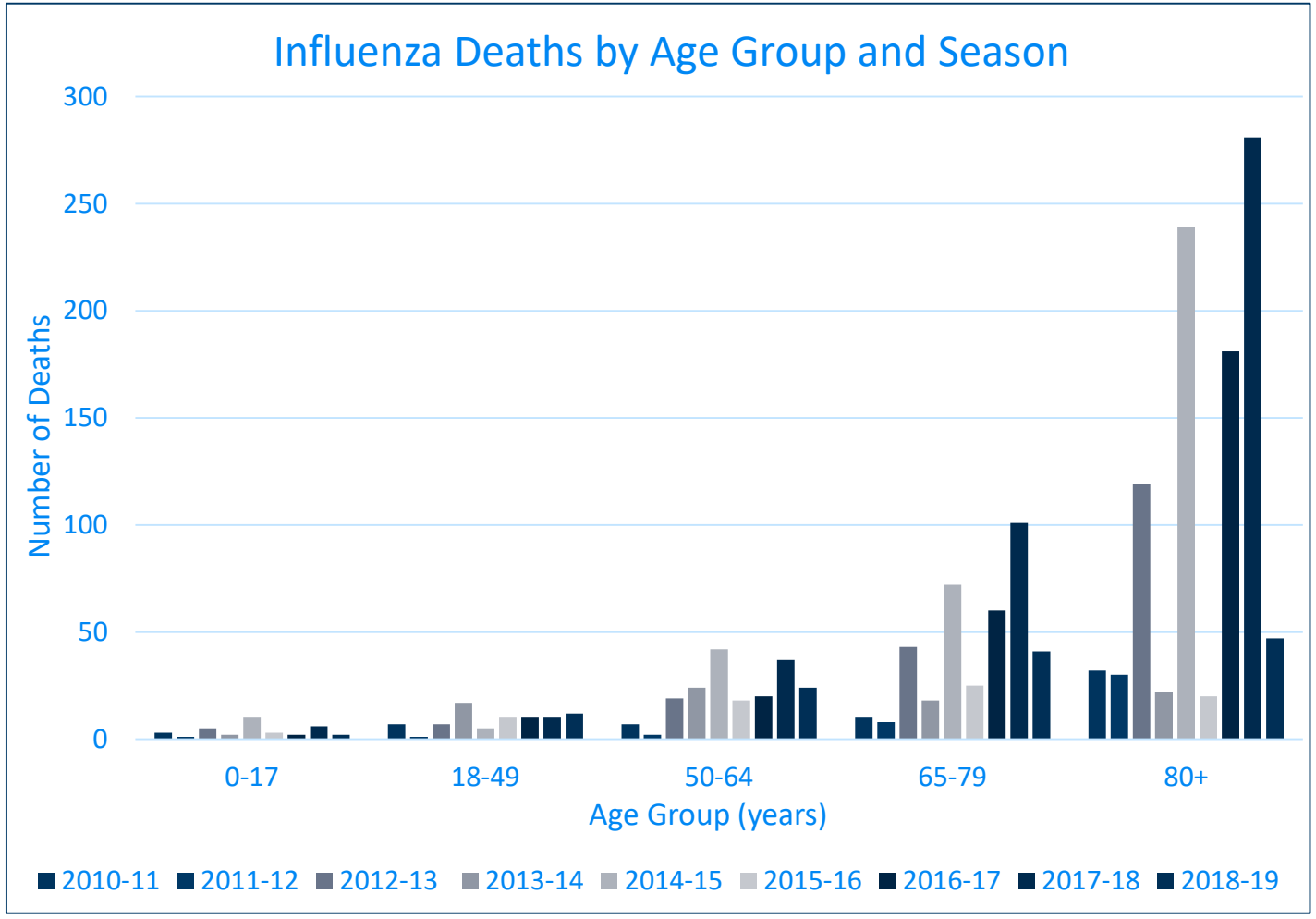


MN Influenza-Associated Deaths, 2010-2019





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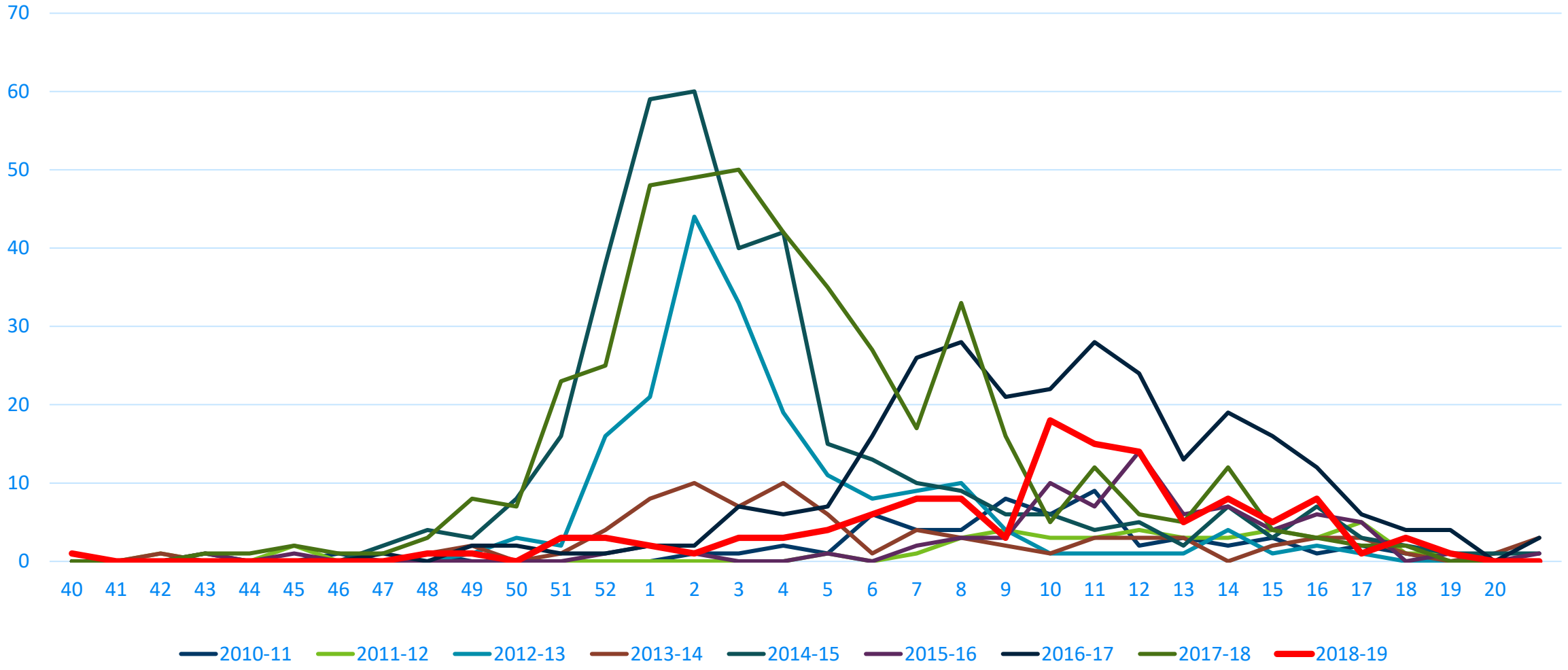

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Questions?

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Thank you!

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