Canada Health Infoway Challenge

· Question:
What is the rate of repeated laboratory tests within a ninety (90) day period?

· **Team and list of all team member names:**
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Describing the Data and Analysis

· Data Custodian Organization(s) and data sources: British Columbia Pubic Health and Microbiology Reference Laboratory (BCPHMRL).
· List of Datasets Used (e.g. names of database and/or data origins): Sunquest (the BC provincial public health laboratory's laboratory information system) data is imported daily into the BC Public Health Reporting Data Warehouse where laboratory test and result data is restructured into test episodes. Since infectious agents are not usually identified by a single test, test episodes represent a group of tests that, taken together, indicate a positive or negative result.

· Exclusions:
- Proficiency tests
- Tests not performed for various reasons (e.g. insufficient sample)
- HIV point of care tests

· **Nature and Size of Cohort (e.g. geographic area covered, number of patients included):**

Results are representative of the entire BC population as ~95% of all HCV testing in BC is done through the BCPHMRL, and 100% of all syphilis and HIV testing is done through BCPHMRL.

· Data timeframe: 2010-2014

Please provide a brief summary of the analysis methodology:
Testing episodes are defined by a window of time in which a sequence of tests is performed to determine the final result for positivity/negativity of the infectious agent under laboratory investigation. Currently the episode time frames are defined as 7, 30 and 42 days for HCV, HIV, and Syphilis testing respectively. These represent the broadest range to confirm a single true positive case. The final result for an episode is determined based on rules defined by lab Subject Matter Experts. Each episode is assigned a pattern based on its final result and relation to previous episode(s). For example if a positive episode immediately precedes another positive episode, it is called a "Multiple Reactive" episode. For this analysis all Multiple Reactive episodes over a 5 year period that are within 90 days of prior positive episode are included in the numerator and all episodes within the 5 year period are included in the denominator.

Describing the Findings

· Numerator and Denominator (as specified in the question definition)

More specifically, we investigated:
HCV multiple reactive serology episodes within 90 days over a 5 year period/ total # HCV serology test episodes in a 5 year period
HIV multiple reactive episodes within 90 days over a 5 year period/ total # HIV test episodes in a 5 year period
Syphilis multiple reactive episodes within 90 days over a 5 year period/ total # syphilis test episodes in a 5 year period

Where 'episode' represents a series of laboratory tests and results for a specific pathogen performed for the same individual within a specific period of time e.g. screening and confirmatory serology for Hepatitis C virus performed for patient x within 7 days of each other.

- For HCV, anti-HCV and a supplemental anti-HCV test are included in the episode.
- For HIV, anti-HIV, and a supplemental anti-HIV and a western blot or HIV RNA are included in the episode.
- For syphilis, anti-syphilis and an RPR and a supplemental treponemal antibody test are included in the episode.

Where a reactive episode is defined by rules set by approved diagnostic guidelines. 'Multiple reactive' implies that a positive episode immediately precedes another positive episode; 'multiple non-reactive' implies that a negative episode immediately precedes another negative episode. The time frame between episodes was set to be less than or equal to the 90 day period requested by the Challenge.

· Please also provide a brief summary of the findings including any key limitations or interpretation issues (may also include one figure/table)

Results:

Collection Years: 2010-2014; Days Since Prior Episode: within 90 days		
	Numerator/ Denominator	Ratio
# HCV multiple reactive serology episodes within 90 days over a 5 year period/ total # HCV serology episodes in a 5 year period	4,427/904,790	0.49%
# HCV multiple non-reactive serology episodes within 90 days over a 5 year period/ total # HCV test episodes in a 5 year period	41,609/904,790	4.60%
# HIV multiple reactive episodes within 90 days over a 5 year period/ total # HIV test episodes in a 5 year period	23/1,155,349	0.00%
# HIV multiple non-reactive episodes within 90 days over a 5	68,259/1,155,349	5.91%

year period/ total # HIV test episodes in a 5 year period		
# Syphilis multiple reactive episodes within 90 days over a 5 year period/ total # Syphilis test episodes in a 5 year period	120/917,698	0.01%
# Syphilis multiple non-reactive episodes within 90 days over a 5 year period/ total # Syphilis test episodes in a 5 year period	65,096/917,698	7.09%

Interpretation:

- In all three infectious diseases, there is a low ratio of multiple reactive episodes indicating a low rate of re-testing in individuals who have a recent reactive test. This likely reflects the fact that close to 100% of testing is performed at a single laboratory and re-testing, if required, is requested within the episode time frames. In addition, due to the fact that episode time frames were as long as 42 days (for syphilis), we would expect a low probability of multiple reactive episodes (i.e. nearly half of the 90-day Challenge period is within a single episode time frame).
- As expected, across all the selected diseases, the rate of multiple non-reactive episodes is higher than the rate of multiple reactive episodes. Individuals exhibiting high risk behaviours may be re-tested within 90 days of a previously negative result and this is actively encouraged for some diseases. Additionally, BC campaigns to create awareness and encourage testing, such as the STOP HIV campaign may contribute to the number of multiple non-reactive episodes within 90 days.
- This tool allows for creation of optimum laboratory testing algorithms for diagnosis of true positive infections. It also can be used to discern optimum testing frequencies of at-risk individuals to support efficient diagnosis in at-risk populations.
- The methodology is flexible such that data from other laboratories could be linked in a data warehouse to allow calculation of multiple reactive episodes across public health, private and hospital laboratories. The important structures have been pre-built: the ability to group tests into episodes, define and easily modify rules to determine whether an episode is positive, negative or indeterminate, and incorporate pathogen-specific time frames that distinguish one episode from the next.