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demographic characteristics, weather, vaccination coverage, geo-
location, and reported COVID-19 cases two weeks prior were in-
cluded as predictors. We considered weeks as temporal and health
regions as geographic units to account for population-level vari-
abilities. We used a holdout method for model validation of over
300 iterations. Average mean squared error (MSE) and 95% con-
fidence interval (CI) along with overlaying forecasted COVID-19
cases over the reported were used to evaluate the overall model
fit. The model predictions were summarized as means and 95% CIs.

Results: Our best forecasting model had a mean MSE of 0.53
(95% CI: 0.49 – 0.56). Since May 2021, the overall trend of the re-
ported COVID-19 cases in Ontario closely followed the forecasted
cases, about 89% of the reported cases were within 1.5 times the
interquartile range (IQR) and all were within the entire range of
the distribution of the predictions. Forecasting accuracy also varied
by health region characteristics, such a population size and density,
remoteness, and reported COVID-19 case volume during the most
recent weeks.

Conclusion: A near-term prediction of new COVID-19 cases with
real-time population-level data could help public health au-
thorities anticipate, plan, and monitor disease burden in a popu-
lation. Such predictions also allow the assessment of population-
level health interventions to minimize new COVID-19 cases on a
real-time basis and inform prompt decision making.

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PS25.04 (1189)
Forecasting SARS-CoV-2 Incidence in Ontario Municipalities with Statistical and Algorithmic Modelling and Ensembles
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Purpose: In this study, a variety of statistical and algorithmic
models were applied to forecast Covid-19 incidence in two Can-
dian cities, Wellington-Dufferin-Guelph (WDG) and Toronto, On-
tario. The purpose of forecasting incidence in the two cities was
to explore and compare the predictive capacity of each approach
in two regions where daily incidences differ due to population
sizes, thus requiring different analytical approaches to inform pub-
lic health.

Methods & Materials: The dataset consisted of daily Covid-19
incidence within WDG and Toronto, Ontario. Data was split into
training data (March 13, 2020, to June 17, 2021) and validation
data (June 18, 2021, to July 8, 2021). Models fitted to the train-
ing data were assessed on validation data. Additionally, the effect-
ive reproductive number (Re), holidays, type of variant (i.e., Alpha,
Beta, Gamma, Delta), mutation common to a variant detected or no
mutation detected as well as the cumulative number of first and
second vaccination doses were included as predictors.

Statistical models employed were General Linear Autoregres-
sive Moving Average (GLARMA), Seasonal Autoregressive Integrated
Moving Average (SARIMA) and Regression with ARIMA errors. The
two machine learning algorithms were Neural Network Autoregres-
sion (NNAR) and Random Forest (RF). A hybrid model combining
the statistical and algorithmic approaches (ARIMA-Boosted) was
also explored. Ensembles combining several of the models were
then generated to investigate improvement in predictive perform-
ance. Performance was assessed via Root Mean Square Prediction
Error (RMSE) and Mean Absolute Scale Prediction Error (MASE).

Results: In WDG, regression with ARIMA achieved respectable
forecast accuracy (RMSE = 3.50, MASE = 0.71). Ensembles provided
a marginal gain in forecast accuracy (RMSE = 3.48, MASE = 0.67) In
Toronto, SARIMA modeling had the superior forecasts (RMSE = 8.14,
MASE = 0.52), whereas ensembles did not improve accuracy
(RMSE = 8.57, MASE = 0.58).

Conclusion: Models based on observed associations (i.e., statisti-
cal modeling) provided more accurate forecasts than data driven
algorithmic modeling (i.e., machine learning) for forecasting epi-
emic/pandemic trajectory. This finding was consistent in both
WDG and Toronto, Ontario. While ensemble forecasts may slightly
improve the forecast accuracy, the computational expense did not
justify its application in the current examples.

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Topic 26: Outbreak Response and Control
OP26.01 (825)
Assessing Effectiveness of Ring Vaccination in Mitigating a Mumps Outbreak on a College Campus
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Purpose: Mumps outbreaks continue to occur in populations
that share close social networks. Ring vaccination is a strategy that
focuses on vaccinating primary contacts and secondary contacts of
an infected individual. While a third dose of the measles-mumps-
rubella (MMR) vaccine is recommended by the Centers for Disease
Control and Prevention during outbreaks, there are limited studies
focusing on the effectiveness of ring vaccination.

Methods & Materials: In spring 2019, during a mumps outbreak
at a large urban university where two documented doses of MMR
are required for matriculation, ring vaccination was used as the
university’s primary strategy. To assess the effectiveness, this study
compared the attack rates between primary and secondary con-
acts who had only two doses of documented MMR vaccine and
contacts who were ring vaccinated and received a third MMR vac-
cine. Surveillance and contact tracing efforts during the outbreak
were also reviewed.

Results: A total of 26 case investigations resulted in 1419 pri-
mary and secondary contacts. The attack rate for contacts who had
only two documented doses of the MMR vaccine was over three
times higher than the attack rate for contacts who were ring vac-
ninated and received a third dose of MMR vaccine at least two weeks
before developing mumps infection (20 per 1000 cases versus 6
per 1000 cases, respectively; p = 0.02).

Conclusion: The rate of infection was significantly lower in ring
vaccinated contacts Guidelines that recommend ring vaccination
may help prevent larger mumps outbreaks in colleges. Requiring
MMR documentation at colleges and universities, using rigorous