# Title

# The burden of Acute Respiratory Infections on Emergency Department: a study from a university hospital in Central Italy

# Authors

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# Abstract

## Background

Acute Respiratory Infections (ARIs) have a relevant impact on public health in terms of prevalence and costs associated with the diseases. Since COVID-19 pandemic highlighted the need to adopt accurate surveillance systems to face new emergencies, the aim of our work is to describe the impact of ARIs on healthcare facilities. s.

## Methods

A retrospective analysis was conducted on electronic medical records from Pisa University Hospital, from January 2017 to December 2021. To link ED admissions and lab test, multiple linear regression models were used to understand the phenomenon and to assess the contribution of each virus within different age groups.

## Results

During the study period, 33,101 ARI admissions in ED were registered, resulting in 7,426 hospital admissions. We observed a seasonal pattern between week 42 of each year and week 17 of the following year. A reduction in ED admissions has been found in 2020, while, the average weekly rate was of 30.8% in 2020, as compared with 21.7% in 2017-2019. Analysis by age group showed a peak of accesses in the last weeks of 2021 for the <1 and 1-4 years old.

## Conclusions

Data on ARI-related admissions provide valuable insights into the dynamic patterns of seasonal air-borne infections and specific age-related vulnerabilities. This could be useful in directing health policies to identify indicators of future epidemic waves. These findings contribute to the ongoing efforts to enhance preparedness and response strategies for respiratory infections, laying the groundwork for more effective public health interventions in the future.

**Keywords:** Acute Respiratory Infection, Emergency Department, Flu, RSV

**Conflict of Interest:** All authors declare that there are no conflict of interest to disclose.

# Background

Acute Respiratory Infections (ARIs) represent a significant global health concern, contributing to substantial morbidity and placing a considerable burden on healthcare systems.

ARIs are caused by various infectious agents that affect different levels of the respiratory tract, resulting in clinical conditions. Some common examples of ARIs include flu, bronchitis, pneumonia, and severe acute respiratory syndrome (SARS).1-3 These kinds of infections are typically transmitted through respiratory droplets, leading to the circulation of pathogens, especially in populations with high density and in enclosed spaces. 4

The influenza virus is the primary etiological agent of ARIs. It is one of the main causes of death from infectious diseases in industrialized countries and is responsible for common colds.5 Secondarily, parainfluenza viruses are ubiquitous and highly common, causing bronchiolitis, bronchitis, and pneumonia, mostly in children. The seasonality of infections varies depending on the serotype.6

During outbreaks or seasonal peaks of respiratory viruses, such as the flu or respiratory syncytial virus (RSV)7,8, EDs may experience a surge in patient volume with common clinical features: (1) severe symptoms that require immediate evaluation and treatment (high fever, severe cough, shortness of breath, chest pain, or worsening respiratory distress); (2) Complications, as pneumonia, bronchitis, or exacerbation of pre-existing respiratory conditions like asthma or chronic obstructive pulmonary disease (COPD); (3) The above-mentioned conditions are more frequently reported in high-risk populations, such as young children, older adults, pregnant women, and individuals with weakened immune systems.9

The severity and frequency of acute respiratory virus admissions to emergency departments can vary based on factors like circulating viruses, demographics, and vaccination rates. Public health measures, such as vaccination and handhygiene, can alleviate this burden.10 Additionally, the human population faces a growing risk of infectious diseases due to emerging viruses influenced by climate change, globalization, urbanization near diverse animal habitats, and a rising number of immunocompromised individuals. Continuous surveillance, research, and public health efforts are crucial to monitor, prevent, and control these emerging infectious diseases.11

By leveraging technological advancements and real-time data analysis, syndromic surveillance systems can enhance public health agencies' ability to monitor and manage ARIs effectively. These systems offer several advantages, including early detection of outbreaks, timely response, and efficient use of electronic health data complements traditional methods, serving as an early warning tool for insights into ARIs’trends.12

For instance, the Italian online platform “Influnet” plays a vital role by offering real-time data on influenza activity, aiding in outbreak detection and public health interventions for swift responses in Italy. The “Influnet” surveillance system has been recently updated to include not only flu but also SARS-CoV-2 and other coronaviruses, RSV, Rhinovirus, Parainfluenza virus, Adenovirus, Metapneumovirus, and Bocavirus. For this reason, from the 2022/23 season, it has been renamed as “RespirVirNet”. 13

The Early Warning and Response System (EWRS) is a crucial tool for infectious disease surveillance and response. It enables rapid notification and reporting of outbreaks, supports international collaboration, and facilitates early detection and risk assessment. Overall, EWRS enhances global health security by facilitating data sharing, early detection, and coordinated responses to infectious diseases.14

The purpose of this study is to establish a comprehensive framework for accessing and characterizing the patterns of ARIsin the emergency department of the AOUP. This involves not only gathering data on ED access for ARIs but also integrating this information with laboratory-characterized ARI cases to create an integrated surveillance system designed to monitor and respond to ARIs effectively.

# Methods

## Data sources

This study uses two distinct sources of data: (1) ED electronic health records (EHR) and (2) laboratory data.

* ED data: We retrospectively extracted aggregated data, collected from January 2017 to December 2021 within the EHR of the ED of AUOP hospital in Pisa, Tuscany, Italy. These data were stratified by age group, sex, ICD-9-CM diagnosis, admission status, year and isoweek.
* Laboratory data: Data on respiratory samples virology obtained from January 2017 to December 2021 from AOUP-admitted patients were extracted from the Hospital Laboratory dataset (OpenLIS)15. Both PCR and antigenic tests were used to detect Adenovirus, Bocavirus, Coronavirus (HKU1, NL63, OC43, Mers and Sars), Enteroviruses, Influenza (A, A/H1, A/H3 and B), Metapneumovirus, Parainfluenza (1 to 4), RSV (A and B), and Rhinovirus. Virology test results were stratified by results, age group, sex, year, and isoweek.

## Data cleaning and pre-processing

Extracted ED data had seven age classes, namely: below 1 years old (yo), from 1 to 5 yo, from 5 to 15 yo, from 15 to 25 yo, from 25 to 65 yo, from 65 to 85 yo and above 85 yo, with upper limit excluding the margins. Clinical suspect of ARIs was defined according to the diagnosis at discharge using the following ICD-9 CM codes:

|  |  |
| --- | --- |
| Code | Description |
| 460 | Acute rhinopharyngitis |
| 462 | Acute pharyngitis |
| 463 | Acute tonsillitis |
| 465.9 | Upper breathway infection, not specified |
| 466.0 | Acute bronchitis or bronchiolitis |
| 466.11 | RSV-related acute bronchiolitis |
| 466.19 | Acute bronchiolitis from other infectious agents |
| 480.8 | Pneumonia from other viruses, not specified |
| 485 | Bronchopneumonia, not specified |
| 487.0 | Flu |
| 487.1 | Flu with other respiratory manifestations |
| 487.8 | Flu with other manifestations |
| 786.07 | Wheezing |
| 786.09 | Other kind of dyspnoea or respiratory anomalies |
| 786.2. | Cough |

The virus database included the aggregated number of tests that the AOUP laboratory performed. To harmonize quantitative and semi-quantitative tests with qualitative tests, The results were coded according to positive or negative tests performed, such as rinopharyngeal swab, pharyngeal swab, sputum, blood culture, serum/plasma culture and all other kind of swab or culture. The number of positive results for each test was then extracted by age group, sex, year, and isoweek. Laboratory data could include multiple tests for a single sample, and multiple samples for a single subject with possibly multiple time-points per subject. Confirmed cases of ARIs were defined as the number of positive results.

ED data were merged with laboratory data relative to the same year and isoweek and accordingly to the demographic strata (age class and sex) to obtain a single dataset.

For the sensitivity analyses described in the statistical analysis section, we decided to gather isoweek counts by month to avoid having any lab count of zero by strata and period. For age related sensitivity analyses we further grouped age-classes into macro age-classes to both limit the presence of sparse data and maintain interpretable results. Indeed, macro age-classes used subgroups generated with the 6- and 65-years cut-offs. This allowed to separate groups of subjects with different expected ARI-associated risk factors, namely infants and pre-scholar children (aged 0 to 5), scholar children and adults (aged 6 to 65 years) and older adults and elder (above 65 years of age).

## Statistical analysis

Characteristics of emergency department admissions and laboratory tests were summarized as counts and percentages. We used generalized linear models to estimate (1) the association between clinical suspect of ARI at ED and other admission characteristics (sex, age, and initial emergency code); and (2) the associations between laboratory-charachterizedARI cases and other test or subject characteristics (sex, age, and type of tested virus). Odds ratio (ORs) and their 95% confidence intervals are used to report these estimates.

The observed positive lab test results by virus were visually compared with the number of ED visits caused by ARIs over the same period. To quantify this association, we modelled the weekly ARIs counts using multivariable linear regression. The independent variables were the number of positive viral laboratory results within the same period frame. Model intercept was assumed to represent the number of subjects with ARI-related ED admission that were not explained by the virus counts included in the model.

Despite all the virus counts being considered as explanatory variables, terms with negative coefficients were discarded from the model16. This strategy was a consequence of considering biologically implausible the hypothesis that any ARI-related positive-test could have a protective effect against ARI-related ED admission, regardless of statistical significance. The model contribution of each virus counts was assessed in terms of the explained proportion of the ARIs-related ED admission variability expressed as adjusted R2. Adjusted R2 as compared to raw R2 mitigate the bias related to R2 inflation when more than one independent variable is used. The attribution of the ARI’s rate to each virus was generated by multiplying each regression coefficient by the virus count within the corresponding time window.

R statistical software version 4.3.0 was used for all analyses.

## Sensitivity analysis

The confounding effects of age, sex, laboratory activity, and seasonal patterns were explored in sensitivity analyses. As an attempt to account for the age confounding effects, we fitted the multivariable linear regression model splitting each time period in age macro-classes (0 to 5 years, 6 to 65, above 65 years), estimated the presence of a significant interaction between the age class and type of virus, and then compared the virus count contribution in terms of the explained proportion of ARIs variability in each age strata. A similar approach (assessment of heterogeneity and then conditional estimates) was used to explore the confounding effects of sex. As an effort to explain the possible confounding effect of a non-constant laboratory activity, we run again the regression model keeping the number of positive tests as dependent variable but using the total number of performed tests as an offset. As an attempt to account for seasonal variations, we modified the regression model with a single intercept into a model with a different intercept for each month (representing a variable monthly number of unexplained ARI-related ED admissions). When comparing nested models, we based on the likelihood ratio test the decision of whether include or not include an additional predictor to the model (such as age or sex).

# Results

## ARI cases in ED

During the 5-year study period, a total of 404,820 admissions were recorded in the AOUP ED. 12,834 of them were identified as cases of ARIs. 25 to 65 years old and 65 to 85 years old were the most prevalent age groups, including 70% of the admitted subjects. Notably, within the age group of 0–1 year-old showed a higher prevalence of ARI cases compared to other groups. Most patients (42.2%) accessing the ED were categorized with a green code during triage, indicating a deferrable urgency level that is not immediately life-threatening (*Table 1*). *Figure 1* summarizes admissions by isoweek, sex, and age. ARIs diagnoses had higher occurrence in males compared to females (OR = 1.17, 95% CI from 1.13 to 1.21) and across extremer age groups compared to the 25-65 years class (OR ranging from 1.2 to 13.5). Notably, the 0-15 yo age group displayed an elevated risk, particularly in the 0-1 years old subgroup with an OR of 13.49 (95% CI = 12.72-14.30, p<0.001), as presented in *Table 1*.

## Laboratory tests

During the 5-year study period, a total of 122,754 laboratory tests were conducted on 7,133 subjects. Non clinically relevant heterogeneity in test administration was observed among sex and age classes, as shown in *Figure 2*. For each tested virus, the positivity of lab test result had no significant gender associations, but substantial heterogeneity was detected across age groups, as shown in *Table 2*. A visual overview of the associations between age class and laboratory test positivity for each test type is included in *Figure 3*. Briefly, Influenza showed a higher positivity trend with increasing of age, coronavirus positivity showed a weak association with age and all the other viruseswere more frequent in younger than adults.

## Cases attribution

Temporal trends in virus diagnoses from respiratory samples were cross-referenced with the number of ARI-related ED visits over the same time frame, revealing a consistent pattern of infections peaking in the final weeks of the year and the early weeks of the subsequent year, coinciding with the cold season (*Figure 2*).

A modelling approach was employed to assess the relationship between ARI cases and laboratory virus counts. The isoweek of diagnoses in the ED served as the unit of observation, while lab-confirmed virus counts from the same isoweek of the corresponding year served as independent variables. The weekly RSV and Influenza counts had a strong, positive, and significant correlation with ARI cases in the ED (*Table 3*). Adenovirus, Bocavirus, Coronavirus, and Parainfluenza weekly counts displayed a biologically implausible protective effect (with an estimated OR below 1). Meanwhile, Enterovirus/Rhinovirus and Metapneumovirus showed a non-significant positive association with clinical suspect of ARIs at ED. These models explained approximately 35% of the variability in ARIs counts. To refine the analysis, independent variables that were negatively associated with ARIs or displayed a non-significant association (p>0.05) were excluded. This led to the development of a simplified model. Remarkably, this reduced model retained just two virus counts (Influenza and RSV), explaining about 29% of the variability in ARIs counts - a mere 6% drop from using all predictors.

However, when focusing on the two most prominent viruses, RSV and Influenza, distinct demographic patterns emerged. Specifically, a slight peak in flu positivity among females aged 1-5 years old was observed in 2017 (16.7%), and a more significant peak in RSV positivity was noted among females aged 0-1 years old in the same year (80.0%).

To address the potential confounding effects of ARIs varying prevalence across age groups, we first adjusted estimates for ages, then we added an interaction term in the model between age classes and the virus counts, and finally we stratified the analysis by age group. Age alone explained about 14%, of which, about 9% was already explained by the two viral counts. A significant statistical interaction was observed between age classes and both virus counts, suggesting that the association between lab test positivity and suspected ARI admission in ED varied across ages. Within each age group strata, approximately 50% of the variability in ARI cases could be elucidated by virus counts. Specifically, RSV accounted for roughly 35% of the ARIs variability in the 0-5 years old group, and less than 3% in other groups. Flu, on the other hand, explained about 45% of the ARIs variability in age groups above 6 years old, and approximately 20% in the 0-5 years old group.

Sex alone explained less than 1% of ARIs ED variability and offer no contribution when included in the model with the Influenza and RSV (likelihood ratio test p=0.178).

After ED visits and lab tests, 3,066 patients were admitted to inpatient units as ARI cases and the allocation in the destination ward is usually related to the clinical status of patients and disease pattern. In our findings, patients were often admitted to General Medicine ward (1,522, 49.6%), Geriatrics (540, 17.6%), Pediatrics (473, 15.4%), Infectious and Tropical Diseases (239, 7.8%) and Pneumology (99, 3.2%) wards.

# Discussion

The main observation of this study is the trend of ARI-related emergency room admissions, with a peak of infections during the cold season. The temporal correlation between ARI cases and RSV and influenza lab positivity, underscores the role of these pathogens in determining seasonal fluctuations in respiratory illness.

The study also highlights variations in ARI hospitalizations and virus positivity among different age groups, revealing potential disparities: higher rates of ARI hospitalization were found in 25-65 years old and 65-85 ones), with significant spikes in viral infections such as influenza, may reflect differences in access to health care or preventive measures, such as vaccination rates.

Modelling results emphasize the prevalence of viruses such as RSV and influenza in younger age groups, too. Influenza accounted for 45 percent of the variability of ARI in children older than 6 years, suggesting that vaccines could be effective strategies to reduce ARI-related emergency room admissions. This underscores the importance of vaccination campaigns and public health strategies on mitigating the spread of respiratory viruses and reducing ARI-related Emergency room admissions.

The association within vaccine-preventable infections and admission in ED may highlight a need for improved vaccination coverage and early detection protocol among children and elderly. Infection rates underscore a significant burden of ARI in infants aged 0 to 1 year. This age group showed the highest risk of emergency room admissions for ARI, indicating their vulnerability to respiratory infections, mostly RSV-related.

The prevalence of “green code” during triage in ED, indicating non-life-threatening conditions, may suggest overuse of emergency services and pressure on allocated resources. The distribution of ARI cases among different medical units after ED visits shows that patients were mainly assigned to General Medicine and Geriatrics departments, but a notable allocation of ARI cases to Pediatrics units underscores the burden of respiratory infections in children.

To contain the burden on ED, many of these non-severe cases could be managed in primary care settings or outpatient services. Strengthening community care, improving patient education, and increasing the co-operation with General Practitioner or local healthcare facilities could help divert minor codes from the ED, optimizing resource allocation and improving patient flow.

Although this study contributes significantly to the understanding of the epidemiology of ARI and its relationship to respiratory viruses, limitations must be acknowledged. The study is retrospective in nature and is based on existing cumulative data, so potential underreporting or incomplete reporting may be considered . Furthermore, remains a critical need for future research to advance our understanding and improve disease surveillance.

# Conclusions

In summary, this study reveals important trends in ED admissions for ARI, revealing the role of RSV and flu as key factors in seasonal respiratory infections. Age-specific vulnerability underlines the importance of tailored interventions for different demographic groups. However, further research is needed to explore contributing factors, identifying seasonality and optimising bed occupancy levels.

These findings have implications for public health strategies, emphasising the importance of targeted interventions for better patient management. Strategies should prioritise vaccination campaigns, particularly for RSV and influenza, along with improved patient care protocols to relieve pressure on healthcare facilities and reduce the prevalence and severity of ARI.

In conclusion, while the current study has provided important insights into ARIs and the association with respiratory viruses, the advancement of syndromic surveillance systems represents a promising avenue for future research. The integration of real-time data, advanced analytics and predictive modelling can improve our ability to monitor, predict and respond to ARI outbreaks, ultimately contributing to more effective public health strategies and better management of respiratory diseases.

# List of abbreviations

AOUP – Azienda Ospedaliero-Universitaria Pisana (Pisa University Hospital)

ARI(s) – Acute Respiratory Infection(s)

COPD - Chronic obstructive pulmonary disease

COVID-19 – CoronaVirus Disease 2019

ED – Emergency Department

EHR(s) – Electronic Health Record(s)

EWRS – Early Warning and Response System

ICD-9 CM – International Classification of Diseases, 9th revision, Clinical Modification

PCR – Polymerase Chain Reaction

RSV – Respiratory Syncytial Virus

SARS – Severe Acute Respiratory Syndrome

# Declarations

## Ethics approval and consent to participate:

Not applicable

## Consent for publication

Not applicable

## Availability of data and materials

The data that support the findings of this study are available from AOUP but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of AOUP

## Competing interests

The authors declare that they have no competing interests

## Funding

Not applicable

## Authors' contributions

Conceptualization: CR, NZ, FDS, GA

Data extraction and database management: FF, MC, OP, MP, ADP

Statistical analysis: LC and LB

Writing, review and editing: CR, NZ, FDS, LC

## Acknowledgements

Not applicable

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# Tables

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Overall  N = 404820 | Non suspected  ARI cases  N = 391977 | Suspected  ARI cases  N = 12843 | OR (95%CI) |
| Male, N (%) | 199964 (49.4) | 193142 (49.3) | 6822 (53.1) | 1.17 (1.13, 1.21) |
| Age (year), N (%) |  |  |  |  |
| Below 1 | 10744 (2.7) | 8628 (2.2) | 2116 (16.5) | 13.5 (12.7, 14.3) |
| 1 to 5 | 17878 (4.4) | 15468 (3.9) | 2410 (18.8) | 8.57 (8.11, 9.05) |
| 5 to 15 | 28987 (7.2) | 27724 (7.1) | 1263 (9.8) | 2.51 (2.35, 2.68) |
| 15 to 25 | 37484 (9.3) | 36645 (9.3) | 839 (6.5) | 1.26 (1.17, 1.36) |
| 25 to 65 | 185037 (45.7) | 181733 (46.4) | 3304 (25.7) | reference |
| 65 to 85 | 97630 (24.1) | 95550 (24.4) | 2080 (16.2) | 1.20 (1.13, 1.27) |
| 85 or above | 27060 (6.7) | 26229 (6.7) | 831 (6.5) | 1.74 (1.61, 1.88) |
| Initial emergency code, N (%) |  |  |  |  |
| Arrived deceased | 58 (0) | 58 (0) | 0 (0) | n.c. |
| Emergency / Red | 8049 (2.0) | 7960 (2.0) | 89 (0.7) | 0.32 (0.26, 0.39) |
| Emergency Unavoidable / Yellow | 60679 (15.0) | 58705 (15.0) | 1974 (15.4) | 0.95 (0.90, 1.00) |
| Emergency Postponable / Green | 170948 (42.2) | 165120 (42.1) | 5828 (45.4) | reference |
| Minor emergency / Blue | 96710 (23.9) | 93936 (24.0) | 2774 (21.6) | 0.84 (0.80, 0.88) |
| Non-Emergency / White | 68376 (16.9) | 66198 (16.9) | 2178 (17.0) | 0.93 (0.89, 0.98) |
| Year, N (%) |  |  |  |  |
| 2017 | 89558 (22.1) | 86528 (22.1) | 3030 (23.6) | reference |
| 2018 | 91151 (22.5) | 88128 (22.5) | 3023 (23.5) | 0.98 (0.93, 1.03) |
| 2019 | 93678 (23.1) | 90244 (23.0) | 3434 (26.7) | 1.09 (1.03, 1.14) |
| 2020 | 58045 (14.3) | 56360 (14.4) | 1685 (13.1) | 0.85 (0.80, 0.91) |
| 2021 | 72388 (17.9) | 70717 (18.0) | 1671 (13.0) | 0.67 (0.64, 0.72) |

*Table 1. Characteristics of the admission at the Emergency Department of Azienda Ospedaliero-Universitaria Pisana from January 2017 to December 2021*

|  |  |  |  |
| --- | --- | --- | --- |
|  | Overall  N = 122754 | Not-confirmed  ARI cases  N = 118513 | Confirmed  ARI cases  N = 4241 |
| Male, N (%) | 66264 (54.0) | 63874 (53.9) | 2390 (56.4) |
| Age (year), N (%) |  |  |  |
| Below 1 | 7630 (6.2) | 6991 (5.9) | 639 (15.1) |
| 1 to 5 | 6401 (5.2) | 5941 (5.0) | 460 (10.8) |
| 5 to 15 | 8229 (6.7) | 8030 (6.8) | 199 (4.7) |
| 15 to 25 | 7802 (6.4) | 7573 (6.4) | 229 (5.4) |
| 25 to 65 | 42609 (34.7) | 41543 (35.1) | 1066 (25.1) |
| 65 to 85 | 35694 (29.1) | 34494 (29.1) | 1200 (28.3) |
| 85 or above | 14389 (11.7) | 13941 (11.8) | 448 (10.6) |
| Tested, N (%) |  |  |  |
| Adenovirus | 17699 (14.4) | 17240 (14.5) | 459 (10.8) |
| Bocavirus | 5710 (4.7) | 5572 (4.7) | 138 (3.3) |
| Coronavirus | 17226 (14.0) | 16764 (14.1) | 462 (10.9) |
| Human rhinovirus/enterovirus | 11723 (9.5) | 10854 (9.2) | 869 (20.5) |
| Influenza | 31713 (25.8) | 30724 (25.9) | 989 (23.3) |
| Metapneumovirus | 6763 (5.5) | 6518 (5.5) | 245 (5.8) |
| Parainfluenza | 20558 (16.7) | 19987 (16.9) | 571 (13.5) |
| RSV | 11362 (9.3) | 10854 (9.2) | 508 (12.0) |

*Table 2. Characteristics of the respiratory samples’ virology from the Azienda Ospedaliero-Universitaria Pisana laboratories by year from January 2017 to December 2021*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Term | logOR | Standard error | p | R-squared (%) |
| Complete | Adenovirus | negative | - | - | 0.03 |
| Bocavirus | negative | - | - | 0.01 |
| Coronavirus | negative | - | - | 0.55 |
| Enterovirus/Rhinovirus | 0.58 | 0.55 | 0.298 | 6.81 |
| Influenza | 1.15 | 0.23 | <0.001 | 18.3 |
| Metapneumovirus | 2.27 | 1.36 | 0.096 | 2.50 |
| Parainfluenza | negative | - | - | 0.01 |
| RSV | 3.68 | 0.64 | <0.001 | 9.36 |
| Multiple R-squared = 0.376  Adjusted R-squared = 0.353 | | | | |
| Simplified | Influenza | 1.21 | 0.51 | 0.021 | 27.0 |
| RSV | 2.32 | 1.16 | 0.051 | 4.86 |
| Multiple R-squared = 0.319  Adjusted R-squared = 0.294 | | | | |

*Table 3. Model results*

# Figures

A graph of different colored lines

Description automatically generated with medium confidence

*Figure 1. Median yearly counts of the Emergency department suspected, and laboratory confirmed cases of ARI by sex and isoweek. Age groups are represented with different filling colour, males’ columns extend from the solid black line downward, while female cases are counted from the solid black line upward.*

A graph of different colored lines

Description automatically generated

*Figure 2. Absolute counts of emergency department suspected (thicker black line) and laboratory confirmed (coloured lines) cases of ARI overtime.*

A graph of a virus

Description automatically generated with medium confidence

*Figure 3. Association between age classes and laboratory test positivity by type of test. The class 25 to 65 years is considered as the reference risk group.*