Supplementary information

Appendix 1: ICD-10 codes related to COVID-19

Table A.1 shows a list of ICD-10 codes used to classify COVID-19-related conditions and diagnoses. Each code represents a specific health condition directly associated with COVID-19, ranging from exposure to the virus to post-COVID complications.

Appendix 2: Quantifying the Effective Coverage of SHIELD Test Centers

In this model, represents the index for each SHIELD test center, corresponds to each zip code, and denotes time. The variable ​ is the number of COVID-19 samples collected from zip code by test center in time , while ​ represents the total number of samples collected from zip code by all test centers in in time . The proportion of samples collected by test center iii from zip code in time , denoted as ​. The effective number of SHIELD test centers serving zip code in time , denoted as , is then determined by summing these proportions across all test centers, capturing the distribution of service provided by the centers in relation to the zip code. This approach quantifies the contribution of multiple centers in testing coverage for each zip code.

Appendix 3: Mathematical Calculation of COVID-19 ICU Admission Rate

The total number of ICU admissions in zip code during time is represented by , and the population of zip code is denoted as ​. The COVID ICU admission rate for zip code during time , denoted as , is calculated as the ratio of the total ICU admissions to the population of the zip code. This rate captures the proportion of ICU admissions related to COVID-19 in a given zip code relative to its population, providing a standardized measure of the ICU burden on the local healthcare system. The formula is:

This formula calculates the number of ICU admissions per 1,000 people for a given zip code in time

Appendix 4: Trends of SHIELD test centers and effective number of SHIELD centers over time

Figure A.1 shows the trends of the number of SHIELD test center versus effective number of SHIELD test centers for all zip codes over time.

Appendix 5: Comparison of LUMC ICU Cohort with Cook County and National Averages1.

Table A.2 compares demographic characteristics of the LUMC ICU cohort with Cook County and national averages, highlighting differences in race, gender, language, and socioeconomic factors.

**Table A.1:** ICD-10 codes related to COVID-19

|  |  |
| --- | --- |
| COVID-19-relatedICD-10 code | Description |
| Z11.52 | Contact with and (suspected) exposure to COVID-19 |
| M35.81 | Multisystem Inflammatory Syndrome (MIS) |
| J12.82 | Pneumonia due to Coronavirus disease 2019 |
| U07.1 | COVID-19 |
| U09.9 | Post-COVID-19 condition, unspecified |
| B97.29 | Other Coronavirus as the cause of disease classified elsewhere |
| J20.8 | Acute bronchitis confirmed as due to COVID-19 |
| J22 | Lower or acute respiratory infection due to COVID-19 |
| J98.8 | Respiratory infection due to COVID-19 |
| J80 | Acute Respiratory Distress Syndrome (ARDS) due to COVID-19 |

**Table A.2:** Demographic Comparison of LUMC ICU, Cook County, and National Averages

|  |  |  |  |
| --- | --- | --- | --- |
| Characteristic | LUMC ICU Cohort | Cook County | National Average |
| Black/African American Patients (%) | 19 | 23.8 | 13.4 |
| Female Patients (%) | 43.3 | 51.4 | 50.8 |
| Non-English Speakers (%) | 35 | 35 | 21.5 |
| Hispanic Population (%) | - | 26.1 | 18.5 |
| Poverty Rate (%) | - | 13 | 11.4 |

**Fig. A.1:** Trends of SHIELD test centers and SHIELD centers over time for all zip codes: This figure illustrates the trends in the average number of SHIELD test centers and the average effective number of SHIELD test centers over time, segmented by the Alpha, Delta, and Omicron COVID-19 waves. The data highlights changes in testing site availability and effective utilization during different phases of the pandemic, showing a peak during the Delta and Omicron waves, followed by a decline after early 2022.

References

1. U.S. Census Bureau QuickFacts: Cook County, Illinois. https://www.census.gov/quickfacts/fact/table/cookcountyillinois/POP010220.