Covid-19, Airlines, Society

Flying in the COVID-19 Era--Science-based Risk Assessments and Mitigation Strategies on the Ground and in the Air: A Workshop

Pinar Keskinocak, Ph.D.
William W. George Chair and Professor,
School of Industrial and Systems Engineering
Director, Center for Health and Humanitarian Systems
Uncertainty
Variability
Disruptions
Complexity

Data, analytics, systems engineering in decision-making

- Fleet planning, Maintenance, Ground operations, Flight & Crew scheduling, Price and revenue management, Disruption management, ...

Source: World Bank Data
Comparison of number of flights operated between 2019 and 2020

Snapshot of Aug 2020 air-passenger volume compared to Aug 2019:

- Global travel ↓64%
- Domestic travel ↓51%; International travel ↓81%
- Connecting flights ↓81%; Non-stop flights ↓61%

Source: International Civil Aviation Organization data
**Chart 4:** Int'l belly cargo and freighter capacity growth

![Chart 4: Int'l belly cargo and freighter capacity growth](https://www.ajc.com/business/with-few-passengers-delta-gets-faa-approval-carry-cargo-cabin/txiJbJv3srGFc0c1mkU8H/)

**Source:** IATA Monthly Statistics

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**Chart 5:** International cargo load factors by region

![Chart 5: International cargo load factors by region](https://scmwiki2012.wordpress.com/b/belly-cargo/)

**Sources:** IATA Economics, IATA Monthly Statistics
Travel Budget
Direct business travel spending in U.S., by U.S. residents

$350 billion

When do you expect your company’s budget for employee travel to return to pre-pandemic levels?

Source: CNBC Q4 2020 Technology Executive Council Survey

Note: 2020-2024 figures reflect Nov. 2020 forecast
Source: U.S. Travel Association
Infectious Disease Modeling

Disease progression in an individual – Natural history

Disease spread

- Model the spread of the disease
- Project spread & metrics/outcomes of interest
- Evaluate the impact of interventions on outcomes
- Estimate resource needs
- Resource planning and allocation
**Data:** Various data sources, including
- Household statistics, workflow data, classroom sizes, age statistics

**Modeling:** Agent-based simulation
## Scenarios for Non-Pharmaceutical Interventions

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Baselines</th>
<th>Feb 18</th>
<th>Feb 25</th>
<th>Mar 3</th>
<th>Mar 10</th>
<th>Mar 16</th>
<th>Apr 3</th>
<th>May 1</th>
<th>May 8</th>
<th>May 15</th>
<th>____</th>
<th>Sep 30</th>
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</thead>
<tbody>
<tr>
<td><strong>No Intervention</strong></td>
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<td>Mar 16: School Closures</td>
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</tbody>
</table>

**Voluntary Quarantine (VQ):**

All household members stay home if there is a person with cold/flu like symptoms in the household, until the entire household is symptom-free.

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>SIP: 4 weeks</th>
<th>LOW VQ</th>
<th>VSIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 2</td>
<td>SIP: 4 weeks</td>
<td>MEDIUM VQ</td>
<td>VSIP</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>SIP: 4 weeks</td>
<td>HIGH VQ</td>
<td>VSIP</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>SIP: 5 weeks</td>
<td>LOW VQ</td>
<td>VSIP</td>
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<tr>
<td>Scenario 5</td>
<td>SIP: 5 weeks</td>
<td>MEDIUM VQ</td>
<td>VSIP</td>
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<tr>
<td>Scenario 6</td>
<td>SIP: 5 weeks</td>
<td>HIGH VQ</td>
<td>VSIP</td>
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<tr>
<td>Scenario 7</td>
<td>SIP: 6 weeks</td>
<td>LOW VQ</td>
<td>VSIP</td>
</tr>
<tr>
<td>Scenario 8</td>
<td>SIP: 6 weeks</td>
<td>MEDIUM VQ</td>
<td>VSIP</td>
</tr>
<tr>
<td>Scenario 9</td>
<td>SIP: 6 weeks</td>
<td>HIGH VQ</td>
<td>VSIP</td>
</tr>
</tbody>
</table>

**LOW VQ:** 70% VQ with 20% weekly decrease and stabilize at 20%

**MEDIUM VQ:** 80% VQ with 5% weekly decrease and stabilize at 25%

**HIGH VQ:** 85% VQ with 3% weekly decrease and stabilize at 30%

**Shelter In Place (SIP):**

Start on April 3

**VSIP:** 60% VSIP and decrease to 40%, 20%, 5% weekly then continue at 5%
A few takeaways from our research

- *Shelter-in place* effects are temporary
- *School closures* buy time, but disruptive; alternating school day schedules are effective
- *Voluntary quarantine* at high compliance levels significantly reduces infections, while limiting ‘homebound days’
- Predictions about resource (hospital bed, ICU bed, ventilator) needs and shortages in various geographic regions

- Number of contacts
- Frequency of contacts
- Proximity of contacts
- Duration of contacts
Back to “normal”?

The Joint Impact of COVID-19 Vaccination and Non-Pharmaceutical Interventions on Infections, Hospitalizations, and Mortality: An Agent-Based Simulation | medRxiv
Which countries have got the vaccines?
Total reported vaccine doses administered per 100 people

- Below 1
- 1-10
- 10-20
- 20-30
- 30-40
- 40-50
- 50 or more
- No data

Note: Total vaccinations refers to the number of doses given, not necessarily the number of people vaccinated

Source: OWID, gov.uk dashboard, ONS, updated 1000 GMT on 1 Feb

Source: NBC and CDC

What is on the horizon?
