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Session: P-16. COVID-19 Impact of Social Distancing/Mitigation Measures

Background: In December 2009, a cluster of patients with pneumonia was reported in the city of Wuhan, capital of Hubei province in China, caused by a novel coronavirus: SARS-CoV-2.

The epidemiological compartmental susceptible-exposed-infected-recovered (SEIR) model has been previously used during the initial wave of the H1N1 influenza pandemic in 2009. This study investigates whether the SEIR model, associated to mobility changes parameters, can determine the likelihood of establishing control over an epidemic in a city, state or country.

Methods: The critical step in the prediction of COVID-19 by a SEIR model are the values of the basic reproduction number (R0) and the infectious period, in days. R0 and the infectious periods were calculated by mathematical constrained optimization, and used to determine the numerically minimum SEIR model errors in a country, based on COVID-19 data until april 11th. The Community Mobility Reports from Google Maps (https://www.google.com/covid19/mobility/) provided mobility changes on april 5th compared to the baseline (Jan 3th to Feb 6th). The data was used to measure the non-pharmacological intervention adherence. The impact of each mobility component was made by logistic regression models. COVID-19 control was defined by R0 of the SEIR model in a country less than 1.0.

Algorithm for the SEIR model applied to COVID-19 (initialization)

```
Algorithm COVID
    Read N (population's size)
    Read T_phase_I (duration of the first phase of the epidemic (days))
    Read = R0_phase_I (basic reproduction number for COVID-19 from the first phase of the epidemic)
    Read T_infectious_phase_I (the infectious period from the first phase of the epidemic (days))
    Read T_phase_II (duration of the second phase of the epidemic (days))
    Read = R0_phase_II (basic reproduction number for COVID-19 from the second phase of the epidemic)
    Read T_infectious_phase_II (the infectious period from the second phase of the epidemic (days))
    Read = R0_phase_III (basic reproduction number for COVID-19 from the third phase of the epidemic)
    Read T_infectious_phase_III (the infectious period from the thrid phase of the epidemic (days))
    T_incubacao = 3.7 (COVID-19 the incubation period, in days)
    p_CTI = 0.05 (spectrum of disease: proportion of critical COVID-19 cases)
    letalidade = 0.023 (the overall case-fatality rate)
    p_assintomaticos = 0.18 (asymptomatic proportion of COVID-19)
    f = 1/T_incubacao (the rate at which individuals move from the latent class to the infected class)
    t = 0 (first day = "zero day")
    t_Max = 180 (last day of simulation: 180 days after the first COVID-19 case)
    Susceptivel[t] = (N - COVID) (susceptible individuals)
    Preinfec[t] = 0 (exposed or latent patients)
    COVID[t] = 1 (infected patients or COVID-19 cases)
    Imunes[t] = 0 (recovered or immune patients)
    CTI[t] = 0 (critical cases)
    Obitos[t] = 0 (case-fatality)
...
```

Table 01: Algorithm for the SEIR model applied to COVID-19 (calculation of new COVID-19 cases day-by-day)

```
...
    Repeat
        t = t + 1
        If (t ≤ T_phase_I)then
                        ecr = R0_phase_I/T_infectious_phase_I (effective contact rate for phase 1)
                        recupera = 1/T_infectious_pahse_I (recovery rate for phase 1)
                else Se (t ≤ T_phase_II)then
                        ecr = R0_phase_II/T_infectious_phase_II (effective contact rate for phase 2)
                        recupera = 1/T_infectious_pahse_II (recovery rate for phase 2)
                else
                        ecr = R0_phase_III/T_infectious_phase_III (contact rate for phase 3)
                        recupera = 1/T_infectious_pahse_III (recovery rate for phase 3)
        End If

        Beta = ecr/N (transmission rate)
        Susceptivel[t] = Susceptivel[t-1] - Beta*COVID[t-1]*Susceptivel[t-1]
        Preinfec[t] = Preinfec[t-1] + Beta*COVID[t-1]*Susceptivel[t-1]-f*Preinfec[t-1]
        COVID[t] = COVID[t-1] + f*Preinfec[t-1] - recupera*COVID[t-1]
        Imunes[t] = Imuntes[t-1] + recupera*COVID[t-1]
        CTI[t] = p_CTI*COVID[t]
        Obitos[t] = letalidade*Imunes[t]*p_assintomaticos
        Write t, Susceptivel[t],Preinfec[t],COVID[t],Imunes[t],CTI[t],OBitos[t]
        If (t = t_Max)
            Then break
        End If
    End Repeat
End Algorithm
```

Results: Residential mobility restriction presented the higher logistic coefficient (17.7), meaning higher impact on outbreak control. Workplace mobility restriction was the second most effective measure, considering a restriction minimum of 56% for a 53% chance of outbreak control. Retail and recreation mobility presented 53%, and 86% respectively. Transit stations (96% and 54%) were also assessed. Park mobility restriction demonstrated the lowest effectiveness in outbreak control, considering that absolute (100%) restriction provided the lowest chance of outbreak control (46%).

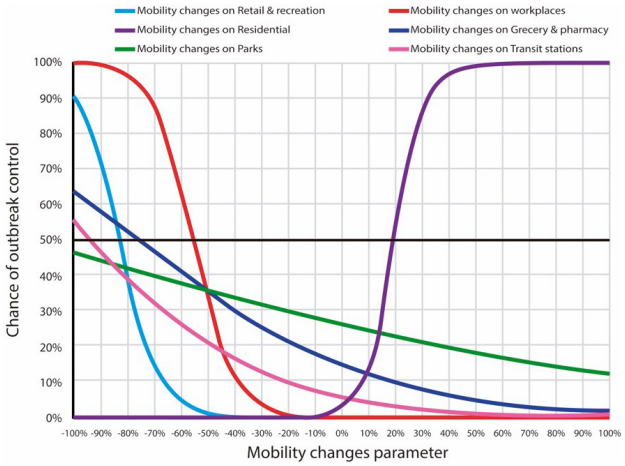
Table 2: The Community Mobility Reports from Google Maps: Mobility changes on April 5 compared to the baseline (5- week period; Jan 3–Feb 6, 2020): T_infectious and R0 obtained by using COVID-19 new cases day-by-day in each country, adjusted to the SEIR model by mathematical constrained optimization

Country	Cases on April 11	Days after first cases	Mobility changes on April 5 compared to the baseline (5- week period; Jan 3–Feb 6, 2020)								
			Population (2018)	Retail & recreation	Grocery & pharmacy	Parks	Transit stations	Workplaces	Residential	T_infectious (days)	R_t
Spain	157.022	71	46,723,749	-94%	-77%	-90%	-89%	-68%	23%	14.0	0.5
Austria	13.560	46	8,847,037	-82%	-55%	-11%	-64%	-46%	12%	7.3	0.5
Switzerland	24.228	46	8,516,543	-76%	-25%	42%	-48%	-42%	12%	10.4	0.6
Italy	147.577	72	60,431,283	-95%	-82%	-90%	-86%	-62%	24%	14.0	0.7
Israel	10.408	47	8,883,800	-75%	6%	-52%	-57%	-60%	30%	8.2	0.7
Belgium	26.667	68	11,422,068	-76%	-36%	-13%	-60%	-46%	15%	8.7	1.2
Netherlands	23.097	44	17,231,017	-54%	-16%	41%	-52%	-29%	8%	7.0	1.2
France	90.676	78	66,987,244	-85%	-62%	-73%	-82%	-53%	17%	13.9	1.2
Portugal	15.472	40	10,281,762	-84%	-60%	-88%	-82%	-55%	23%	11.6	1.3
Germany	117.658	75	82,927,922	-58%	-13%	61%	-47%	-30%	8%	14.0	1.6
UK	70.272	72	66,488,991	-82%	-41%	-29%	-70%	-54%	15%	6.3	2.0
Sweden	9.685	71	10,183,175	-25%	-9%	69%	-37%	-18%	6%	14.0	2.5
Turkey	47.029	29	82,319,724	-76%	-40%	-61%	-76%	-48%	19%	13.3	2.5
USA	501.560	82	327,167,434	-49%	-20%	-20%	-54%	-40%	13%	8.8	2.3
Canada	22.133	77	37,058,856	-63%	-45%	-13%	-67%	-46%	14%	14.0	2.6
Brazil	19.638	43	209,469,333	-67%	-24%	-66%	-57%	-30%	15%	9.3	2.6

Logistic regression models to evaluate the chance of an epidemic control based on the non-pharmacological interventions adherence

Mobility changes parameter		Logistic regression unstandardized coefficients		Minimum mobility restrictions for the COVID-19 control	
		Constant	Logistic coefficient	Percent	Chance of outbreak control
Retail & recreation	Mobility trends for places like restaurants, cafes, shopping centers, theme parks, museums, libraries, and movie theaters.	-11.127	-13.4	-100%	91%
Grocery & pharmacy	Mobility trends for places like grocery markets, food warehouses, farmers markets, specialty food shops, drug stores, and pharmacies.	-1.720	-2,3	-100%	64%
Parks	Mobility trends for places like national parks, public beaches, marinas, dog parks, plazas, and public gardens.	-1.048	-0.9	-100%	46%
Transit stations	Mobility trends for places like public transport hubs such as subway, bus, and train stations.	-2.774	-3,0	-100%	56%
Workplaces	Mobility trends for places of work.	-7.258	-13.2	-72%	90%
Residential	Mobility trends for places of residence.	-3.779	17.7	+34%	90%

Simulation of the impact of the mobility component in the chance of outbreak control: analysis by using the logistic regression model summarized in Table 2



Conclusion: Residential mobility restriction is the most effective measure. The degree to which mobility restrictions increase or decrease the overall epidemic size depends on the level of risk in each community and the characteristics of the disease. More research is required in order to estimate the optimal balance between mobility restriction, outbreak control, economy and freedom of movement.

Disclosures: **All Authors**: No reported disclosures

480. Outbreak of COVID-19 Among School Auction Attendees: Was it a "Silent Auction" or "Silent Transmission"?

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Session: P-16. COVID-19 Impact of Social Distancing/Mitigation Measures

Background: One day after the pandemic was announced, Tennessee declared a state of emergency on March 12, 2020 with implementation of a stay-at-home order on March 23, 2020. Data regarding the routes and patterns of community transmission of SARS-CoV-2 are limited. We initiated an investigation after clusters of confirmed COVID-19 cases attended a large social gathering.

Methods: We were notified of clinical providers who attended a "Silent School Auction" on March 7, 2020, of which several confirmed-cases were identified as targeted participants. To derive a standardized REDCap web-survey, we conducted a hypothesis-generating interview with three confirmed attendees to collect event details. Once finalized, enrollment included collecting sociodemographic, epidemiologic, and clinical data. Attendees were classified as: 1) confirmed if they had a positive SARS-CoV-2 test; 2) suspected if they developed symptoms 21-days before or after the auction; and 3) asymptomatic if no symptoms were noted.

Results: From March 20-June 16, 100/166 (60%) of attendees were enrolled, with a median age of 41 years, 54% female, and 99% white. Of those, 34 and 32 were confirmed- and suspect-cases, respectively. **Table 1** compares sociodemographic behaviors of all attendees, with the majority of confirmed-cases eating late in the evening. From March 6 to March 8, 58 participants reported attending other social events, of which three (i.e., church service, women's retreat, and a birthday party) were common among 43 attendees and five individuals reported onset of mild respiratory symptoms prior to the event **(Figure 1)**. Confirmed-cases were more likely to report having shortness of breath, chest tightness, loss of taste, loss of smell, and fever compared to suspect-cases **(Figure 2)** and no one required hospitalization. Dining tables from the school auction depicted a clustering of cases occurring at each table, with some individuals visiting more than one table during the event **(Figure 3)**.

Table 1. Demographic and Social Behaviors of Silent School Auction Attendees, by Case Definition

Characteristic n (%)	Confirmed-Case (n=34)	Suspect-Case (n=32)	p-value	Asymptomatic (n=34)	p-value
Age, months (median [(IQR])	41 (38-47)	42 (38-47)	0.471	40 (37-46)	0.207
Sex, female	18 (53)	23 (72)	0.113	13 (38)	0.223
Race, white	33 (97)	32 (100)	0.314	34 (100)	--
Reported using communal hand sanitizer/washed hands at the event	20/32 (63)	14/28 (50)	0.330	23/33 (70)	0.540
Eat buffet	32 (97)	27 (96)	0.906	30 (88)	0.174
Bidding	28/33 (85)	21/28 (75)	0.335	28 (82)	0.783
Alcoholic Beverages	28/32 (87)	24/28 (86)	0.839	30 (88)	0.927
Restroom	21/32 (66)	14/28 (50)	0.221	21/33 (64)	0.867
Used communal pens for bidding	25/27 (93)	19/21 (90)	0.792	26/28 (93)	0.970
Handshake	23/32 (72)	18 (64)	0.528	29 (86)	0.183
Hug	27 (84)	23 (82)	0.817	28 (82)	0.826
Prior Party	9/33 (27)	7/28 (25)	0.841	7 (34)	0.521
Afterparty	5/33 (15)	4/28 (14)	0.924	1 (3)	0.080
Time ate at event					
Early Evening	13/32 (41)	7/27 (26)	**0.010**	9/32 (30)	**0.004**
Mid Evening	4/32 (13)	13/27 (48)		15/32 (26)	
Late Evening	15/32 (47)	7/27 (26)		6/32 (21)	

Footnote: Gray shade denotes confirmed-case as the referent group for pairwise comparisons.

Figure 1. Onset of Respiratory Symptoms for COVID-19 Confirmed- and Suspect-Cases who Attended the School Auction on March 7, 2020

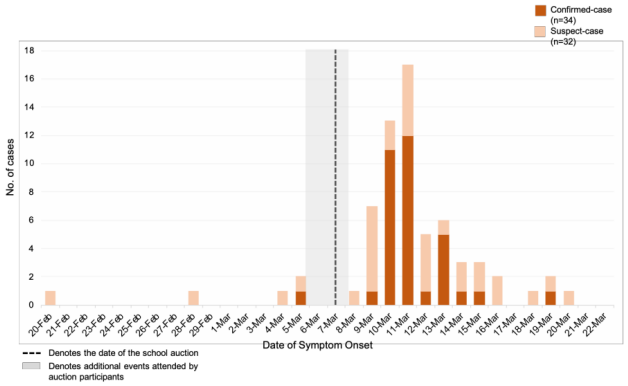
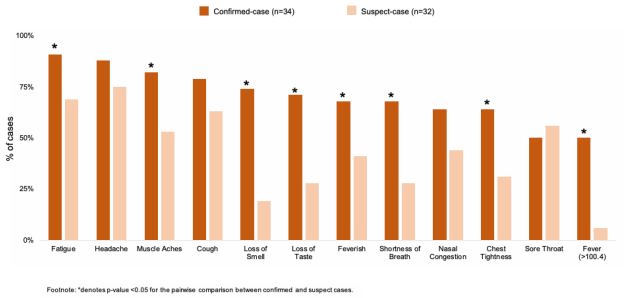
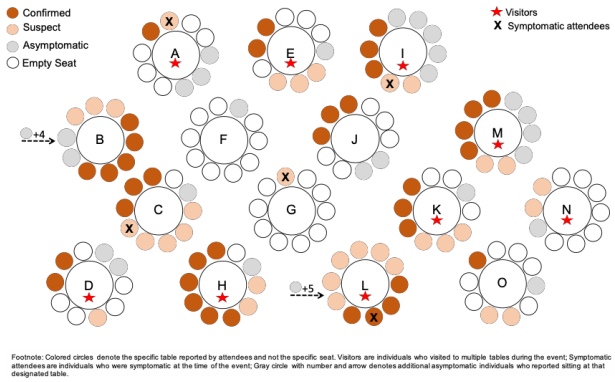


Figure 2. Proportion of COVID-19 Confirmed- and Suspect-Cases by Clinical Symptom Presentation (n=66)



Conclusion: We identified several COVID-19 cases from a single event that occurred prior to social mitigation strategies. Our investigation highlights the importance of staying home when sick and the significance of social distancing to halt transmission of COVID-19.

Figure 3. School Auction Dinner Seating Chart, by Case Definition—Confirmed, Suspect, and Asymptomatic Attendees



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481. Epidemic – Pandemic Impacts Inventory (EPII) Survey Results for Persons Living with HIV in Chicago's West and Southwest Communities

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Session: P-16. COVID-19 Impact of Social Distancing/Mitigation Measures

Background: The rapid spread of COVID-19 in recent months has caused local and regional governments to enact protective measures that have hindered economies and imposed demanding restrictions on daily life. Households may be experiencing physical, psychological, social, and economic challenges due to these preventative measures. Populations with fewer resources and/or pre-existing conditions may be at higher risk for these negative, life-altering effects. Therefore, we investigated COVID-19 impact on daily life among persons living with HIV (PLH) in Chicago's under-resourced, largely minority, west and southwest side communities.

Methods: We modified the EPII, a survey designed to measure pandemic disease impact over nine domains of life, to assess how COVID-19 affected PLH receiving outpatient HIV care. From 5/11–29/2020, participants (n=49) completed the survey online or over the phone and received a $10 grocery gift card. We present the proportion of respondents who reported that they or any household member was impacted by select survey items.

Results: More than half of respondents reported a household member getting laid off and/or furloughed (63%), increased mental health (45%) or sleep problems (51%), less physical activity (61%), and increased screen time (82%); 45% were unable to pay important bills. Positive changes included eating healthier foods (53%), more time for enjoyable activities (63%), more quality time with friends or family (65%), and paying more attention to personal health (76%). We observed differences by gender, age, and race/ethnicity over all domains (Table 1). Finally, 80% of those who participated in telehealth services were satisfied with their experience.

Table 1.

Table 1. COVID-19 impact on SHS patient households: results by gender, race, ethnicity, and age, N=49.

EPII* Items	Total (N=49)	Male (N=33)	Female (N=16)	White[a] (N=18)	Black[a] (N=24)	Hispanic[a] (N=25)	25-39 y.o (N=28)	40-65 y.o (N=21)
Work and Employment								
Laid off from job, closed own business, reduced hours, and/or furloughed	31 (63%)	23 (70%)	8 (50%)	13 (72%)	14 (58%)	14 (61%)	18 (64%)	13 (62%)
Continued to work even though in close contact with people who might be infected	17 (35%)	15 (45%)	2 (13%)	7 (39%)	9 (38%)	9 (39%)	13 (46%)	4 (19%)
Home Life								
Experienced increased conflict*	15 (31%)	9 (27%)	6 (38%)	5 (28%)	7 (29%)	7 (30%)	8 (29%)	7 (33%)
Social Activities								
Separated from family or close friends	17 (35%)	10 (30%)	7 (44%)	8 (44%)	7 (29%)	9 (39%)	10 (36%)	7 (33%)
Did not have the ability or resources to talk to family or friends while separated	11 (22%)	7 (21%)	4 (25%)	5 (28%)	5 (21%)	5 (22%)	9 (32%)	2 (10%)
Economic								
Unable to get enough food or healthy food	19 (39%)	13 (39%)	6 (38%)	7 (39%)	8 (33%)	10 (43%)	12 (43%)	7 (33%)
Unable to pay important bills like rent or utilities	22 (45%)	17 (52%)	5 (31%)	10 (56%)	10 (42%)	11 (48%)	14 (50%)	8 (38%)
Emotional Health and Well-being								
Increase in mental health problems or symptoms	22 (45%)	15 (45%)	7 (44%)	8 (44%)	9 (38%)	12 (52%)	13 (46%)	9 (43%)
Increase in sleep problems or poor sleep quality	25 (51%)	16 (48%)	9 (56%)	10 (56%)	11 (46%)	14 (61%)	13 (46%)	12 (57%)
Spent more time on screens and devices	40 (82%)	27 (82%)	13 (81%)	16 (89%)	19 (79%)	19 (83%)	26 (93%)	14 (67%)
Physical Health Problems								
Less physical activity or exercise	30 (61%)	21 (64%)	9 (56%)	13 (72%)	15 (63%)	13 (57%)	18 (64%)	12 (57%)
Got less medical care than usual	18 (37%)	11 (33%)	7 (44%)	9 (50%)	6 (25%)	13 (57%)	9 (32%)	9 (43%)
Physical Distancing and Quarantine								
Entire household was quarantined for a week or longer	21 (43%)	15 (45%)	6 (38%)	8 (44%)	10 (42%)	8 (35%)	14 (50%)	7 (33%)
Positive Change								
More quality time with family/friends in person or from a distance	32 (65%)	21 (64%)	11 (69%)	11 (61%)	19 (79%)	11 (48%)	20 (71%)	12 (57%)
More time doing enjoyable activities	31 (63%)	20 (61%)	11 (69%)	13 (72%)	17 (71%)	13 (57%)	19 (68%)	12 (57%)
Paid more attention to personal health	37 (76%)	23 (70%)	14 (88%)	15 (83%)	18 (75%)	18 (78%)	20 (71%)	17 (81%)
Ate healthier foods	26 (53%)	16 (48%)	10 (63%)	7 (39%)	13 (54%)	12 (52%)	12 (43%)	14 (67%)
Telehealth								
Scheduled telehealth visit with SHS	15 (31%)	11 (33%)	4 (25%)	1 (6%)	14 (58%)	2 (9%)	9 (32%)	6 (29%)

*EPII=Epidemic-Pandemic Impacts Inventory, [a]Non-hispanic white, [a]Non-hispanic black, [a]Hispanic any race, *Increased verbal or physical conflict with spouse, children, or any adult in the home.