Clinical and Economic Impact of COVID-19 among Guatemalan Farm Workers: Update from the AGRI Study

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Background

- Essential workers, including farm workers, at greater risk of acquiring COVID-19.
- Farm workers in LMICs essential for global food security, but limited data on disease burden
- Increased rates of some chronic diseases (Mesoamerican nephropathy) -> dz severity.
- Farm workers are often economically vulnerable
- Monthly food basket price in Guatemala: $356.10

Objectives

1) Characterize clinical and socioeconomic outcomes of acute respiratory viral infections among Guatemalan plantation workers

2) Measure the effectiveness of a workplace-based vaccination program in improving these measures.

Methods

- All eligible workers (must have a phone and plan to work ≥1 year at farm) at sites within a large agribusiness were offered enrollment (June 2020-Sept 2022)
- ***ILI Surveillance System*** using 3 approaches:
  - *ILI = cough + fever (Jun 2020-Jan 2021) for at least 2 days; cough *or* fever *or* dyspnea (>Jan 2021) for at least 2 days
  1. Prospective weekly visits to all worksites
  2. Sentinel surveillance at farm health posts
  3. Nurse phone line for self-reporting
- ***Testing (ILIs)*:** NP swab for RT-PCR for RSV + FLUV (Roche); SARS-CoV-2 PCR (Roche) or antigen (SD Biosensor)
- **Controls:** randomly selected healthy sub-cohort of workers = 5% of cohort per month
- ***Symptomatic visit:*** all ILI cases
- ***Follow-up Surveys*** (cases + healthy sub-cohort) to assess outcomes collected at Day 7, Day 28
- ***Annual serum*** collected from all workers: anti-N IgG, eGFR, biobanked

Outcomes:

- Clinical: Flu-iiQ inventory, symptoms
- Economic: self-report costs, absenteeism; company-reported absenteeism/productivity
- Epidemiologic: incidence, index case

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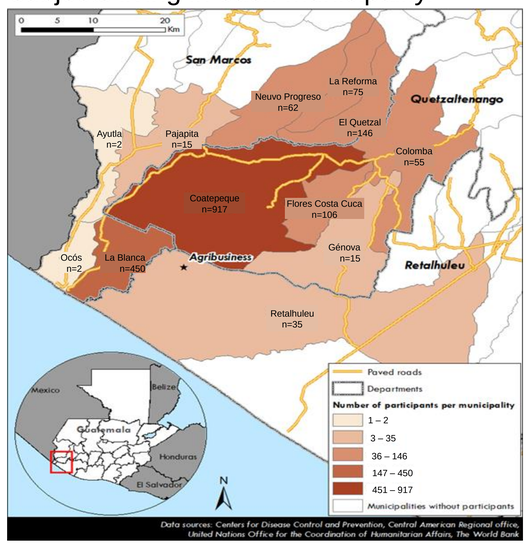
Results

Figure 1. Map of the study region (2,600 km^2) showing number of enrolled subjects living in each municipality.



- 2,427 workers screened, of which 1,893 workers (78%) enrolled (June 2020 – Oct 2022)
  - Male sex: 84%
  - Field workers: 73%
  - Income/mo: US$364
  - Mean age: 30.8 yrs
  - Obesity: 11%
  - Kidney Disease: 3%
  - Food insecurity: 58%
- 2,562 person-years of surveillance (June 3rd 2020 through Sept 15th, 2022)
- 277 ILI cases, 267 of which provided samples, in 224 workers
- 270 subjects with ILI completed 4 weeks of follow-up
- ILI incidence: 10.8/100 PY
- 71 (27%) SARS-CoV-2(+), incidence: 2.8/100 PY
- 8 (3%) RSV(+), 13 (5%) FLUV(+)
- Worker = index HH case: 84% (ILI), 78% (SARS-CoV-2)
- SARS-CoV-2(+) vs SARS-CoV-2(-) ILI ($p<0.05$) (Table 1)
  - Cough: 54% vs 34%
  - Anosmia: 33% vs 16%
  - Dysgeusia: 36% vs 21%
  - Fatigue: 46% vs 27%
  - Irritability: 47% vs 31%
  - Feeling Defenseless: 33% vs 16%
  - Frustrated: 26% vs 13%

Figure 2. Differences in expenditures between SARS-CoV-2 (+) vs (-) ILI.

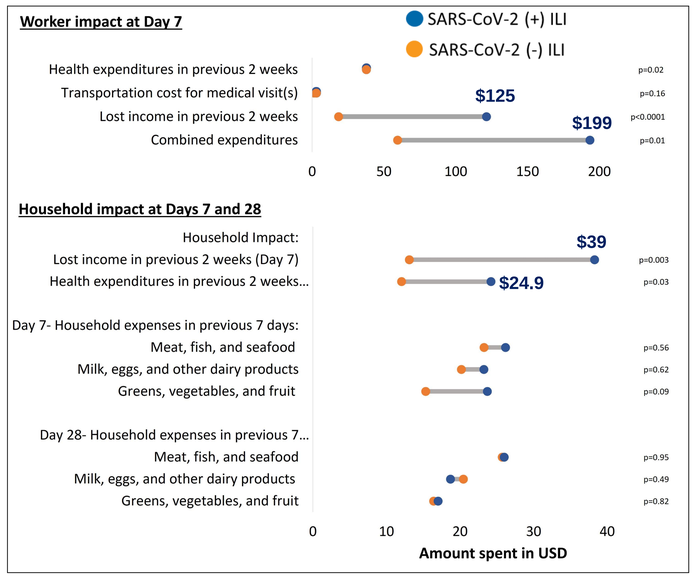


Figure 3. Cumulative probability of symptomatic SARS-CoV-2 infection by NC IgG serostatus at enrollment

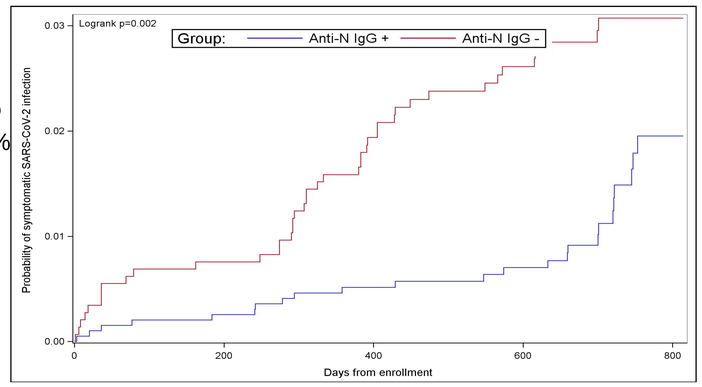
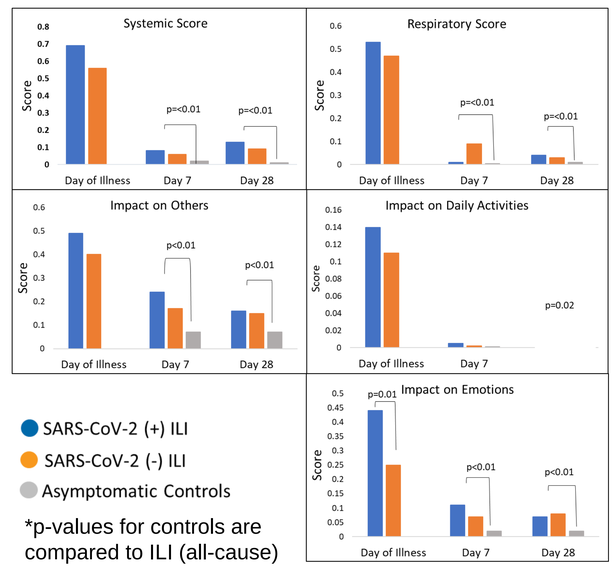


Table 1. Comparing Self-Reported Outcomes in SARS-CoV-2-positive ILI vs SARS-CoV-2-negative ILI

	Day 0 COVID(+) (n=71)	Day 0 COVID(-) (n=170)	p-value*	Day 7 COVID(+) (n=71)	Day 7 COVID(-) (n=170)	p-value*	Day 28 COVID(+) (n=71)	Day 28 COVID(-) (n=170)	p-value*
Clinical Symptoms									
Have you felt ___ in last 24 hrs; n (%)									
Fever	41 (58.6)	96 (56.8)	0.80	3 (4.3)	22 (12.8)	0.049	5 (7.4)	4 (2.4)	0.07
Headache	44 (62.9)	88 (52.1)	0.13	17 (24.3)	39 (22.7)	0.79	11 (16.2)	23 (13.8)	0.63
Cough	38 (54.3)	57 (33.7)	<0.01	10 (14.5)	33 (19.3)	0.38	4 (6.0)	9 (5.4)	0.86
Dysgeusia	25 (35.7)	35 (20.7)	0.01	9 (12.9)	9 (5.2)	0.04	4 (6.0)	2 (1.2)	0.04
Fatigue	32 (45.7)	46 (27.2)	<0.01	10 (14.3)	16 (9.3)	0.26	6 (8.8)	7 (4.2)	0.16
Anosmia	23 (32.9)	27 (16.0)	<0.01	10 (14.3)	7 (4.1)	<0.01	5 (7.5)	2 (1.2)	0.01
Dyspnea	21 (30.0)	36 (21.3)	0.15	5 (7.1)	9 (5.2)	0.56	5 (7.6)	3 (1.8)	0.03
Wheezing	7 (10.0)	24 (14.2)	0.38	1 (1.4)	9 (5.2)	0.18	4 (6.0)	1 (0.6)	0.01
Well-Being**									
Have you had difficulty with (last 24 hrs), n (%):									
Getting out of bed	23 (32.9)	37 (21.9)	0.08	7 (10.0)	9 (5.2)	0.18	5 (7.4)	6 (3.6)	0.22
Preparing meals...	10 (14.3)	15 (8.9)	0.21	3 (4.3)	3 (1.7)	0.25	3 (4.4)	1 (0.6)	0.04
Performing usual…	20 (28.6)	37 (21.9)	0.27	5 (7.1)	5 (2.9)	0.13	4 (5.9)	2 (1.2)	0.04
Leaving the home…	16 (22.9)	21 (12.4)	0.04	6 (8.6)	1 (0.6)	<0.01	2 (2.9)	2 (1.2)	0.35
Concentrating on…	22 (31.4)	35 (20.7)	0.08	5 (7.1)	5 (2.9)	0.13	4 (5.9)	5 (3.0)	0.30
Taking care of…	21 (12.4)	16 (22.9)	0.04	4 (5.7)	1 (0.6)	0.01	3 (4.4)	3 (1.8)	0.25
Leave the room	9 (12.9)	21 (12.4)	0.93	4 (5.7)	1 (0.6)	0.01	2 (2.9)	2 (1.2)	0.35
Have you felt the following (last 24 hours), n (%):									
Irritable	33 (47.1)	53 (31.4)	0.02	5 (7.1)	14 (8.1)	0.79	4 (5.9)	12 (7.2)	0.72
Defenseless	23 (32.9)	27 (16.0)	<0.01	6 (8.6)	7 (4.1)	0.16	3 (4.4)	9 (5.4)	0.76
Worried	25 (35.7)	47 (27.8)	0.23	16 (22.9)	14 (8.1)	<0.01	9 (13.2)	17 (10.2)	0.50
Frustrated	18 (25.7)	22 (13.0)	0.02	4 (5.7)	8 (4.7)	0.74	3 (4.4)	7 (4.2)	0.94
People worrying…	38 (54.3)	77 (45.6)	0.21	24 (34.3)	38 (22.1)	0.049	15 (22.1)	30 (18.0)	0.47

Figure 4. Flu-iiQ severity scores (range: 0-3), for workers with SARS-CoV-2(+) ILI, SARS-CoV-2(-) ILI, and asymptomatic controls.*



*p-values for controls are compared to ILI (all-cause)

Conclusions

- In rural Guatemala, COVID-19 resulted in a significantly greater clinical and economic impact on farm workers vs. other ILIs.
- Workers with COVID-19 lost nearly half their monthly income (mostly from absenteeism).
- Self-reported clinical symptoms and well-being significantly worse following COVID-19 than other ILI
- The AGRI Cohort will continue to be followed for 3 more years, and will include additional endpoints:
  - Vaccine efficacy: COVID-19, influenza
  - Vaccine hesitancy: workers/community
  - Company-reported absent./presenteeism
  - Evaluate other pathogens: BioFire RP2.1, global fever panel, Minion NGS

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