California Agricultural Employers and COVID-19

Modeling the Economic Cost of a COVID-19 Outbreak Among Workers

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This document is intended to give agricultural employers an idea of the costs, in terms of paid time off, associated with facilitating COVID-19 vaccines for their workers. We will attempt to show that the cost of facilitating vaccines is much smaller than the costs of a COVID-19 outbreak among your workers. Data was collected during December of 2021 and January 2022, and the model incorporates the best available data about the spread of COVID-19. The model has certain features specific to California agriculture (a presumed wage of $16/hr, data about vaccination rates in certain counties) but we believe that the scenarios are similar for agricultural employers anywhere in the country. Specific assumptions about the model can be found on page 5 of this document, as well as references for specific claims.

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Agricultural employers led the way in 2021 to make sure workers could get vaccinated against COVID-19: hosting vaccination clinics at the workplace and helping workers get to community vaccination events. According to county level vaccine data[i], it is now likely that more than half of agricultural workers in California are fully vaccinated against COVID-19.

But employers can make a difference still: by offering boosters to workers who are eligible for them (to keep up protection from COVID-19) and by encouraging and facilitating initial vaccination for workers who are still unvaccinated. This model will show that the costs of giving your workers time off to get the vaccine or the booster are much lower than the costs from having unvaccinated and unboosted workers out sick with COVID-19.

We modelled a hypothetical situation of a crew of 100 workers during the current surge of the Omicron variant of COVID-19, looking at the likely economic impact in three scenarios:

1. The status quo where an employer does nothing to encourage vaccines
2. An effort by the employer to facilitate vaccines and the entire workforce gets vaccinated.
3. An effort by the employer to facilitate vaccines, but not all workers want it

The Need for Vaccines and Boosters as the Season Starts

With the new Omicron variant, COVID-19 transmission has substantially increased. Vaccination provides imperfect protection against infection, but it does greatly reduce the risk of hospitalization and death. Among people who are fully vaccinated and have had a booster shot, about 70% who are exposed to COVID-19 will not get sick, but those who do are more likely toy have a mild case that doesn't require hospitalization (there's a reduction in hospital admissions by at least two-thirds among those who are up-to-date on their shots)[iiiii].

So—new steps are needed to reduce the risk of a workplace COVID-19 outbreak:

- Encouraging and helping workers who have not yet gotten their initial vaccination or vaccination series to get it
- Helping those who need booster shots get them (by 5-6 months after vaccination with a mRNA vaccine or 2 months after vaccination with J&J).

Details on the Costs and Benefits of COVID-19 Vaccination

With extraordinary good luck, an employer may not have COVID-19 introduced into their workplace. But about 1.5% of the entire population in agricultural counties in California was being infected each week as of January 15, 2022. The chance an agricultural employer's workplace will be affected by COVID-19 is very high. The scenarios presented here provide a basis for thinking about options for employers to mitigate the likely economic impacts COVID-19 will have on their business.

The costs of vaccinating workers include paid time off to get their vaccination and paid time off for those who are unable to work because they've had some side effects from the vaccination (it's estimated 15% will need a day off[iv]). The cost of currently unvaccinated workers remaining unvaccinated and vaccinated ones not being up-to-date on their booster shot stem from the fact that each COVID-19 positive worker must isolate themselves for 5 days. And, also, every unvaccinated co-worker who has had close contact with a sick co-worker needs to be quarantined for 5 days.

Estimating Costs of COVID-19 Outbreaks in Different Scenarios

<u>Scenario 1: Status Quo</u> (60 workers vaccinated, 10 with booster, and 40 unvaccinated)
<u>Scenario 2: Maximum Protection</u> (all 100 fully vaccinated, 60 with booster)
<u>Scenario 3: Effort But Not All</u> (70 workers vaccinated, 60 with booster, 30 remain unvaccinated)

The following table shows the worst case (Scenario 1) and the best case (Scenario 2). Scenario 3 is explained further below. Efforts to vaccinate workers will almost always decrease the costs of COVID-19 to a business although the actual savings will vary—depending on workplace conditions, level of vaccine uptake when workers were initially vaccinated, extent of on-time boosting, and how hard COVID-19 hits a community, and when.

Impact of a COVID-19 Workforce Outbreak on Available Workers and Work Hours				
Hypothetical Agricultural Workforce of 100	**Workers Quarantined (COVID-19+ or Close Contact)**			
SCENARIO 1: STATUS QUO	**WEEK1**	**WEEK 2**	**WEEK 3**	**CUMULATIVE**
Infected Workers *(60 vaccinated, 10 w/ booster, 40 unvaccinated)*	1	2	4	7
Unvaccinated co-workers who were in close contact with infected workers, so have to quarantine	12	14	15	40
Hours lost to isolation of sick workers and quarantine of their unvaccinated contacts (1 recovered worker returning in Week 2, 2 in Week 3, 6 quarantined back in Week 2 ,10 back in Week 3	376	900	1,212	2,488
SCENARIO 2: FULL VACCINATION	**WEEK1**	**WEEK 2**	**WEEK 3**	**CUMULATIVE**
Workers Out if All Vaccinated *(100 vaccinated, 60 w/ booster, 0 unvaccinated)*	0	1	2	3
Co-workers who were in close contact—*None because vaccinated workers can continue to work even if exposed*	0	0	0	0
Hours lost to isolation for workers with breakthrough infection with one recovered worker returning in Week 3	0	40	60	100

**Initial weekly community incidence=1% and infection rate (average people infected by each Omicron case)*

<u>Scenario 1: Hope for Best, Do Not Encourage Vaccines/Boosters</u>

In a crew of 100 where 60 are vaccinated, but few (only 10) have gotten a booster we project that, over a 3-week period, about 7 workers are going to be out sick for at least 5 days each because they were infected. The biggest economic impact of COVID-19 in this scenario is from unvaccinated workers and those overdue for a booster needing to be quarantined. The likelihood of being a close contact of a co-worker who has contracted COVID-19 increases over the 3 weeks in this scenario because there are likely to be more cases in Weeks 2 and 3 than in the first week.

The combination of sick workers and unvaccinated, quarantined workers (some of whom might subsequently become ill, some who fortunately would not) would likely shut down production during Weeks 2 and 3 of a workplace outbreak, so there would be additional costs from lost revenue.

Modelling suggests the economic impact of COVID-19 in this typical workforce—time off for 7 sick workers to isolate and the unvaccinated co-workers who had close contact with them to quarantine would be about $40,000.

Scenario 2: Encourage Vaccination/Boosters for Workers, 100% Uptake

Assuming the entire workforce of 100 is vaccinated and boosted, the economic impact of Omicron will be greatly reduced. Although vaccination doesn't provide perfect protection, it greatly reduces infection and transmission. The cost of time for vaccinating the 40 unvaccinated workers and providing boosters to the 50 workers who need them in this scenario is about $10,000. However, this reduces time off for workers who are sick and, very importantly, makes it possible for the workers who have been vaccinated to continue working (using masks) even if they have been exposed to a worker who has COVID-19.

The cost in that scenario is, then, about $10,000 for time off for the unvaccinated workers to get vaccinated and for the already-vaccinated workers to get their boosters. Although there will be a few vaccine breakthroughs, the cost of sick leave is likely to be about $1,600.

The total economic impact of COVID-19 in Scenario 2, then, is about $12,000. Most importantly, production can continue at close to usual rates—because only 3 workers would be expected to have vaccine breakthrough cases and vaccinated workers can continue to work even if they are a close contact of one of the workers who did contract COVID-19.

Scenario 3: Encourage Vaccination/Boosters for Workers, but not all want

We also modeled a Scenario 3—assuming a vigorous but incomplete effort to get the entire workforce vaccinated and boosted, and projected a COVID-19 impact cost of $28,000—a savings of $12,000 over doing nothing.

The Bottom Line: Return on Investment in Vaccination Is 2:1

Since Scenario 1 (no additional vaccination) results in about $40,000 of COVID-19 impact costs and Scenario 2 (assuring the entire workforce is vaccinated and boosted) results in about $12,000 of costs, an employer's investment to get their whole workforce vaccinated yields cost savings of $28,000, a return on investment of about 2:1—even without factoring in loss of revenue from decreased production.

Working hard to make sure your workers all get vaccinated and that those who have already been vaccinated get a booster right away is the best way to protect your own business profitability as well as protecting your workers and their families.

Proactive efforts to facilitate workers getting vaccinations, including boosters when they need them, will also really help morale in a worrisome time. To be sure, there may still be some workers who are reluctant to get vaccinated but doing everything possible to encourage vaccination and help those who want to be vaccinated or get a booster when they need it, will result in savings for your business and your workers.

If employers invite workers' family members who need vaccinations to get vaccinated at company-hosted vaccination events it will help even more—because it reduces the risk of workers getting infected even further, a real benefit to the workers, their families, and the local community.

Modeling Assumptions: *based on published data analyses, statements by experts, and news coverage*

Omicron reproductive rate: Wuhan wild-strain R0=2.76 and Omicron R0=10—about 4 times more infectious
mRNA protection against Omicron for vaccinated individuals=30%
mRNA vaccination+booster protection against symptomatic Omicron infection=65%
agricultural worker vaccination rate=60%
agricultural worker vaccination+booster rate=10%
workcrew infection assumes weekly community weekly incidence=0.5% in Wk 1, 1% in Wk 2, 1.5% in Wk. 3
work crew outbreak is based on "composite incidence"—community incidence+prior week workplace
Scenario 2 for proactive vaccination assumes vaccination or boosting 1 mo. prior to 1st workcrew case
work hours lost assumes that COVID-19+ workers return to workforce having been off work for 5 days
assumes close contacts of unvaccinated and those overdue for boosters are quarantined and return after 5 days
assumes 1/3rd of workforce are close contacts in Week 1, that ½ are close contacts in Week 2, and 2/3rds in Week 3
assumes employer pays 4 hours for time off to get vaccinated, actual cost may be lower if vaccination is on site
modeling assumes that vaccine and vaccinators provided at no cost by a public sector entity

Discussion of Underlying Model for Estimating Workplace Outbreak Costs in Scenarios 1 and 2

This preliminary estimate of the progression of a workplace outbreak of COVID-19 Omicron variant outbreak is a simplified SEIR model (susceptible, exposed, infected, recovered). It assumes that virtually all agricultural workers are exposed to COVID-19 in the workplace, at home in crowded housing, or in crowded transportation to/from work. The estimate incorporates current California guidance (based on January 5, 2022 California Department of Public Health and January 12, 2022 Cal/OSHA regulations) for isolation of COVID-19-infected workers and quarantined their co-workers who are unvaccinated or overdue for a booster shot. See https://www.dir.ca.gov/dosh/coronavirus/COVID19FAQs.html#iso

Our estimate stratifies the workforce in terms of risk of susceptibility based on the estimated proportion of farmworkers who are unvaccinated (40%), vaccinated (60%), and up-to-date with boosters (10%) based on current estimates of vaccine efficacy against Omicron and estimated vaccination levels among farmworkers. It is estimated that prior mRNA vaccination provides 30% protection against Omicron variant infection but that J&J protection is lower. It is assumed that vaccination+booster provides 65% protection.

The first component of the model estimates spread of COVID-19 infection in the workplace and hours lost due to required isolation of infected workers and required quarantine of their unvaccinated close contacts. The second component estimates cost of vaccination and cost of hours of work lost. The cost calculations assume payment for time off for vaccination, time off for vaccination side effects that preclude work, payment of time off for isolation of COVID-19+ workers and for required quarantine of close contacts (i.e. the unvaccinated close contacts of infected workers).

The model assumes employer diligence in rapidly identifying and quarantining COVID-19+ workers and that close contacts are also rapidly and reliably identified. Slower identification of COVID-19 infected workers will result in faster spread and a higher number of close contacts for each infected worker. The model recognizes that COVID-cases are, typically, infectious for 1 day or more before symptoms appear and that a significant proportion are asymptomatic and would only be detected with routine workplace screening with rapid-turnaround testing. It is not possible to guarantee that vaccinated and boosted workers will be protected. But it is possible to guarantee that the chances of remaining uninfected and staying healthy are greatly improved if they are up-to-date on their shots.

This hypothetical model assumes a workforce of 100 full-time workers who work 40 hours per week. It is designed simply to show the consequences of two courses of action to confront COVID-19: Scenario 1 and Scenario 2. In the real-world actual progression of outbreaks in agricultural work settings depends on specific crop activities and operational conditions—including extent to which masking and social isolation are encouraged. Even where seasonal work is at a low, preparing for more worker-to-worker close contact in Spring, 2022 pays off.

The modelling of both COVID-19 spread in a workplace outbreak does not incorporate any specific assumptions about work assignments of vaccinated and unvaccinated workers but it does assume that there is a 1-2 day lag in identifying close contacts of COVID-19+ workers. For this reason, the model estimates COVID-19 incidence in the workplace based on incidence in the prior week, multiplied by the infection rate. So, if the previous week workplace incidence is 1% (i.e.1 out of 100 workers infected), the estimated workplace incidence is the "mid-week" one—1.5 times the previous week since that is the average Omicron infection rate in agricultural counties—then the current week workplace infection rate is 1.5%.

Actual vaccination rates in some agricultural counties may be much lower than estimated in our current modelling—e.g. 35%-50%, not 60%. Actual workplace spread is, of course, faster where there are more unvaccinated workers. The rate of spread is also sensitive to the proportion of vaccinated workers who have gotten a booster on time.

State and national data suggest that our estimate that only 10% of the agricultural workforce are currently boosted is accurate. As of January 15, all workers who finished their initial vaccination series by August 15 are due for a booster. Booster-driven increases in protection are rapid—1 week after vaccination. Booster shots essentially double protection against Omicron (from 30% protection to 70% protection)[v].

COVID-19 transmission in farmworker communities is a 2-way street where workers living in crowded housing may be infected by family or other housemates and bring COVID-19 into the workplace. Or vice-versa workers who contract COVID-19 in the workplace can bring it home.

To the extent possible, working to vaccinate workers' families' will be helpful too. The current incidence of COVID-19 at is already high in some agricultural counties. The model assumes an agricultural workplace will be very likely to have Omicron introduced into its workforce with a community incidence of 1% or greater.

The current community incidence in California agricultural counties as of January 15th, 2022 is the following:

COMMUNITY INCIDENCE 1-17 FROM ACT NOW[vi]	**New cases per day/100K**	**New cases per week/100K**	**New cases/week as % of population**	**Infection Rate from COVID Act Now on 1-17**
Fresno	183	1281	1.3	1.64
Kern	189	1323	1.3	1.65
Ventura	309	2163	2.2	1.52
San Joaquin	247	1729	1.7	1.63
Stanislaus	202	1414	1.4	1.62
Tulare	173	1211	1.2	1.66
Madera	174	1218	1.2	1.47
Merced	212	1484	1.5	1.44
Monterey	189	1323	1.3	1.50

[i] California. COVID ActNow. Published January 15, 2022. Accessed January 15, 2022. https://covidactnow.org/us/california-ca/?s=28271713

[ii] Sakay YN. How effective are covid-19 vaccines against Omicron? Healthline. https://www.healthline.com/health-news/by-the-numbers-covid-19-vaccines-and-omicron. Published January 7, 2022. Accessed January 15, 2022.

[iii] Barda N, Hernán M, Cohen C. Effectiveness of a third dose of the BNT162b2 mRNA COVID-19 vaccine for preventing severe outcomes in Israel: an observational study. *The Lancet*. 2021;398(10316).

[iv] Rosenblum HG, Gee JM, Liu R, et al. Safety Monitoring of mRNA Vaccines Administered During the Initial 6 Months of the U.S. COVID-19 Vaccination Program: Reports to Vaccine Adverse Events Reporting System (VAERS) and v-safe. *medRxiv*. Published online January 1, 2021:2021.10.26.21265261. doi:10.1101/2021.10.26.21265261

[v] Barda N, Hernán M, Cohen C. Effectiveness of a third dose of the BNT162b2 mRNA COVID-19 vaccine for preventing severe outcomes in Israel: an observational study. *The Lancet*. 2021;398(10316).

[vi] California. COVID ActNow. Published January 15, 2022. Accessed January 15, 2022. https://covidactnow.org/us/california-ca/?s=28271713

Other References

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7327374/ Wuhan strain R_0 estimated as 2.61-2.95

https://www.sfchronicle.com/health/article/These-charts-show-how-the-geography-of-16687138.php Chart shows rates of booster shots for all CA counties. Proportions of the overall population in agricultural counties that have received an on-time booster is generally in the range of 9%-12% (for overall county population)

https://www.latimes.com/projects/california-coronavirus-cases-tracking-outbreak/covid-19-vaccines-distribution/#zip-code-map

https://www.cdc.gov/coronavirus/2019-ncov/your-health/quarantine-isolation.html Vaccinated individuals do not need to quarantine but should get tested 5-7 days after exposure and wear mask indoors

https://www.dir.ca.gov/title8/3205.html California regulations re quarantine of workers testing positive and unvaccinated close contacts