

Economic and Clinical Impact of a Novel, Antiviral Therapy on COVID-19 in the US

Scott Gibson, BSc,¹ Rhodri Saunders, MBioch, DPhil,¹ Nathan Stasko, PhD,² Cherrise-Brown Bickerstaff, PhD, MPH,³ John Oakley, BS,² Mark Osterman, BA,² Rafael Torrejon Torres BSc, MSc,¹ Jonathan K. Kish, PhD, MPH,³ Bruce A. Feinberg, DO,³ David Emerson, PhD²

¹Coreva Scientific, Koenigswinter, Germany; ²EmitBio, Inc., Durham, NC, USA; ³Cardinal Health Specialty Solutions, Dublin, OH, USA

Objective

- Given both the clinical and economic toll of the pandemic, we sought to estimate how RD-X19, or any such at-home intervention which reduces the duration of symptomatic disease, might have reduced cases, deaths, and direct healthcare costs in 3 U.S. states and nationally.

Introduction

- Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infected >80 million individuals and resulted in at least 950,000 deaths through March 2022 in the US.¹
- Economic losses in the U.S. directly attributable to the COVID-19 pandemic were estimated to be in the tens of trillions of dollars.²
- As of April 2022, ~60% of the U.S. population was either not vaccinated or under-vaccinated.¹
- Monoclonal antibodies and oral therapies reduce severe outcomes, but there are no interventions available for patients without risk factors for disease progression that are both easily deployable and administered by patients themselves.
- RD-X19 is an at-home, light-based treatment for patients with mild-to-moderate COVID-19 shown to reduce viral load by 95% and reduce duration of symptomatic disease by 2.4 days (Table 1).

Table 1. RD-X19 clinical study and results (NCT04662671)³

Trial Design	Randomized, double-blind, sham-controlled early feasibility study
Population	Positive SARS-CoV-2 rapid antigen test within 3 days of symptom onset and ≥2 moderate COVID-19 symptoms at baseline
Intervention	Self-administered 5-minute, twice-daily treatments with RD-X19 for 4 days; follow-up for 8 days
Outcomes	Mean change in SARS-CoV-2 saliva viral load, time to symptom resolution, adverse reactions
Results	<ul style="list-style-type: none"> Mean reduction in log₁₀ viral load (at study day 8): -1.48 logs Mean reduction in symptomatic days: 2.4 days Adverse reactions: None
Conclusion	RD-X19 reduced mean viral load by 95% compared to sham and shortened duration of symptomatic disease by 2.4 days

Methods

Model Structure

- A time-dependent, state transition (semi-Markov) cohort model was used to retrospectively estimate benefits (compared with standard practice) associated with the use of RD-X19 for the treatment of mild-to-moderate COVID-19.
- Patients progressed through a series of 15 health states covering mild, moderate, and severe COVID-19 infections (Figure 1).
- Impact was measured over a 12-month time horizon running 01 June 2020 – 31 May 2021 corresponding to the initial wave of the pandemic.

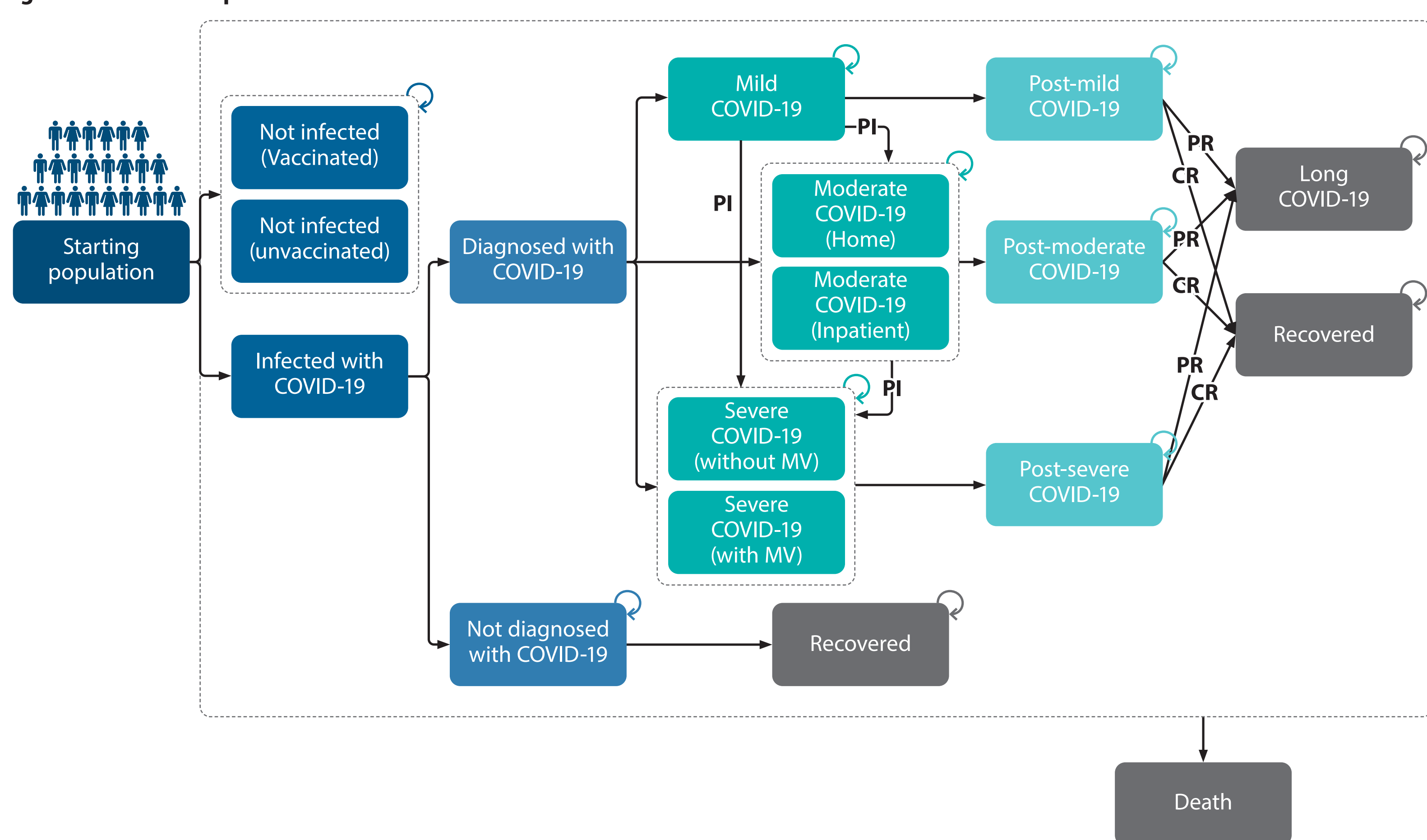
Clinical Parameters

- Infection and vaccination data were obtained from the U.S. Centers for Disease Control and Prevention (CDC).^{1,4}
- The proportions of diagnosed COVID-19 infections that were mild (74.2%), moderate (14.19%), and severe (11.57%) were fixed across the model time horizon and based on NIH/CDCR guidelines.⁵
- Vaccine efficacy was assumed to be 95% for the prevention of laboratory confirmed infection and 86% for vaccine efficacy against COVID-19-related hospitalization.
 - Partially vaccinated individuals were not considered to be vaccinated within the context of the model,
 - No reduction in vaccine efficacy was modeled as a function of time post-vaccination or due to variants of concern, making estimates more conservative
- For economic analyses a US healthcare payer perspective was adopted.
- A cost was assigned to each infected health state (excluding long COVID-19) and post-COVID-19 health states.

RD-X19 and Base Case

- The base case was modeled on results from an early feasibility clinical trial of the RD-X19 device which demonstrated a 2.4 day reduction in the duration of symptomatic disease.³
- RD-X19 was made available to 10% of patients with mild-to-moderate COVID-19, ages 18 years and up, who were also eligible for at-home disease management as identified via model assumptions, in the base case beginning on 01 June 2020.
- The primary cost outcomes were simulated estimates of the total direct incremental cost (total cost when the intervention was adopted minus total standard practice cost) and total direct incremental cost per individual that received the intervention.
- Clinical outcomes included number of COVID-19 infections and deaths, both in total and stratified by infection severity.
- Efficacy and utilization rates were varied in scenario analysis:
 - Efficacy:** 1.2 days (50% reduction in efficacy from base case), 2.4 days (base case), 3.6 days (50% increase in efficacy from base case)
 - Utilization Rate:** 5%, 10% (base case, 2.1M RD-X19 deployed over 12 months), and 25%
 - Deployment Timeline:** 4 months, 8 months, 12 months (base case)
 - Treatment Populations:** Mild and Moderate (base case), Mild only

Figure 1. Cost consequence model schematic

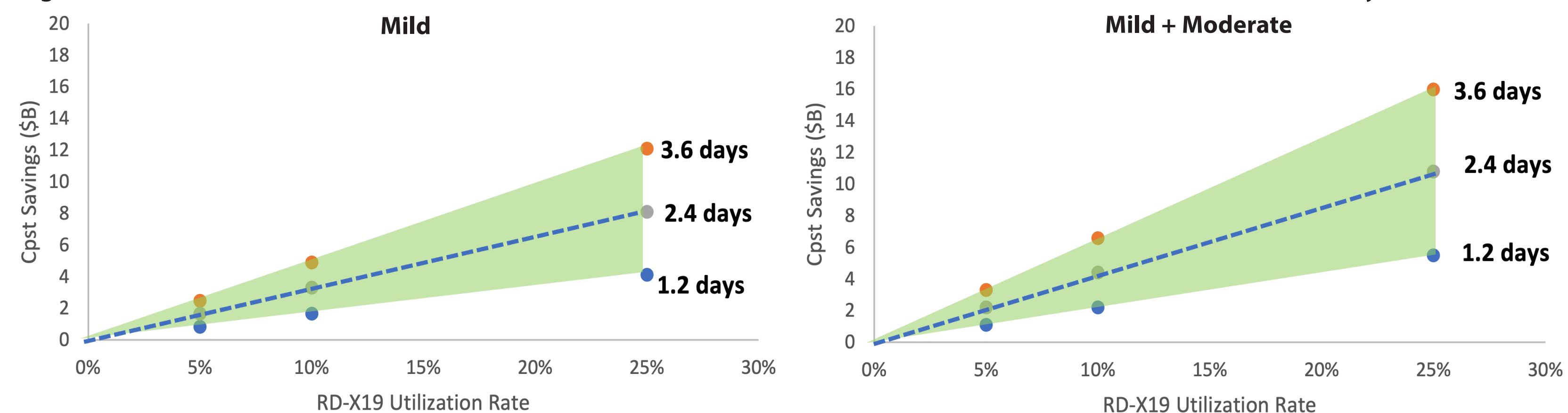


Results

Economic Outcomes

- By state, savings ranged from a low of \$50M in AL (mild only) to \$135M in NC (mild and moderate)
- At the National Level, savings ranged from \$3.3B (mild only) to \$4.4B (mild and moderate)

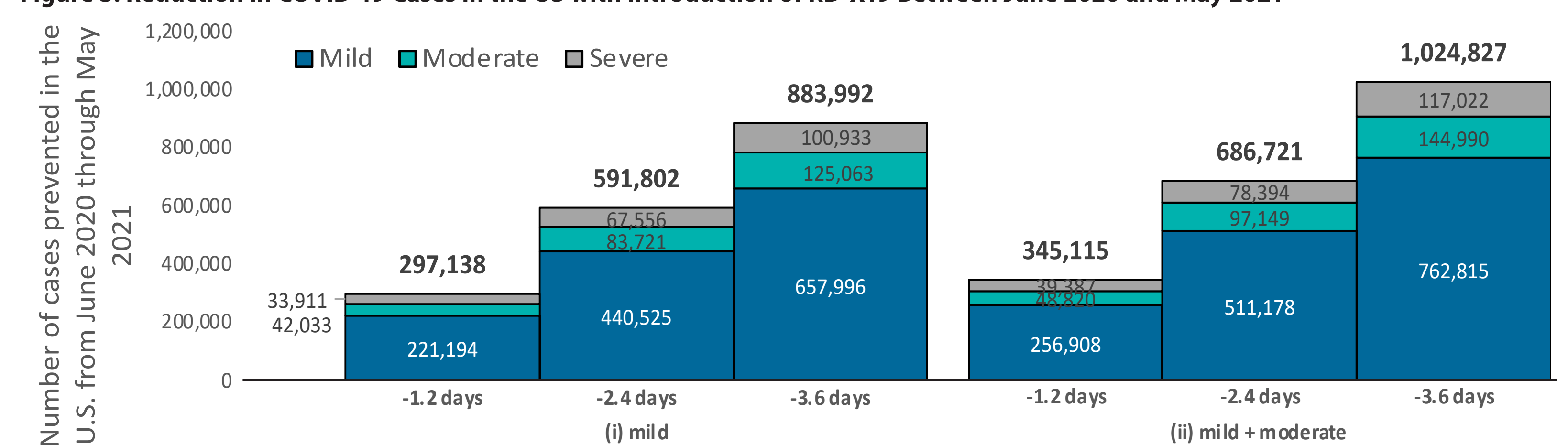
Figure 2. Reduction in healthcare costs in US with introduction of RD-X19 to COVID-19 cases between June 2020 and May 2021



Results: Health Outcomes

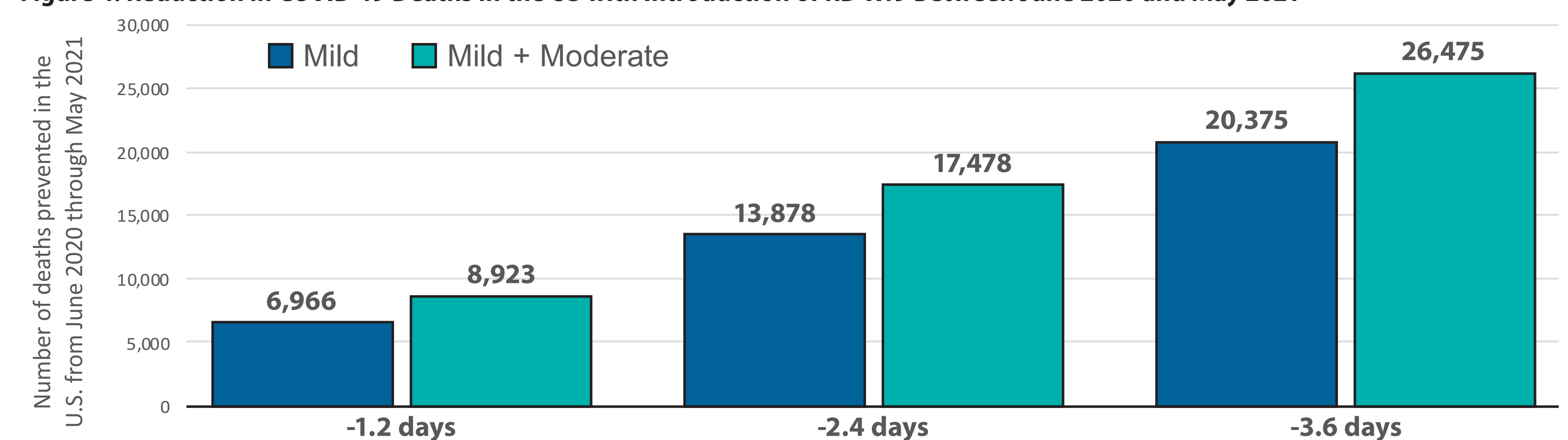
- By state, cases were reduced by 4,345 (AL, 1.2 days, mild only) to 31,477 (NC, 3.6 days, mild and moderate).
- At the national level cases were reduced by 297K (1.2 days, mild only) to 1.02M (3.6 days, mild+moderate) (Figure 3).

Figure 3. Reduction in COVID-19 Cases in the US with Introduction of RD-X19 Between June 2020 and May 2021



- By state, deaths were reduced by 106 (NC, mild only, 1.2 days) to 681 (AZ, mild+moderate, 3.6 days).
- At the national level deaths were reduced by 6,966 (mild only, 1.2 days) to 26,475 (mild+moderate, 3.6 days) (Figure 4).

Figure 4. Reduction in COVID-19 Deaths in the US with Introduction of RD-X19 Between June 2020 and May 2021



Case study

The value of 2.4 less days of disease

- Mild only used as a proxy for endemic (higher previous infection & vaccination rates)
- Devices deployed to 10% of eligible population (2.1 million devices)

	Pandemic (mild & moderate)	Endemic (mild)
Direct healthcare costs saved	\$4.4 billion	\$3.3 billion
COVID-19 cases prevented	686,722	591,802
Deaths avoided	17,748	13,878
Days returned to economy*	5.04 million	5.04 million

*Conservative estimate: includes on 2.4 less days of disease for treated patients, not avoided infections

Saving lives by serving patients with a low risk of disease progression

- Oral antivirals indicated only for patients with a high risk of progression
- This study includes low risk subjects as well

	Indicated for low risk of progression	Lives saved per 100 treatments administered
RD-X19	Yes	0.85
Molnupiravir	No	1.1
Nirmatrelvir/ritonavir	No	1.2

Limitations

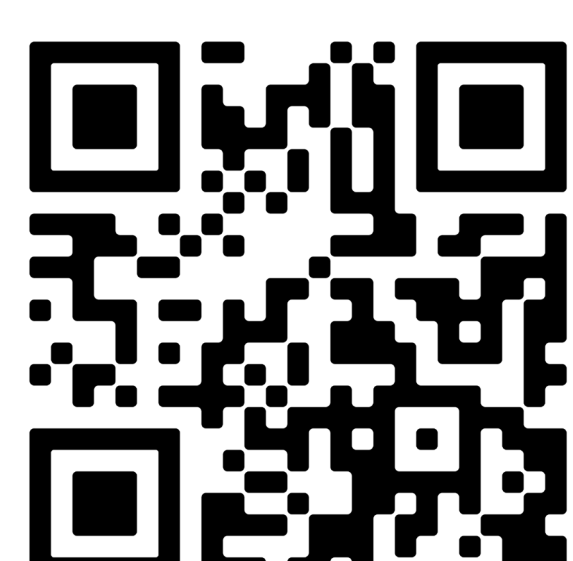
- Baseline efficacy (2.4 days) was modeled on results from the early feasibility study for RD-X19.
- To maintain a parsimonious model, assumptions included a constant rate of transmission/infection across the period, uniform treatment benefit across the treated population, no risk of reinfection, and instantaneous uptake of the treatment to modeled levels.

Conclusions

- As pandemic transitions to endemic and proportion of mild cases increases, a treatment added as a complement to vaccines can have significant impact on cases.
- Our conservative model confirms that even with moderate efficacy and modest deployment, a novel, antiviral therapy can result in significant reductions in direct healthcare costs, COVID-19 incidence, and mortality.

References

- CDC. COVID Data Tracker. Accessed March 17, 2022. <https://covid.cdc.gov/covid-data-tracker/#datatracker-home>.
- Jackson JK et al. (U.S. Congressional Research Service) Global Economic Effects of COVID-19 (R46270); 2021.
- Stasko N. et al. *Clin Transl Sci*. 2022 Feb 8. doi: 10.1111/cts.13249. Online ahead of print.
- CDC. Trends in Number of COVID-19 Vaccinations in the US. Accessed September 2, 2021. <https://covid.cdc.gov/covid-data-tracker/#vaccination-trends>.
- Clinical Spectrum of SARS-CoV-2 Infection. April 4, 2021; <https://www.covid19treatmentguidelines.nih.gov/overview/clinical-spectrum/>. Accessed September 1, 2021.



International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Annual Meeting

May 15-18, 2022

Washington, DC | Virtual

To learn more, scan the QR Code or visit www.EmitBio.com

Email: demerson@knowbiolc.com

Copies of this poster are for personal use only and may not be reproduced without written permission from ISPOR® and the author of this poster.

