

Options for Evaluating VA Programs

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Outline

1. Motivation for economic evaluations
2. Popular economic evaluation methods and terminology
3. Alternate methods and extensions that leverage data from VA's CDW
4. Difference-in-differences (DID) and event study methods
5. Examples of VA program evaluations

Motivation: Why Conduct Economic Evaluations?

- Useful for policymakers setting budgets and priorities
- Common goals
 - Should we adopt this new policy / treatment?
 - Compare programs to choose programs that achieves the best outcomes at lowest costs

Typical Requests

- VA budgets are tight and there is substantial pressure to optimize care
- We frequently get requests for assistance with economic evaluations

Examples of common questions:

1. What does it cost to provide clinical resource hubs and do they save money?
2. Is VA's new telestroke program cost-effective?
3. What is the return on investment from VA's mobile medical units?
4. What is the value of remote monitoring for heart failure?
5. What is the budget impact of creating a new clinic to manage patients with chronic pain?

Key Data & Design Considerations

1. What is the comparison/comparator?
 - Usual care, no care, another program
2. What is the perspective of the study?
 - VA/health system perspective, societal, providers, patients
3. Which costs to include?
 - Care provided by VA, VA-purchased care, paid by non-VA, inpatient, outpatient, prescriptions, patient/provider time costs
4. Time horizon?
 - Short-term (often <5 years) vs. long-term
5. **Do you want to include benefits and outcomes (effectiveness) alongside costs?**

Popular Economic Evaluation Methods

- **Cost-Effectiveness Analysis (CEA)**
 - Comparison across programs
 - Costs considered alongside disease-specific outcomes (vs. strict cost comparisons)
 - Usually focus on a ratio of: 1) incremental benefit for patient outcomes, and 2) costs
- **Cost-Benefit Analysis**
 - Similar to CEA, but outcomes are on the same monetary scale as costs
 - Difficult to assign a monetary value to patient outcomes
- **Cost-Utility Analysis**
 - Similar to CEA but outcomes are utility-based measures, such as quality of life and wellbeing, most commonly the Quality-of-Life-Adjusted-Years (QALYs)
 - Offers comparability across disease domains, but it can be difficult to estimate QALYs

Details in archived HERC seminars: [An Overview of Decision Analysis \(va.gov\)](#) and [Introduction to Effectiveness, Patient Preferences, and Utilities \(va.gov\)](#)

Today, we focus on the general “CEA” terminology.

Limitations of CEAs

- CEAs are often conducted alongside a randomized control trial (RCT).
 - Details in archived HERC presentation: [CEA Alongside a Clinical Trial \(va.gov\)](#)
 - CEAs in VA may be conducted as a follow up to an RCT, with investigators combining effectiveness data from trial arms with administrative cost data.
 - But RCTs can be expensive and time-consuming.
 - CEAs alongside RCTs may not always be the right tool for VA operational leaders seeking timely quality improvements.
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An Alternative: Unleash the Power of VA's CDW

- Often, after talking to researchers or operational partners about economic evaluations, we suggest another option.
- Leverage the CDW to do a causal inference study using observational data.

Alternate Methods/Extensions

- CEA consider costs along with disease-specific outcome measures.
- Causal inference can improve identification of *causal* impacts of an intervention on both costs and outcomes
- Popular causal inference methods:
 - Difference-in-differences (DID) design
 - Event study design
 - Regression discontinuity/kink designs
 - Instrumental variables
 - All of these topics are covered in the HERC Econometric Seminar Series

Today: we highlight how DID and event study methods can be particularly useful for VA program evaluations.

Difference-in-Differences (DID) Design

- Can be used to evaluate the average effect of a program/intervention/treatment.
- Uses a comparison group not exposed to the program to adjust for temporal outcome trends not due to the program.
- Assumes that the program and control groups exhibit parallel outcome trends in the absence of the program.
- Best practice: visually/graphically assess this assumption.
- DID attributes post-program breaks in parallel trends to the effects of the program.

Event Study Design: Extension of DID

- For traditional DID, best practice typically involves visually examining *unadjusted* outcome trends.
- Event studies graph *adjusted trend differences* between program and control groups over time.
 - Event studies plot adjusted differences between the groups for *each period* (e.g. month, quarter, year) before and after a program.
 - Pre-program absence of effects/differences and absence of trending, followed by abrupt breaks/changes post-program indicate program effects.

Examples 1 & 2:

**Evaluate VA's distribution of
tablets/iPads for video telehealth**

Examples 1 & 2: VA-issued tablets

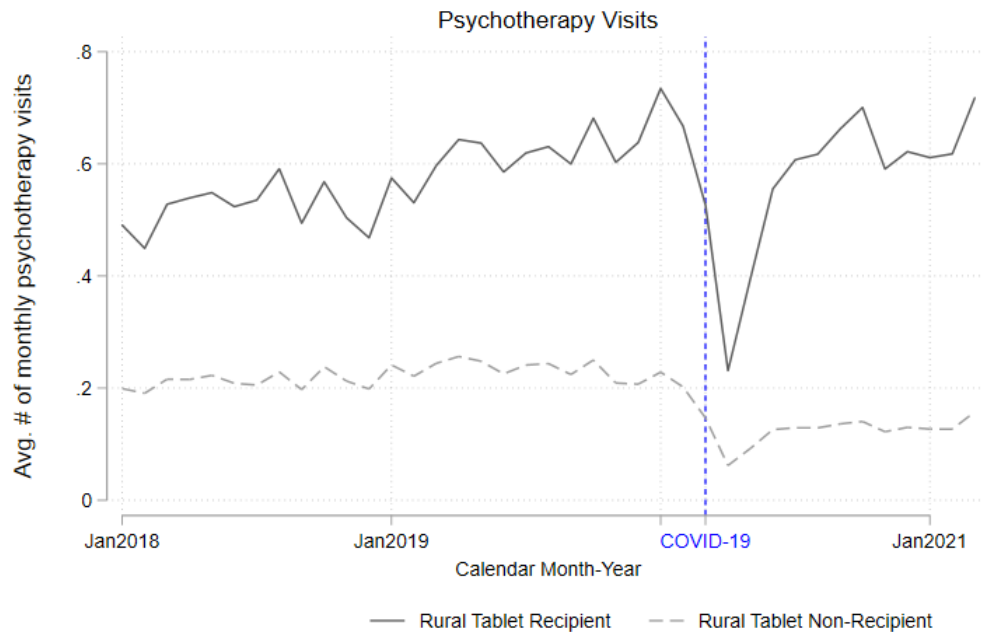


- In 2016, VA began loaning tablets with data plans to Veterans with access barriers to facilitate video telehealth.
- Providers initiated tablet consultations for patients they thought could qualify.
- Tablet criteria required that Veterans:
 - did not own a smart device,
 - had an access barrier (distance, transport), and
 - were able (or had a caregiver) to physically and cognitively operate a tablet.
- Tablets were ordered to be mailed to qualifying Veterans.
- VA escalated tablet distribution during the COVID-19 pandemic to facilitate telehealth care during social distancing mandates.

Example 1: Impact of tablets among rural Veterans

- Examined the impact of tablets issued during the pandemic on psychotherapy.
- Cohort of rural Veterans with indicated mental health needs (i.e. ≥ 1 mental health visit in 2019).
- Used difference-in-differences (DID) and event study designs.
- Compared tablet-recipients with non-recipients, before and after tablet-shipment.
- Differential (or “staggered”) calendar timing of tablet assignments across patients
 - Reduces the possibility that any one calendar time event other than tablet issuance could be driving the results.

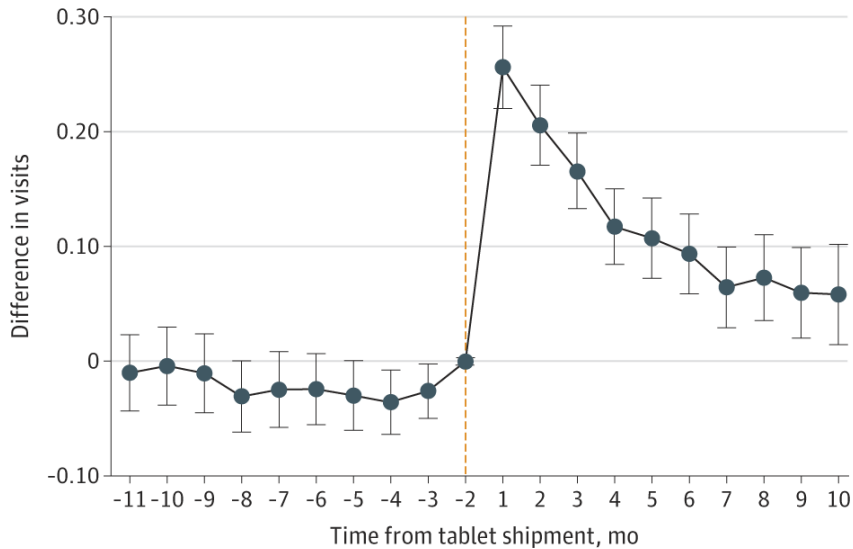
Example 1: Impact of tablets among rural Veterans



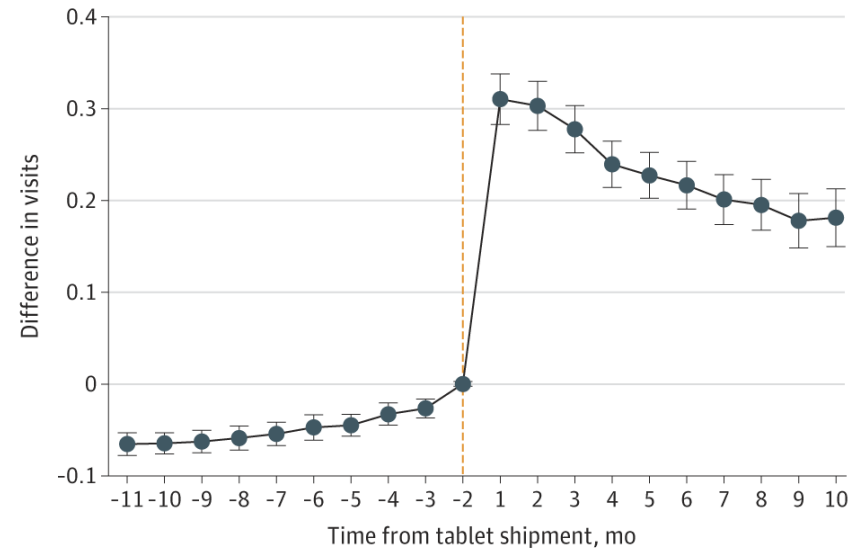
- Unadjusted outcome trends between tablet-recipients and non-recipients prior to COVID-19, before tablets we evaluated were issued, were roughly parallel.
- DID design was deemed appropriate.

Example 1: Impact of tablets among rural Veterans

A Psychotherapy visits (all modalities) compared with baseline



B Video psychotherapy visits compared with baseline



Note: We excluded months -1 and month 0 because treatment assignment i.e. tablet assignment likely occurred in these months and we did not want to attribute tablet assignment-related visits to tablet-associated effects. All models adjusted for veterans' sociodemographic and clinical characteristics, indicator for being a tablet recipient, covid-19 cases in the county, month effects, and VA facility effects.

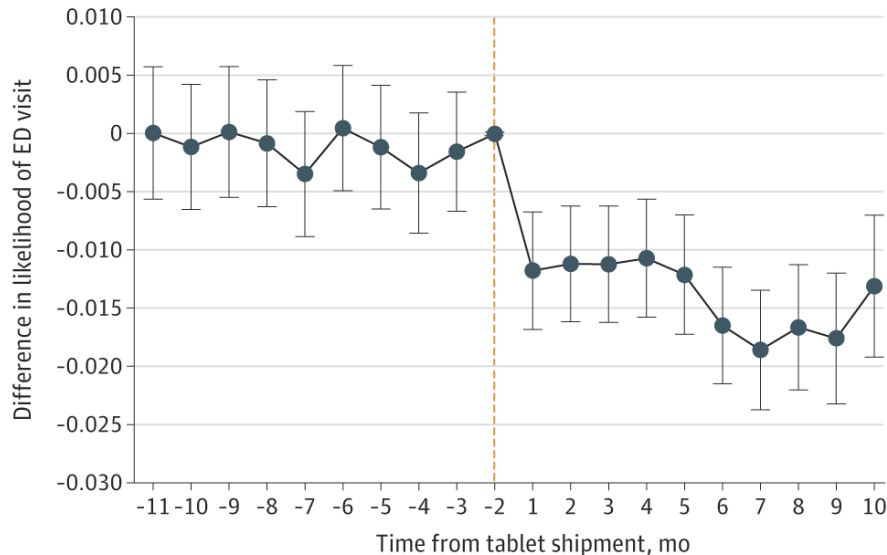
DID Estimates – compare post-program period avg. to pre-program period avg.

Tablets were associated with:

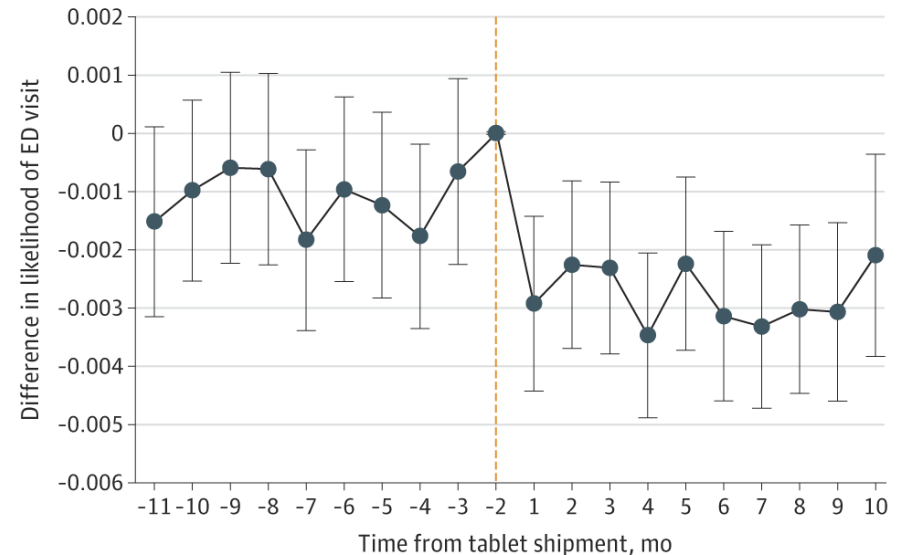
- An increase of 1.8 visits/year across all modalities (phone, video, in-person) (+23%)
- An increase 3.5 visits/year in video-based psychotherapy (+33%)

Example 1: Impact of tablets among rural Veterans

A Any ED visit compared with baseline



B Any suicide-related ED visit compared with baseline



Note: We excluded months -1 and month 0 because treatment assignment i.e. tablet assignment likely occurred in these months and we did not want to attribute tablet assignment-related visits to tablet-associated effects. All models adjusted for veterans' sociodemographic and clinical characteristics, indicator for being a tablet recipient, covid-19 cases in the county, month effects, and VA facility effects.

DID Estimates - Tablets were associated with:

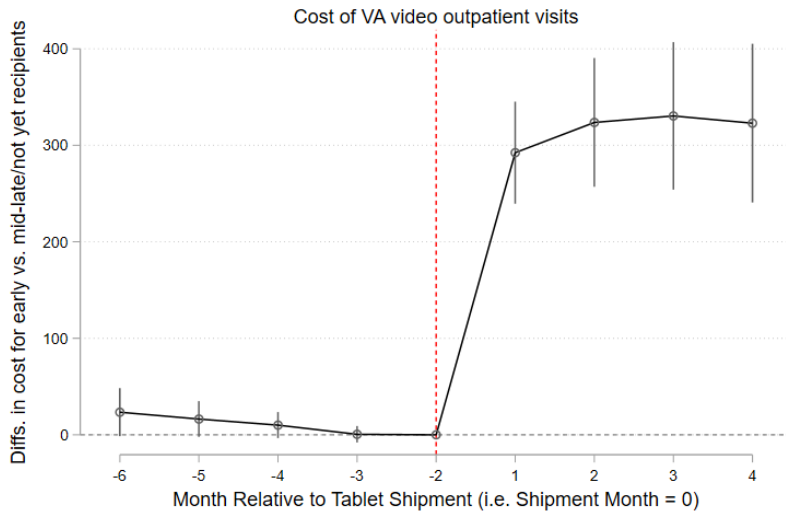
- A 20% reduction in the likelihood of an emergency department (ED) visit, and
- A 36% reduction in the likelihood of a suicide-related ED visit.

Example 2: Ongoing work examining tablets' impact on *costs* among rural and urban Veterans

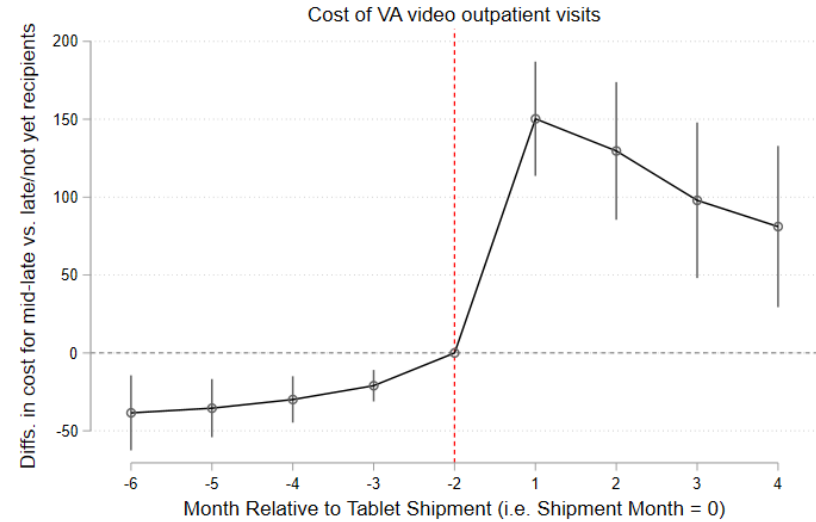
- Building on our prior work on rural Veterans, we examined the impact of tablets on visit *costs* for rural and urban Veterans with mental health needs:
 - Mental health visits, outpatient visits, and ED and inpatient visits
- Using DID and event studies like before,
 - We compared **early tablet recipients to mid-late/not-yet tablet recipients** to examine the effect of early-issued tablets.
 - We compared **mid-late recipients to late/not-yet recipients** to estimate the effect of mid-late-issued tablets.
- The idea underlying these new program and control group comparisons is that tablet recipients are likely more similar to later/not-yet tablet recipients than to Veterans who never received tablets.

Example 2: Impact on costs among rural and urban Veterans

Early vs. mid-late recipients



Mid-late vs. late recipients



DID Estimates:

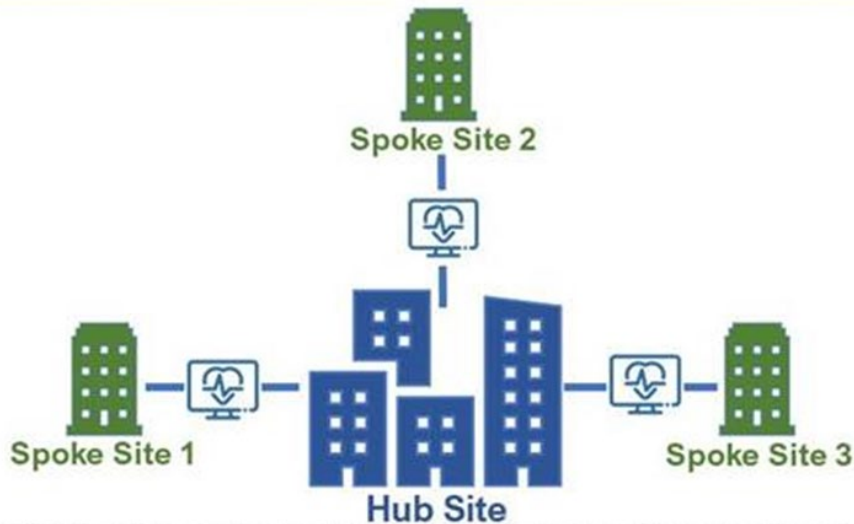
- Early-issued tablets (April 2020 to July 2020) associated with avg. +\$292/month/person, driven by the increase in video visits.
- Mid-late-issued tablets (January 2021-April 2021) associated with avg. +\$150/month/person, driven by the increase in video visits.

Next steps: Examine impact on the cost of mental health visits, as well as ED visits and inpatient visits.

Example 3 & 4:

Evaluate VA's Clinical Resource Hub Telehealth Program

Examples 3 & 4: VA's Clinical Resource Hub

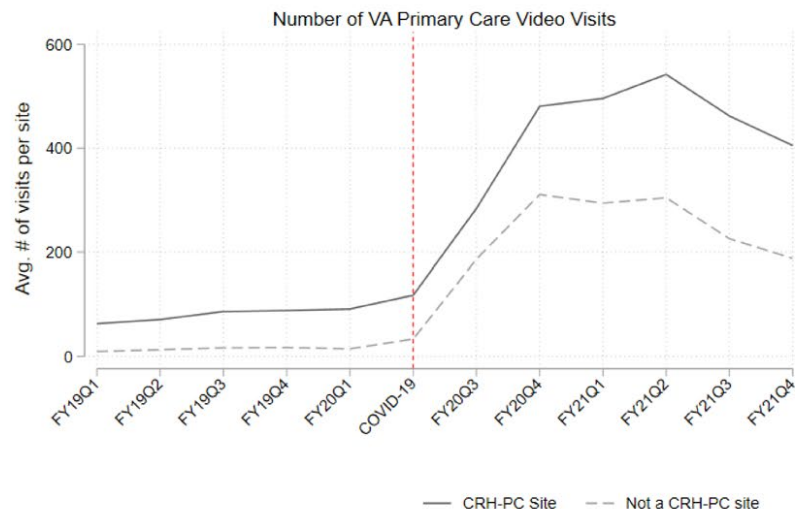
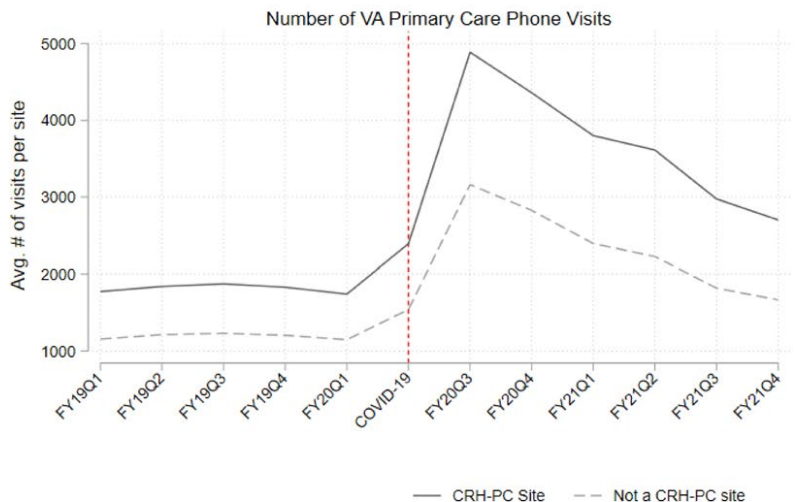
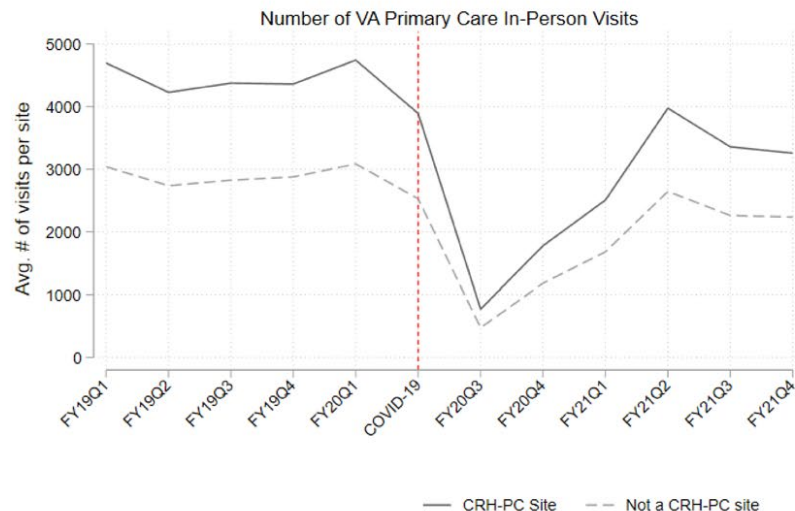
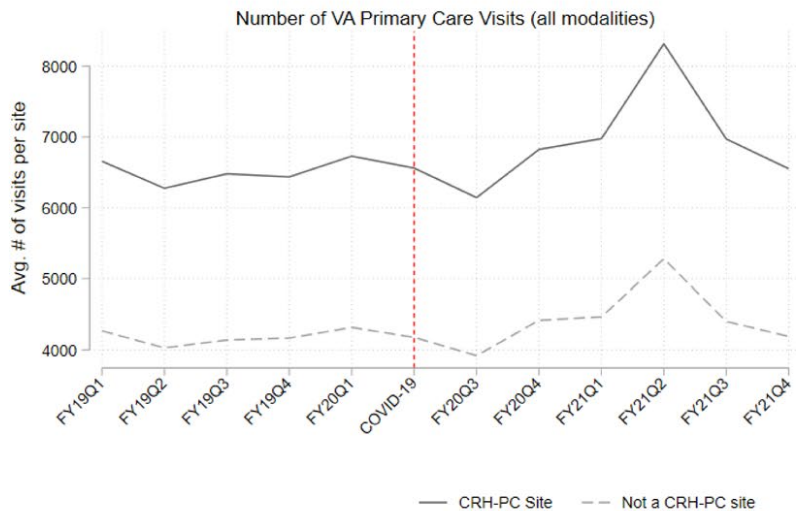


- In Oct. 2019, before the onset of the COVID-19 pandemic, VA began national implementation of the Clinical Resource Hub (CRH) Telehealth program.
- CRH provides staffing on a contingency basis for VA clinics undergoing a staffing shortage, primarily through telehealth.
- Services are administered from VA regional hub sites to local VA clinics within the VA regional networks via telehealth.

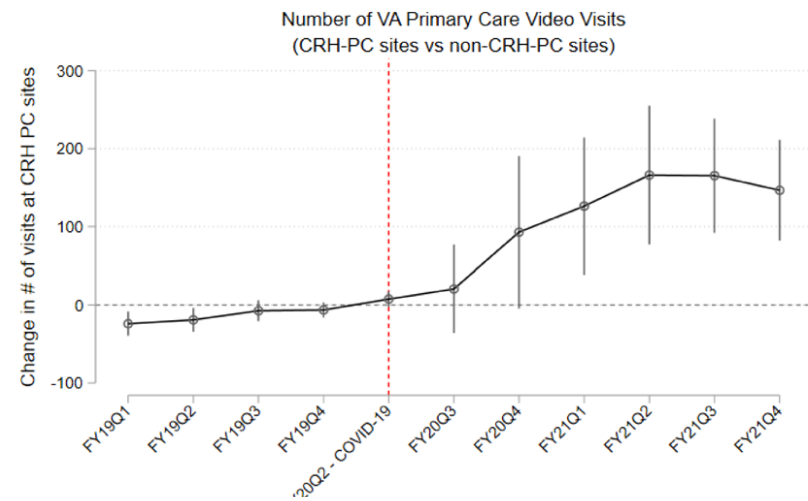
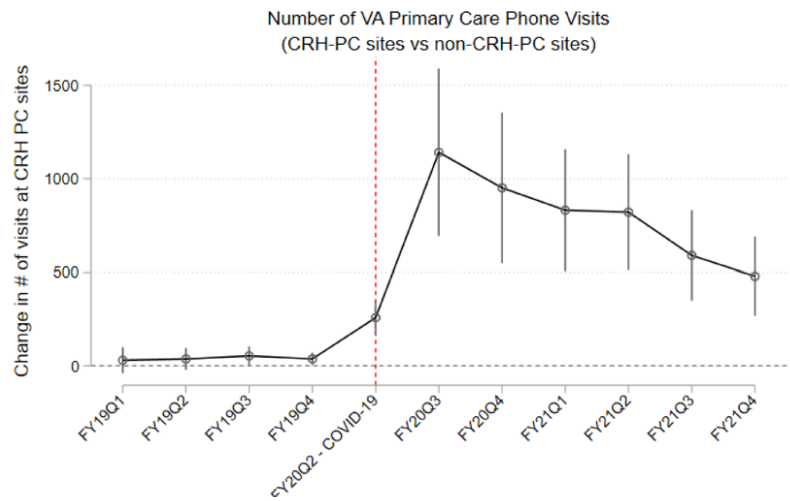
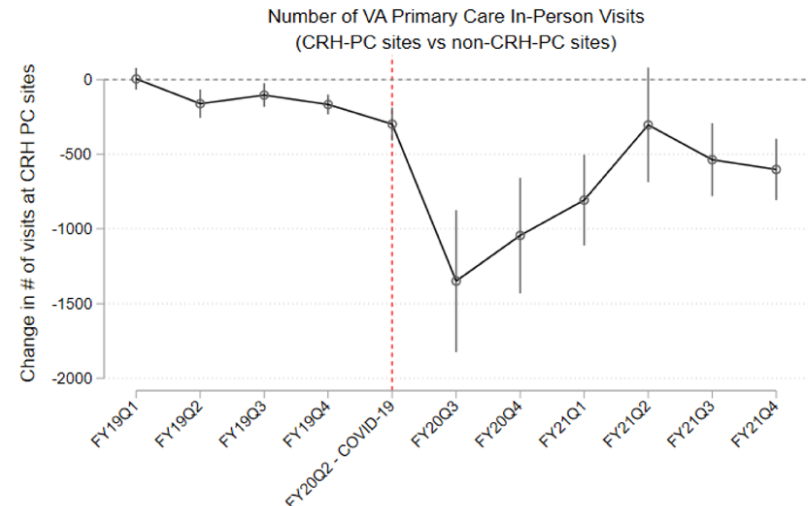
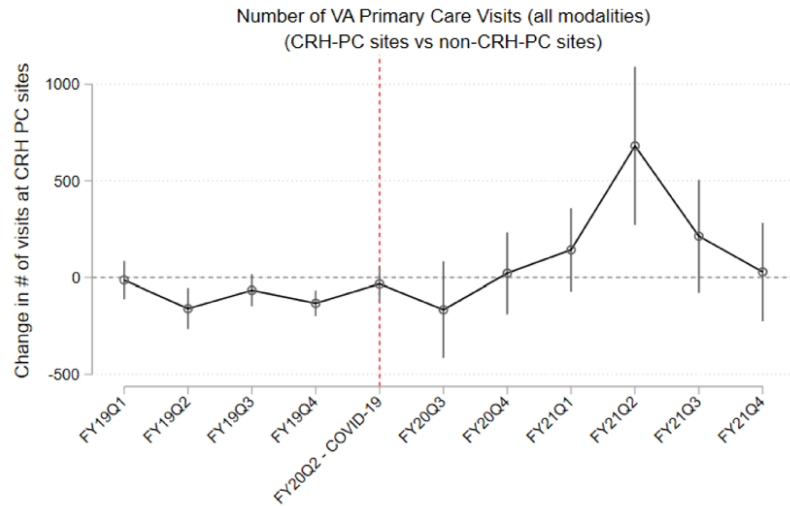
Example 3: Impact of COVID-19 on CRH-PC sites

- We hypothesized that adoption of the CRH program for primary care (CRH-PC) would provide telehealth infrastructure advantages that would facilitate primary care utilization during the pandemic.
- In this study, we evaluated the impact of the pandemic on CRH's delivery of primary care (total and by modality).
- We used DID and event study methods for a site-level analysis, comparing sites that adopted CRH-PC and sites that did not adopt CRH-PC, before and after the pandemic onset.

Example 3: Impact of COVID-19 on CRH-PC sites



Example 3: Impact of COVID-19 on CRH-PC sites



Example 3: Impact of COVID-19 on CRH-PC sites

- CRH-PC sites, compared with non-CRH-PC sites, had a primary care visits volume increase of 3.4% during the pandemic.
- This increase in visits was driven primarily by video and phone visits increase while in-person visits at CRH-PC sites decreased during the pandemic.
- VA's pre-pandemic rollout of CRH-PC intended to improve access facilitated primary care visits during the pandemic, a period fraught with care disruptions, and limited in-person health care delivery
- This indicated the potential for the CRH-PC program to offer health system resilience.

Example 4: Ongoing work examining costs.

- Building on our prior site-level analysis examining the impact of COVID-19 on CRH-PC sites, we sought to isolate the impact of the CRH-PC program on care visits and costs.
- We used difference-in-difference and event study analyses.
- To isolate this effect, we leveraged the differential timing of site-specific CRH-PC adoption dates, adjusting for the effect of the pandemic.
- We compared patients exposed to CRH-PC services with patients who never used CRH-PC services at CRH-PC sites, pre-post site-level CRH-PC adoption.

DID Methods Nuances and Advantages

DID designs pair well with large datasets such as VA's CDW data.

- VA data on many periods → parallel trends can be examined more rigorously using longer time frames.
- VA's rich data on covariates → many parameters
- Large-scale data on many patients and many time periods → more reliable estimation of all model parameters and reliable covariate adjustment.
- Data on program/treatment start dates is also an important consideration.

DID Methods Nuances and Advantages

DID designs with large-scale data can outperform matching methods.

- Matched analyses compare program and control groups use observable characteristics but cannot account for unobservable differences across groups.
- DID allows for unobservability conditioned on parallel trends.
- Large scale data adjusted for a group indicator along with other covariate adjustments helps reduce concerns about group differences.
- Matching can reduce the sample size, a critical consideration.
- Matching can increase bias depending on researcher decisions and incorrect assumptions.

Event Study Method Nuances and Advantages

Event studies similarly pair well with large datasets such as data from VA's CDW.

- Event studies estimate DID effects/differences in *each time period* → increases the number of model parameters.
 - They make transparent what's going on underneath traditional DID estimates by graphically showing differences in each time period.
- Event studies use non-significance in the pre-program period to imply a lack of effects – more power helps this claim.

Large-scale data on many patients, many time periods and many covariates can improve event study analyses.

Summary: DID and Event Study Methods

- Offer powerful alternatives/extensions to traditional CEA.
- Can be used for evaluating different impacts of VA programs: patient outcomes, health care use, visit costs, travel costs, time costs and more.
 - Offer flexibility on economic evaluation aspects discussed earlier: comparator, perspective, various types of cost data, time horizon, can include or exclude patient outcomes.
 - If cost data are not available, rigorous causal analyses of utilization data may be sufficient.
- These methods are improved with large-scale data like VA's CDW.
- These methods are enhanced when there is staggered rollout of programs, i.e. differential program start dates.
- The use of graphs/visual evidence makes these designs particularly transparent and compelling for attributing the observed effects to program introduction.

Resources: Important HERC Links

- HERC Webpage: [HERC: Home \(va.gov\)](#)
 - Cost Data
 - Analytic Methods
 - Resources (consulting, guidebooks, reports)
- HERC's CEA and Econometrics Seminar Series:
 - [HERC: Archived Seminars \(va.gov\)](#)
 - [An Overview of Decision Analysis \(va.gov\)](#)
 - [Introduction to Effectiveness, Patient Preferences, and Utilities \(va.gov\)](#)
 - [CEA Alongside a Clinical Trial \(va.gov\)](#)
 - [Cost as the Dependent Variable](#)
 - [Natural Experiments & Difference-in-Differences \(va.gov\)](#)

Resources: Details on example studies

VA-Issued Tablet Evaluations using DID and event studies:

- Gujral, K., Van Campen, J., Jacobs, J., Kimerling, R., Blonigen, D., & Zulman, D. M. (2022). Mental health service use, suicide behavior, and emergency department visits among rural US veterans who received video-enabled tablets during the COVID-19 pandemic. *JAMA Network Open*.
- Gujral, K., Van Campen, J., Jacobs, J., Lo, J., Kimerling, R., Blonigen, D. M., Wagner, T.H. & Zulman, D. M. (2023). Sociodemographic differences in the impacts of video-enabled tablets on psychotherapy usage among veterans. *Psychiatric Services*.
- Gujral, K., Van Campen, J., Jacobs, J., Kimerling, R., Zulman, D. M., & Blonigen, D. (2023). Impact of VA's video telehealth tablets on substance use disorder care during the COVID-19 pandemic. *Journal of Substance Use and Addiction Treatment*.

Clinical Resource Hub Evaluations using DID and event studies:

- Gujral, K., Scott, J. Y., Dismuke-Greer, C. E., Jiang, H., Wong, E., & Yoon, J. (2024). The Clinical Resource Hub telehealth program and use of primary care, emergency, and inpatient care during the COVID-19 Pandemic. *Journal of General Internal Medicine*.

Resources: CEA, DID & Event Studies

- Barrett, B., & Byford, S. (2009). Economic evaluations in evidence based healthcare. *BMJ Ment Health*.
- Sanders, G. D., Neumann, P. J., Basu, A., Brock, D. W., Feeny, D., Krahn, M., ... & Ganiats, T. G. (2016). Recommendations for conduct, methodological practices, and reporting of cost-effectiveness analyses: second panel on cost-effectiveness in health and medicine. *JAMA*.
- Wing, C., Simon, K., Bello-Gomez, R.A. (2018). Designing Difference in Difference Studies: Best Practices for Public Health Policy Research. *Annual Review of Public Health*.
- Daw JR, Hatfield LA. (2018) Matching and Regression to the Mean in Difference-in-Differences Analysis. *Health Services Research*.
- Zhou, H., Taber, C., Arcona, S., & Li, Y. (2016). Difference-in-differences method in comparative effectiveness research: utility with unbalanced groups. *Applied health economics and health policy*.
- Miller DL. (2023). An Introductory Guide to Event Study Models. *Journal of Economic Perspectives*.
- Goodman-Bacon, A. (2018). Difference-in-Differences with Variation in Treatment Timing. *The National Bureau of Economic Research*.
- Freyaldenhoven, S., Hansen, C., Shapiro, J.M. (2019). Pre-event Trends in the Panel Event-Study Design. *American Economic Review*.
- Roth J. (2022). Pretest with caution: Event-study estimates after testing for parallel trends. *American Economic Review: Insights*.
- Roth J, Sant'Anna PH, Bilinski A, Poe J. (2023). What's trending in difference-in-differences? A synthesis of the recent econometrics literature. *Journal of Econometrics*.

Thank You

Questions?

Please also feel free to reach out to us by email:

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