

Impacts of telehealth on rural health care access

Introduction

Telehealth represents a comprehensive suite of technologies and methodologies aimed at delivering educational, health, and medical services across distances. It encompasses a wide range of fields such as primary care, dentistry, counseling, various therapies (including physical and occupational), home health care, chronic disease monitoring and management, disaster management, and both consumer and professional education. This innovative approach to health care delivery is instrumental in enhancing the quality of rural health care and addressing challenges faced by rural residents, such as limited access to specialty care and transportation difficulties.

Background

The significance of telehealth was particularly apparent during the COVID-19 pandemic, which saw a surge in the adoption of socially distanced, virtual health care visits. In response, numerous adjustments were made in laws, reimbursement policies, and provider practices to facilitate greater access to telehealth services, many of which have been maintained, extended, or concluded following the pandemic's peak. A study on private insurance claims data showed that telehealth encounters increased 766 percent in the first three months of the pandemic.¹ Similarly, use of telehealth services under Medicare grew for rural and urban beneficiaries, but the growth rate was more less for rural beneficiaries.²

Telehealth modalities are diverse and include live video (synchronous), audio-only, store-and-forward (asynchronous), remote patient monitoring, and mobile health applications. Live video facilitates real-time interactions between patients and health care providers, enhancing access to immediate care. Store-and-forward technology allows for the transmission of health records, images, and other critical patient data to practitioners at remote locations, enabling patients in isolated areas to consult specialists without the need for extensive travel. Remote patient monitoring tracks physiological parameters through non-invasive means, supporting patient care after they return home or move to another care facility. Meanwhile, mobile health leverages mobile communication devices to disseminate public health information, playing a crucial role in preventive health and patient education. Collectively, these telehealth modalities are pivotal in transforming health care delivery, particularly in underserved rural areas, by bridging the gap between the medical services available and the unique needs of these communities.³

Rural America encompasses nearly 80 percent of regions designated as medically underserved, meaning a significant disparity exists in accessing health services. Rural areas are home to 20 percent of the nation's population but are served by fewer than 10 percent of its physicians – a situation that is progressively deteriorating.⁴ The shortage of health care providers in these communities is highlighted by the fact that as of 2020, the patient-to-primary-care-physician ratio in rural areas was 5.1 primary care physicians per 10,000 residents, compared to 8.0 primary care physicians per 10,000 people in urban areas.⁵ Further, the average age of rural doctors is

1



three years older than urban doctors, with half over 50 and over a quarter older than 60.⁶ Predictions indicate a decline of 23 percent in the number of rural doctors by 2030.⁷

Telehealth offers a solution by enhancing the accessibility of physicians, specialists, and other health care services for patients in rural and frontier areas. Through telehealth, remote primary care providers can connect with specialists, offering patients the convenience and benefit of receiving care closer to home. Telehealth is not a substitute for in-person primary care but is a critical support for primary care access. To fully realize the potential of telehealth, barriers must be addressed to ensure rural residents have equitable access to the health care services they critically need.

Effectiveness of telehealth

Telehealth has been instrumental in improving health care access for rural populations, significantly reducing both the travel burden and the overall cost of care. For rural Americans, who often face considerable geographic and financial challenges in accessing health care, telehealth can represent a crucial bridge to essential services. Furthermore, the implementation of telehealth has not only facilitated access but also improved patient education and health outcomes, particularly through the effective remote management of chronic diseases — a significant concern given the higher rates of such conditions in rural areas. Several studies have demonstrated that telehealth can lead to similar or even better outcomes compared to in-person care among rural patients.

Telehealth has demonstrated significant cost savings for patients, with average savings ranging from \$19 to \$121 per telehealth visit.⁸ The primary source of these savings is the avoidance of unnecessary emergency department visits, which represent a significant cost burden for both patients and the health care system. The reduction in time and travel costs represents another aspect of telehealth's cost-effectiveness. For rural residents, who may live hours away from the nearest health care provider, the ability to access care remotely can save significant time and resources. However, telehealth should be balanced with in-person care, when necessary, as part of a coordinated approach led by a local primary care provider.

Analysis of current telehealth policies

Medicaid

Medicaid's approach to telehealth reimbursement is characterized by its flexibility and inclusiveness, with policies varying significantly across states. Approximately half of state Medicaid programs align with Medicare's list of eligible telehealth services, while the rest permit any service deemed medically appropriate to be delivered via telehealth, offering considerable flexibility in service provision.¹¹

All 50 states and Washington, D.C., offer some form of reimbursement for live video telehealth services in their Medicaid fee-for-service programs, acknowledging the importance of real-time patient-provider interactions.¹¹ Store-and-forward technology is reimbursed by 33 state Medicaid

2



programs, including recent additions such as Florida, Montana, North Dakota, South Carolina, and Utah, with certain restrictions and predominantly through specific communication technology-based services codes.¹¹

Remote patient monitoring (RPM) is another telehealth modality gaining traction, with 37 states providing reimbursement for such services. This reflects a growing recognition of RPM's potential to enhance patient outcomes, especially for individuals with chronic conditions. Audio-only services, which became crucial during the COVID-19 pandemic, are reimbursed by 43 states and D.C. with varying limitations, indicating the evolving nature of policies to address the needs of those without access to video technology.

Medicare

Before the COVID 19 pandemic, Medicare generally required telehealth services to be delivered via live video, with store-and-forward permitted only in Alaska and Hawaii. Audio-only visits were allowed under specific circumstances, particularly for mental health services. Medicare reimburses for approximately 100 services that can be delivered via telehealth, identified through Current Procedural Terminology or Healthcare Common Procedure Coding System codes. This approach emphasizes services with an in-person equivalent, distinguishing them from technology-enabled services that do not have an in-person counterpart.

Geographic considerations have always played a significant role in determining eligibility for Medicare telehealth services. The patient's location at the time of service must either be in a health professional shortage area (HPSA) or outside a metropolitan statistical area (MSA), although exceptions exist for behavioral health and substance abuse services. A notable policy update in January 2014 by the Centers for Medicare & Medicaid Services (CMS) expanded eligibility to facilities located in rural census tracts within an MSA, reflecting a nuanced understanding of rural health care needs. Medicare allows a specified list of providers, including physicians, nurse practitioners, physician assistants, and several other health care professionals, to deliver telehealth services.

Private payors

Reimbursement for telehealth services by private and commercial payors varies, but many are aligning more closely with state Medicaid programs. These payors often adopt laws that include coverage parity, ensuring telehealth services are covered similarly to in-person services. Notably, 43 states, along with the District of Columbia and the Virgin Islands, have established private payer laws addressing telehealth reimbursement. Among these, 24 states enforce explicit payment parity laws, requiring telehealth services to be reimbursed at the same rates as equivalent in-person services. Although there have been no new states adding private payor laws since fall 2022, some states have adjusted their existing laws particularly around payment parity and requirements for audio-only services, reflecting the ongoing evolution of telehealth as a recognized and essential component of health care delivery.¹¹

3



COVID-19 impacts

The COVID-19 pandemic brought unprecedented challenges to health care delivery in the United States, catalyzing significant shifts in telehealth utilization and policy. In response to the pandemic, CMS promptly removed numerous geographic restrictions and reimbursement requirements for telehealth services. This regulatory flexibility enabled health care providers to continue delivering care while adhering to the physical distancing recommendations issued by public health authorities. Despite these efforts to promote telehealth as a viable alternative to inperson visits, the adoption of telehealth services during the first year of the pandemic revealed a disparity in usage between urban and rural counties, with urban areas experiencing a much greater increase in telehealth utilization.¹⁴

Policy changes in the wake of COVID-19 were significant, with some being temporary for the public health emergency (PHE) period, such as reimbursement parity with in-person visits and the approval of approximately 120 additional services for Medicare reimbursement during the PHE. Other temporary changes have been extended through December 31, 2024. Telehealth flexibilities made permanent include removing many restrictions for behavioral health visits and the eligibility of rural emergency hospitals as originating sites for telehealth. In the calendar year 2025 Medicare physician fee schedule, CMS included audio-only technology in its definition of telecommunications systems and to continue allowing RHCs and FQHCs to serve as distant site providers for telehealth services absent a congressional extension. A full list of relevant policy changes after the COVID-19 PHE is included in the table below.

Telehealth policy changes during COVID-19 PHE	Permanent	Expired with PHE in 2023	Expires Dec. 31, 2024
Remove geographic originating site restrictions			X
Allow Federally Qualified Health Centers (FQHC) and Rural Health Clinics (RHC) to serve as distant site providers			×
Allow FQHCs and RHCs to serve as distant site providers for behavioral health services	х		
Allow Medicare patients to receive telehealth services for behavioral health care in their home	х		
Eliminate geographic restrictions for originating sites behavioral health services completed via telehealth	х		(in-person visit requirement suspended)
Allow some behavioral services to be delivered using audio-only communication under certain conditions	Х		(in-person visit requirement suspended)
Allow Rural Emergency Hospitals to be originating sites for telehealth	х		
Expand the list of providers eligible to provide Medicare telehealth services such as physical therapists, occupational therapists, speech language pathologists			×
Allow certain Medicare telehealth visits to be delivered using audio-only technology			х
Allow remote evaluations, checkups and visits to be provided to new patients ¹⁷		х	

4



These policy adaptations signify a broader acceptance and integration of telehealth into health care delivery systems. By allowing behavioral and mental health services to be delivered via audio-only methods and removing geographic restrictions for originating sites, these changes aim to strengthen telehealth's role in improving health care access and equity, particularly for rural Americans.

Analysis

The current policy landscape surrounding telehealth, especially in the wake of the COVID-19 pandemic, presents a complex matrix of challenges and opportunities. Recommendations for future policy development must consider several key areas: infrastructure and broadband access, provider authority and licensing, online prescribing, malpractice and informed consent, HIPAA and privacy compliance, patient uptake and willingness, and reimbursement structures.

Infrastructure

A fundamental prerequisite for telehealth is the availability of robust broadband connectivity alongside necessary applications/devices for audio and video communication and technology support. Despite telehealth's critical role, approximately one-third of rural Americans lack sufficient broadband access – a problem made more urgent by the fact that only about 51 percent of Americans aged 65 and older have broadband at home.¹⁸

Funded by the U.S. Department of Health and Human Services and Health Resources and Services Administration, Telehealth Resource Centers provide assistance and information at no cost to support the implementation of telehealth programs for rural and underserved communities. The 12 regional and two national Telehealth Resource Centers offer toolkits on technologies like video platforms and digital health equipment. They also provide online training programs to help them navigate emerging technologies.

Provider authority

Telehealth can potentially enhance rural providers' productivity and income by allowing virtual visits, which are particularly beneficial for those who travel between facilities. However, cross-state provider licensure remains a significant barrier and can make it challenging for physicians wanting to expand their practice to rural areas. Currently, most physicians who practice across state lines must be licensed separately in each state, though solutions like telehealth-specific licenses and interstate compacts can improve access in these cases.

The Federation of State Medical Boards offers solutions for license portability, facilitating credentialing for telehealth in high-demand areas.¹⁹ The Interstate Medical Licensure Compact, an agreement between 29 states, provides an expedited process for physicians to be licensed in multiple states, which is particularly useful for expanding telehealth from urban areas to neighboring rural areas. Nurses, emergency medical services, allied health professionals, and auxiliary health care workers also participate in licensing compacts, although access varies by

5



state. While licensing compacts establish uniform standards, the lack of universal standards poses hiring challenges and exposes providers to additional risks.²⁰

Provider credentialing, as outlined by the Joint Commission, involves verifying and assessing a health care practitioner's qualifications. Coupled with privileging, which authorizes specific patient care services based on a provider's credentials and performance, these processes ensure provider competency. However, credentialing and privileging are often time-consuming and costly, especially for rural hospitals.¹¹

Online prescribing

The capacity for physicians to prescribe controlled substances via telehealth without a mandatory in-person exam has significantly enhanced access to health care and prescription medications, particularly mental health services. Research indicates that the greater the distance patients must travel for treatment, the less likely they are to seek care, highlighting the importance of telehealth for rural populations in need of mental health services. Additionally, the scarcity of providers in rural areas able to prescribe buprenorphine — a key medication for opioid use disorder (MOUD) — poses significant challenges. Approximately one-third of rural residents live in counties without a buprenorphine provider, compared to just 2.2 percent of urban residents.

The COVID-19 PHE led to a temporary removal of the in-person exam requirement for prescribing MOUD, facilitating expanded access, improved patient retention, and reduced overdose risk .²³ However, in October 2023, the Drug Enforcement Administration (DEA) extended telehealth flexibilities only through 2024. Without further action, the in-person medical evaluation requirement for OUD medications will be reinstated in 2025. Meanwhile, S.3193, the TREATS Act, aims to permanently allow audio-only and audio-visual telehealth for MOUD, a significant benefit for rural residents who must travel for mental health care.

Malpractice, informed consent, and privacy

Malpractice liability remains a concern in telehealth, paralleling the risks of traditional clinical practice. Malpractice insurance carriers are not universally required to cover telehealth claims or extend coverage to providers practicing in states where they are not licensed, with Hawaii being an exception. As a result, providers elsewhere may face higher premiums if they wish to secure telehealth malpractice coverage.²⁴

Telehealth providers must adhere to the same HIPAA requirements as in-person health care providers. This includes ensuring encrypted data transmission, secure connections, and technical safeguards to protect electronic health information,³ as well as stringent audit controls and protocols for breach notification to ensure patient privacy and data security are maintained.²⁴ Rural hospitals often face barriers in complying with HIPAA regulations due to limited access to necessary technology or expertise.



Uptake and willingness to adopt

Rural populations stand to benefit significantly from telehealth services, which offer a convenient alternative to traditional health care delivery methods. Despite the general increase in post-pandemic acceptance, many rural residents remain hesitant to fully embrace telehealth.²⁵ Many individuals still show a preference for in-person interactions, particularly for services like primary care and behavioral health, where personal relationships and privacy are highly valued. This preference is underscored by the challenges rural hospitals face in engaging patients with digital health technologies for tasks such as managing medical records or scheduling appointments online.²⁶ Overcoming these barriers will require leveraging telehealth for routine health issues and fostering strong clinical relationships between providers and patients.²⁷

Reimbursement

Telehealth programs frequently encounter challenges, especially under Medicare, due to geographic and provider restrictions as well as the type of services covered. The costs associated with implementing telehealth services can be prohibitive for rural health care facilities, which often operate on thin margins. Rural facilities like RHCs that provide telehealth services still must pay the overhead costs to maintain a physical facility while also implementing virtual care technology.³ Reimbursement rates need to fully cover these costs and adjust for time, overhead, and scope of visit.²⁸

Policy recommendations

To enhance the adoption and efficacy of telehealth services particularly in rural areas, the following recommendations are proposed:

- Continue support for broadband access: Sustain and increase funding for programs like the ReConnect and Rural Broadband Loan and Grant programs at the U.S. Department of Agriculture. This will ensure that rural communities have the necessary infrastructure to support telehealth services.
- Extend affordable connectivity: Maintain support for the Affordable Connectivity Program
 to ensure high-speed internet access at affordable rates for rural residents and older
 adults.
- <u>Permanently extend Medicare telehealth flexibilities</u>: Make permanent the telehealth flexibilities introduced during the COVID-19 pandemic for Medicare beneficiaries.
- <u>Equitable reimbursement rates</u>: Advocate for reimbursement for RHCs and FQHCs at rates equivalent to in-person services to ensure sustainability.
- Enable telehealth adoption in rural health care: Enable rural health care providers and patients to adopt and continue using telehealth technologies including remote patient monitoring to enhance access to health care services. Create clinic guidelines and technical assistance to encourage best practice adoption of telehealth in rural areas.
- <u>Ease cross-state licensure</u>: Support state-level and credentialing authority policies that facilitate cross-state licensure to expand access to medical providers for rural residents,

7



thereby broadening the scope of available health care services. A connection with a local primary care provider should be maintained through in-person visit requirements as deemed clinically necessary.

Policy actions

To implement these recommendations, the following legislative actions are suggested:

- <u>Telehealth Modernization Act (S. 3967/H.R. 7623)</u>: Permanently remove geographic originating site restrictions, expand the types of providers eligible to provide telehealth services, allow for RHC telehealth visit payment parity, and extend coverage for audio-only telehealth, among other telehealth flexibilities.
- CONNECT for Health Act (S. 2016/H.R. 4189): Permanently remove telehealth geographic
 restrictions and expand originating site locations to include the patient's home; remove
 requirements for in person visits for behavioral health treatment; and allow RHC and
 FQHCs to serve as distant sites.
- ReConnecting Rural America Act (S. 1642/H.R. 4227): Make the ReConnect Program permanent to improve broadband infrastructure.
- TREATS Act (S. 3193/H.R. 5163): Retain telehealth flexibilities for prescribing buprenorphine for opioid use disorder, including allowing providers to waive the in-person visit requirement and allow audio-only or audio-visual telehealth technology.

Conclusion

The policy initiatives discussed emphasize telehealth's crucial role in improving health care access in rural areas. By advocating for permanent Medicare telehealth flexibilities and equitable reimbursement rates, NRHA proposes necessary actions to solidify telehealth as a fundamental component of rural health care. Strengthening broadband access and simplifying cross-state licensure are essential for sustainable health care delivery. These legislative measures represent strategic steps toward a more equitable health care system, ensuring that rural areas remain well-served in the face of future health care challenges. By implementing these recommendations, telehealth can continue to bridge health care gaps and transform medical service delivery in rural America.

References

- Shaver, J. (2022). The State of Telehealth Before and After the COVID-19 Pandemic. *Prim Care*, 49(4):517-530. doi: 10.1016/j.pop.2022.04.002. Epub 2022 Apr 25. PMID: 36357058; PMCID: PMC9035352.
- 2. Rural Health Information Hub. (2024). Telehealth and Health Information Technology in Rural Healthcare. Rural Health Information Hub. https://www.ruralhealthinfo.org/topics/telehealth-health-it#:~:text=Updated%20Medicare%20FFS%20Telehealth%20Trends,removal%20of%20pre%2Dpandemic%20geographic
- 3. Rural Health Information Hub. (2023.). Overview of Telehealth. Rural Health Information Hub. https://www.ruralhealthinfo.org/topics/telehealth



- 4. Arredondo, K., Touchett, H. N., Khan, S., Vincenti, M., & Watts, B. V. (2023). Current Programs and Incentives to Overcome Rural Physician Shortages in the United States: A Narrative Review. *Journal of general internal medicine*, 38(Suppl 3), 916–922. https://doi.org/10.1007/s11606-023-08122-6
- U.S. Department of Agriculture. (2023). Availability of healthcare providers in rural areas lags that of urban areas. Economic Research Service. https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=106208
- 6. Palmer, J. (2019). Patient Safety & Quality Healthcare. As Rural Docs Age, Will There Be Enough Left? https://www.psqh.com/analysis/as-rural-docs-age-will-there-be-enough-left/
- 7. Skinner, H. (2019). New research examines implications of an aging rural physician workforce. Geisel School of Medicine at Dartmouth. D%20Skinner%20says.
- 8. Kichloo, A., Albosta, M., Dettloff, K., Wani, F., El-Amir, Z., Singh, J., Aljadah, M., Chakinala, R. C., Kanugula, A. K., Solanki, S., & Chugh, S. (2020). Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. *Family medicine and community health*, 8(3), e000530. https://doi.org/10.1136/fmch-2020-000530
- 9. Ezeamii, V. C., Okobi, O. E., Wambai-Sani, H., Perera, G. S., Zaynieva, S., Okonkwo, C. C., Ohaiba, M. M., William-Enemali, P. C., Obodo, O. R., & Obiefuna, N. G. (2024). Revolutionizing Healthcare: How Telemedicine Is Improving Patient Outcomes and Expanding Access to Care. *Cureus*, 16(7), e63881. https://doi.org/10.7759/cureus.63881
- 10. Chu, C., Cram, P., Pang, A., Stamenova, V., Tadrous, M., & Bhatia, R. S. (2021). Rural Telemedicine Use Before and During the COVID-19 Pandemic: Repeated Cross-sectional Study. *Journal of medical Internet research*, 23(4), e26960. https://doi.org/10.2196/26960
- 11. Center for Connected Health Policy. (2024). All Telehealth Policies. Retrieved from https://www.cchpca.org/all-telehealth-policies/
- 12. Telehealth Resource Center. (2023.). Telehealth Basics. Retrieved from https://telehealthresourcecenter.org/collections/telehealth-basics/
- Centers for Medicare & Medicaid Services. (2014, December 30). Expansion of Medicare telehealth services for CY 2014 (Pub 100-04 Medicare Claims Processing, Transmittal 2848, Change Request 8553). Department of Health & Human Services. https://www.cms.gov/regulations-and-guidance/transmittals/downloads/r2848cp.pdf
- 14. Demeke, H. B., Merali, S., Marks, S., Pao, L. Z., Romero, L., Sandhu, P., Clark, H., Clara, A., McDow, K. B., Tindall, E., Campbell, S., Bolton, J., Le, X., Skapik, J. L., Nwaise, I., Rose, M. A., Strona, F. V., Nelson, C., & Siza, C. (2021). Trends in Use of Telehealth Among Health Centers During the COVID-19 Pandemic United States, June 26-November 6, 2020. *MMWR. Morbidity and mortality weekly report*, 70(7), 240–244. https://doi.org/10.15585/mmwr.mm7007a3
- 15. Centers for Medicare & Medicaid Services. (2023, May 10). Rural Health Clinics (RHCs) and Federally Qualified Health Centers (FQHCs): CMS flexibilities to fight COVID-19. https://www.cms.gov/files/document/rural-health-clinics-and-federally-qualified-health-centers-cms-flexibilities-fight-covid-19.pdf
- 16. Centers for Medicare & Medicaid Services. (2024, July 31). CY 2025 Payment Policies Under the Physician Fee Schedule and Other Changes to Part B Payment and Coverage Policies. https://www.federalregister.gov/documents/2024/07/31/2024-14828/medicare-and-medicaid-programs-cy-2025-payment-policies-under-the-physician-fee-schedule-and-other.
- 17. Department of Health & Human Services. (2023, December 19). Telehealth policy changes after the COVID-19 public health emergency. Telehealth.HHS.gov. https://telehealth.hhs.gov/providers/telehealth-policy/policy-changes-after-the-covid-19-public-health-emergency#permanent-medicare-changes
- 18. Woodall, T., Ramage, M., LaBruyere, J.T., McLean, W. and Tak, C.R. (2021), Telemedicine Services During COVID-19: Considerations for Medically Underserved Populations. *The Journal of Rural Health*, 37: 231-234. https://doi.org/10.1111/jrh.12466
- 19. Provider Bridge. (n.d.). Provide rBridge. Retrieved [8 April 2024], from https://www.providerbridge.org/



- 20. Interstate Medical Licensure Compact. (n.d.). Interstate Medical Licensure Compact. Retrieved [8 April 2024], from https://www.imlcc.org/
- 21. Beardsley, K., et al. (2003). Distance traveled to outpatient drug treatment and client retention. *J. SUBSTANCE ABUSE TREATMENT*, 25, 279.
- 22. Haffajee, R. L. & Frank, R. G. (2018). Making the Opioid Public Health Emergency Effective. *JAMA PSYCHIATRY*, 78, E1, E2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6378105/
- Jones, C. M., Shoff, C., Hodges, K., et al. (2022). Receipt of Telehealth Services, Receipt and Retention of Medications for Opioid Use Disorder, and Medically Treated Overdose Among Medicare Beneficiaries Before and During the COVID-19 Pandemic. *JAMA Psychiatry*, 79(10):981–992. doi:10.1001/jamapsychiatry.2022.2284
- 24. Center for Connected Health Policy. (2019, February). Telehealth policy barriers. Public Health Institute. https://cdn.cchpca.org/files/2019-02/TELEHEALTH%20POLICY%20BARRIERS%202019%20FINAL.pdf
- 25. Sonneier, S., et al. (2020). The Expansion of Telehealth: Equity Considerations for Policymakers, Providers & Payers. IMPAQ Health/American Institutes for Research. https://www.air.org/resource/brief/expansion-telehealth-equity-considerations-policymakers-providers-and-payers
- 26. Chen, J., Amaize, A., and Barath, D. (2021). Evaluating Telehealth Adoption and Related Barriers Among Hospitals Located in Rural and Urban Areas. *J Rural Health*.
- 27. Imlach, F., et al. (2020). Telehealth consultations in general practice during a pandemic lockdown: survey and interviews on patient experiences and preferences. *BMC Fam Pract*, 21.
- 28. Schadelbauer, R. (2017). Anticipating economic returns of rural telehealth. Retrieved on July 18, 2020 from https://www.ntca.org/sites/default/files/documents/201712/SRC_whitepaper_anticipatingeconomicreturns.pdf