Dr. Palinkas, and so briefly, I'll just share that this seminar is sponsored by the Center for Methods and Implementation and Prevention Science, our qualitative methods innovation program at the Yale School of Public Health, our Department of Social and Behavioral Sciences, and the Yale Child Study Center.

Our qualitative methods innovation program, this is the second seminar that we've had, we're deeply grateful and lucky to have Prof. Palinkas here. As a medical anthropologist myself, Dr. Palinkas' contributions to the field of implementation science have allowed younger scholars like myself and others to robustly integrate ethnographic and other innovative methods to help illuminate and inform healthcare delivery.
Among many innovations, he’s developed and packaged the rapid assessment procedure for clinical ethnography, and he worked to develop and make accessible important approaches to improve the implementation of brief interventions for trauma survivors, for adolescents accessing mental health services and for mental health services that more recently are deployed in acute care settings during COVID. And so his current research encompasses the implementation of child and adolescent mental health services, the sustainment of prevention programs and initiatives and effects of climate change on vulnerable populations. And I’m sure he’ll share with us some of the new ideas and projects that he has on his mind. And we look forward to discussions about that during and after the talk. And so we’re deeply appreciative of him taking the time to come all the way here and spend the day with us. And so, I’ll hand it over to him. The title of his seminar is Innovations and the Use of Mixed Methods and Implementation Research. Well, thank you, Ashley.
In fact, last time I was here was almost 50 years ago, and that was even before there was a Yale School of Public Health. Oh, wow.

So it is exciting to be able to be here and to spend this time with you all.

I was asked to talk about some of the things we've been working on with respect to the use of mixed methods in implementation research. And so what I will focus on is, and just to give you a brief overview about how mixed methods have been used in implementation research, and then highlight three particular projects that I've been working on that illustrate the use of these methods in addressing important issues.

Related to implementation of evidence-based interventions, policies, and programs.

So let me first start by talking about what mixed methods are.

And typically we call them at a particular methodology, even though we have methods implies plural.

But it is a methodology for collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies.

The idea being that when you combine...
the two sets of methods,
you're able to get a much better understanding of a research problem than either research approach alone.
In combining the methods, which is the key element to a mixed method, as opposed to a multi-method study.
It’s not merely parallel play where you have somebody who’s doing the quantitative study and somebody doing the qualitative study with no interaction.
It’s really based on the interaction.
So in a sense, you can think of it as a model of, as well as a model for interdisciplinary and even transdisciplinary research.
It also allows you to simultaneously answer confirmatory and exploratory questions,
thereby you can both generate a theory and verify it in the same studies.
The elements of mixed methods depend on both the structure, the function, and the operation.
So in terms of the structure, how you connect the data in a mixed method study may depend on timing and the weight and authority that you assign to each type of method.
You can collect the data simultaneously so that you’re collecting both quantitative
and qualitative data at the same time. Or sequentially, where you use one method followed by the other. You can also vary the priority that you assign to each method, so that if you’re giving priority the qualitative method, it’s indicated by QUAL being in capital letters. And that similarly, if you’re giving priority to the quantitative methods, the QUAN is in capital letters, or you can give equal priority to both methods, even though there are some people who think that’s not really possible. The other aspect of mixed methods is the iterative process of data collection and analysis, so that you may begin with quantitative methods to collect the data and analyze it leading to the collection or analysis of qualitative data, which leads to further quantitative data collection and analysis. This chart shows you the five major uses of mixed methods in implementation research. Similar to the typology of mixed method designs that Creswell and Plano Clark, who written the bible of mixed method research.
There are five major types of mixed method uses in implementation science.

Convergence, where you are corroborating data from different sources to come to either similar conclusions or the quantization of qualitative data.

Complementarity intends to understand a phenomenon more completely by focusing on the breadth of understanding through quantitative analysis but a depth of understanding through qualitative analysis.

Expansion is often used to help explain the findings from one study. So you may get a finding from a quantitative analysis of a survey that produces unexpected results follow that up with a qualitative study to come to some explanation to answer the question why a quantitative study alone is not designed to answer.

We also use mixed methods for exploration and development.

Oftentimes, we will use qualitative methods to identify the way to ask questions in a survey or to develop hypotheses to be tested.

A framework that guides that hypothesis testing, and then the quantitative methods.
to test the hypothesis or validate the framework.

And then finally, we may use it for sampling, so that oftentimes on the basis of quantitative data,

we may select participants for qualitative study,

either focus groups or semi-structured interviews.

We can also reverse the process and use qualitative data to create categories that can then be compared quantitatively,

which I will show you later.

Each of those functions carries with it a variation of timing of data collection, so it may be sequential or concurrent.

And the analysis can occur both, or the mixing of the data can occur both in data collection.

And they may involve the combination of equal weights of quantitative and qualitative data or priority being given to one or the other.

Now, how to decide which function to use.

I usually recommend that when you’re seeking answers to the same question,

use convergence as a strategy for mixing the methods.
When you’re seeking answers to related questions, you may use it for the purpose of complementarity to gain a comprehensive understanding. When the findings based on one method raises questions that can answer be answered by the other method, the function is expansion. When the findings based on one method are prerequisite for the use of another method, such as developing a survey, then that’s development. And when one method can use to define or identify participant samples for collecting and analyzing data, representing the other method, that is sampling. There are three ways of mixing quantitative and qualitative data. You can merge the data in which you bring the two types of data to develop your results. You can connect the data where you take one data from one method to generate and assist the two methods to develop your results. You can embed the data, as is typically the case in randomized controlled trials where qualitative data may be used to help explain the process.
by which an intervention works or implementation occurs.

And the quantitative data can be used to describe the outcomes.

How is that different than merging?
Pardon?

How is that different than merging?
Okay, a good example of merging the data would be triangulation of quantitative and qualitative data, whereas embedding the data is each dataset has a different function. They’re asking different sets of questions, whereas merging the data is asking the same question.

I understand. Okay.

And in fact, as the next slide shows and answers your question, merging the data when you’re seeking answers to the same question, connecting it when answering questions to relate, you’re answering related questions sequentially or embedding it when you’re answering questions that are related simultaneously. So, you can use mixed methods for a variety of reasons in implementation research.

We often use them, for example,
to measure intervention or implementation outcomes
in the qualitative methods, as I said earlier,
to measure process.
Or we can use the qualitative methods
to explore the steps of the intervention
and generate a conceptual model
along with testable hypotheses,
and then test those hypotheses
with the quantitative methods.
Many times we use the quantitative measures
to examine the content of an intervention
and its implementation and the qualitative methods
to examine the context in which it occurs.
We can use the quantitative methods
to incorporate the perspectives of the researcher
and the qualitative methods to incorporate the perspectives
of our collaborators, usually the consumers
of the interventions that we’re implementing.
And then finally, we often use one set of methods
to address the limitations of the other.
So in implementation research, for example,
when the unit of analysis is a clinic or organization
and issues of power may be compromised
by these limited number of available clinics for analysis,
then validating or confirming the results
from a quantitative analysis using qualitative data is another rule that mixed methods can play. So I’m gonna tell you how these methods were mixed in three particular studies. The first being a study that we did on the development of a measure of sustainment of prevention programs and initiatives, a study that was funded through the National Institute Drug Abuse, where we merged and connected data using a structure beginning with qualitative data collection and an analysis to develop a quantitative scale, testing that quantitative scale, and then evaluating predictors of sustainment using qualitative comparative analysis. The functions being development of a scale or instrument, convergence of qualitative data from different data sets. And expansion, using the qualitative data to explain quantitative findings. The second study is an implementation effectiveness hybrid trial that targeted the use of evidence-based interventions for screening and brief treatment of post-traumatic stress disorder and substance use disorders in patients presenting in trauma centers. There we embedded and merged the data in a randomized,
what was it, pragmatic clinical trial with a focus on quantitative data collection and simultaneously qualitative data collection for complementarity and sampling.

The third, I forgot to put the title in, is a study looking at the impact of the COVID pandemic on policy and practice implementation of mental health services for children and adolescents where we merged the data collecting both quantitative and qualitative data for the purpose of convergence.

From the first study, we were able to, you know, we focused on the fact that government agencies like SAMHSA, Substance Abuse Mental Health Services Agency fund hundreds of projects that are designed to deliver drug and HIV prevention programs as well as mental health services like suicide prevention and treatment of conduct disorders.

But being able to sustain these programs, even though they’re explicitly told to include a plan for sustainment in the project application is always an open question because generally we have no way of determining the likelihood of sustainment or providing feedback and to agencies that are trying to sustain their programs.
So the aim of this project was to look at core components of sustainment and how they relate to one another across times, so that we can increase the likelihood of providing useful information that will result in successful sustainment of these programs.

In this particular project, we designed a measurement system for monitoring and giving feedback within SAMHSA and then pilot testing the predictability of that system and its feasibility and acceptability.

So in this study, we essentially began with a series of qualitative interviews with 45 participants of 10 different SAMHSA funded programs.

And we collected information using traditional semi-structured interviews, a free list exercise, which is often used in anthropology to identify semantic domains that are relevant to the people that we’re working with or studying.

And then a checklist of the consolidated framework of implementation research.

The results from each of those forms of data collection were then merged to identify relevant domains of sustainment for SAMHSA funded grantees.
We use those domains to create a scale known as the sustainment measurement system scale.

had 42 items, one subscale describing sustainment outcomes, and then six scales describing determinants of sustainment.

In the next phase of the study, we then evaluated the validity and reliability of the scale by collecting data from 200 SAMHSA grantees representing 145 different organizations that were funded across seven different SAMSA funded programs.

What we found was a measure that had pretty high inter-item reliability of 0.93, but varying degrees of reliability generally satisfactory for each of the subscales.

We were also able to distinguish the difference between each of the predictors as well as outcomes of sustainability, particularly the outcomes and whether the program continued to exist, but were adapted and continuing to exist in the same form.

And then in the third phase of the study, we used the methodology of qualitative comparative analysis to identify pathways of predictors associated with sustainment.
And we found that as a unit, there were two combinations that were significant predictors. So essentially what you’re doing is taking the quantitative data that we had collected from the 200 participants in the 145 programs, and then use the qualitative structured qualitative process known as QCA to identify community responsiveness and organizational capacity when combined with the CFIR process domain or community responsiveness and organizational capacity when combined with coalitions, networks, partnerships. So the reason why this was of interest to us is because while frameworks like the CFIR can identify domains of factors that are predictive of successful sustainment, they don’t prioritize those domains. And the priority assigned to them may vary from one context to the next. Larry, can I just ask, I mean, wouldn’t you prioritize them based on the strength of their association? Or maybe I’m not fully understanding. Like, so the strength of association alone, you know,
this predicts for your outcome.
But the reality is that they don’t exist independently,
they exist in combinations.
And the QCA is able to mirror that or to take that into account.
Thanks.
Can you talk a little bit more about the process of QCA?
I could.
Essentially, it takes a series of configurations.
So the advantage to QCA is that you can work with limited samples,
as few as eight to 10, for example.
And it can take either quantitative or qualitative data.
The outcome can be either categorical in which it can be one form of QCA,
I’m blanking on the type now.
Or it can be inter an interval level measure,
which it’s a fuzzy-set analysis.
But it essentially identifies necessary and sufficient characteristics or conditions
by which combinations of variables predict the outcome variable.
I could give an entire lecture on QCA, but since we’re getting short on time here,
I thought I’d move on to what I really wanted to spend time on,
which is a technique now,
which is a mixed method approach to collecting information
and analyzing it in a much shorter period of time than typically occurs in most implementation research.

So in the context of the next study I’m going to describe, we developed a process known as a Rapid Assessment Procedure-Informed Clinical Ethnography or RAPICE for short. And RAPICE essentially takes two traditions, often used in anthropology. The RAPICE assessment procedures, which is a way of collecting and analyzing information in a short period of time with clinical ethnography, a traditional approach to understanding clinical issues or issues of clinical significance by having clinicians act as ethnographers or participant observers. This was intended to meet the requirements for time-efficient data collection in pragmatic trials, clinical trials where you want to have minimal participant burden and collect qualitative data fairly quickly. The key to this is that rather than being done by a single individual, it’s done as a team. So the interaction between ethnographically trained clinicians or community members act in the role of participant observers.
And then you have a clinically trained social scientist who acts as a mixed method consultant or analyst. It’s that combination that occurs in a series of steps that is intended to provide some consistency or rigor to the process of data collection and analysis.

So, why do we use RAPICE? If we were to do it the way that ethnographers were traditionally done, it could take up to a year just to become familiar with the setting, learning the language usually done alone and collecting a lot of data, not all of which is particularly relevant to the kind of questions we ask in implementation science. It also provides a balance between the role of the participant and the role of the observer. So oftentimes we find in ethnography, someone playing more of a role of one versus the other and having an imbalance.

And the benefit of ethnographic research, which is to combine perspectives that of the insider or emic perspective and that of the outsider, or etic perspective. In doing so, the advantage to RAPICE is that it empowers study participants this particularly valued for underrepresented groups.
It is now assisting in moving the field of implementation science to addressing health equity in a way that it wasn’t able to before because those who are the survivors of disparities have equal weight, carry equal representation in the process of data collection and analysis. We now have two versions of RAPICE. One for clinical settings and one for community settings. The process of doing it begins with a participant observer or observers who conducted formal interviews, did site visits and clinics or communities, and they may interact with study participants, attend meetings, observe clinical procedures, and collect data through informal and semi-structured interviews for later transcription. They record that data through field notes, through logs of data collection activities, field jottings, and they can digitally record semi-structured interviews for later transcription. This information is then presented to the mixed method consultant who reviews it and queries the participant observers to gain a better insight into the data and its context. It may also enable the consultant.
to ask additional questions that the observer hadn’t thought to ask, for example, and in an iterative fashion, enable further data collection. In the next phase, depending upon the context, what resources you have available to mixing the methods. The qualitative data can be subjected to two phases of analysis. The first being immersion crystallization, where you get a holistic representation of the setting, the activities, the phenomenon of interest, followed by a more focused thematic content analysis and perhaps a template analysis if you’re doing comparisons. The participant observer develops a preliminary interpretation of the meaning and significance of that data organized in terms of a set of apriority themes and a description of their inner relationships. The mixed method consultant does something very similar. And then the two, the participant observers and the consultant identified points of convergence and divergence.
and then go through a process of reaching consensus in much the same way that a team approach to qualitative data analysis occurs. If it’s not achieved, follow up interviews or returns to the field site may be necessitated to collect additional data. If it is achieved, the consultant may recommend identification of disconfirming cases in which additional data collection occurs. In the end, the interpretation of the study findings is presented to the participants to confirm validity and comprehensiveness equivalent to member checking in qualitative data analysis. Analyzing the qualitative data using RAPICE is then integrated with quantitative data to provide a comprehensive understanding of implementation process and outcomes. That way we can use that information as I will explain later, to improve the likelihood of successful outcomes. So in two studies where we applied the RAPICE approach, we used both the clinical ethnography and the community ethnography version. The first study used the clinical ethnography to look at interventions.
targeting post-traumatic stress disorder co-morbidity in trauma care settings.

And this gives you sort of a justification or the rationale for why we did this study because each year between the main and a half million people require inpatient hospitalizations due to injuries, but they also carry with them frequently multiple comorbidities including PTSD, alcohol and drug abuse problems, depression, chronic medical conditions that are endemic to this population. So the aim of this study was to enhance the implementation of evidence-based screening and interventions for PTSD and comorbidity in 25 level 1 trauma centers nationwide. We also wanted to impact clinical effectiveness of patient outcomes while also targeting national trauma center implementation policies recommended by the American College of Surgeons. The focus of this study was on implementation outcomes using the RE-AIM framework. Reach, effectiveness, adoption, implementation and maintenance. And so what we did was collect both qualitative data.
using the RAPICE methodology of having clinicians act as participant observers and work with myself to interpret or analyze the data that they collected, as well as quantitative data through the National Trauma Center Behavioral health surveys to identify or create a matrix of American College of Surgeons policy and its implementation, so that the different reach categories were assessed using both quantitative and qualitative data. At the same time, we were also using the qualitative data that we collected through RAPICE to create categories of implementation quality. So the qualitative data became quantified in the assigned scores based on dimensions of the intervention itself, the leadership engagement, the adherence to regulatory standards. So, we had four categories of implementation quality. Excellent, good, fair and poor. When we combined the good and excellent forms of implementation, what we found is essentially no difference in the scores that were assigned to individuals post-treatment indicating very poor clinical outcomes in conditions.
where the implementation of the guidelines was, actually, it’s the exact opposite, we got great outcomes under good and excellent implementation, very poor outcomes as indicated by the disparity between the two sets of measures under conditions of fair and poor implementation. The finding was that the clinical outcomes associated with implementing these guidelines for screening and treating PTSD and comorbid conditions produced much better outcomes when their implementation quality was good or excellent than when it was fair or poor. So finally the third study is that had to do a, as I said, with the impact of the COVID pandemic on child and adolescent mental health and practice implementation. As you know, mental health issues have become of increasing concern in child and adolescent populations even before the pandemic. When the pandemic occurred, those concerns skyrocketed. The increase was very dramatic, so that there were reports that up to half of the population of children, adolescents living in the United States
594 00:35:53.250 --> 00:35:58.250 were experiencing symptoms of severe depression and anxiety.
595 00:35:59.880 --> 00:36:01.740 Visits to emergency room for mental health crises skyrocketed.
596 00:36:01.740 --> 00:36:05.220 Yet the understanding of how to respond to these issues by mental health service systems was very limited.
597 00:36:12.499 --> 00:36:15.892 So the intention of this study was to look at the impact of the pandemic on implementation of policy and practices at the state level.
598 00:36:15.892 --> 00:36:17.547 to look at the current need and demand for preventing and treating mental health problems in this population,
599 00:36:17.547 --> 00:36:21.090 and then look at the capacity to deliver them.
600 00:36:21.090 --> 00:36:25.680 And how state mental health authorities were addressing these needs and demand with a particular focus on telehealth.
601 00:36:25.680 --> 00:36:28.950 So while the last study relied on the RE-AIM framework to evaluate implementation outcomes,
602 00:36:28.950 --> 00:36:30.630 this study utilized the consolidated framework for implementation research to look at the process of implementing evidence-based policies and practice.
603 00:36:30.630 --> 00:36:34.380 We began with conducting semi-structured interviews with 29 state mental health authorities.
and representatives from 21 randomly selected states,
and then using a subgroup of those as participant observers
in their respective states. So they were not only involved
in collecting data in their states, but also assisting us in the analysis of that state data.
So, this is a community ethnography approach.
We also stratified the data according to two criteria,
level of unmet need for services as described by a study that was done
two years prior to this study and the positivity rate for the coronavirus at the time that we conducted this study,
which was in the fall of 2020.
What we found, and part of this data involved,
looking at features of the qualitative data
and comparing them across the categories of states
based on unmet need for mental health services
as well as coronavirus positivity. And some of it was used to provide in-depth understanding
of the process of implementation.
So what you see here is, even though we had 21 states,
the increase in demand for services was high in all of the states.
that fell in the high positivity, high level of unmet need,
whereas the lowest rate of increase in demand occurred in states with low levels of positivity and low levels of unmet need, which is pretty much what you would expect. In terms of capacity, we found that in states with high positivity and high unmet need, the decrease in capacity occurred much higher in those states than in states with low unmet need. So we found a disparity in the supply and demand for mental health services through this study in that states with high positivity and high unmet need had the highest increase in demand for mental health services, but the lowest capacity for delivering those services. When we look at the barriers and facilitators to implementation using the CFIR domains, we found issues related to telehealth that presented challenges to the state mental health authorities, such as limited access to broadband or internet or the technology needed for telehealth, especially among families because they were unfamiliar with the practice or not comfortable using the technology or preferred face-to-face interactions.
At the same time, facilitators included Medicaid waivers to allow billing for services, provider training for its use, information for families on how to use it and grant funding to provide client access, either through expanding access to the internet or access to the technology. We also found that many providers intended to continue using these telehealth or virtual mental health services because it resulted in fewer appointment cancellations or no-shows, greater family engagement and reduce time traveling to provide services. So I’m just gonna end with a description of some of the new things that we’re doing. One of the potential for using RAPICE and other kinds of mixed methods is not just documenting implementation process and outcomes, but actually facilitating implementation as a strategy, much like any of the other strategies that we employ to ensure successful implementation. So a formative evaluation, you know, judges the worth of a program while the program is in progress, it can be conducted at any phase of a study and it focuses on the process itself, but it can influence the outcomes.
if there’s feedback from the process of conducting the formative evaluation. So its main purpose is to detect deficiencies in implementation as soon as possible, so that adjustments can be made to ensure better outcomes.

And it’s, you know, the kind of preliminary research that you do is also considered formative, but this is something completely different. This is formative evaluation. This diagram gives you an idea of how that would work.

In a randomized controlled trial where you’re evaluating an intervention and its implementation, you can influence and potentially improve the outcomes at the next data collection point, so that the outcomes are optimal, optimally constructed by the time the trial ends. So there are a number of methods...
that are out there for doing this.

It’s semi-structured interviews with participants,

investigators, service providers,

or ethnographic field observation.

But we’re now working on using the RAPICE technique.

We're planning to do that in three major projects

that we’ve got underway now.

The first being implementation projects on prevention,

treatment, harm reduction and recovery of opioid use disorders.

A research center that’s focused on developing

and implementing a multi-level intervention to increase vaccination rates in under-resourced communities

for HPV.

And then the third,

a stepped care approach to delivering mental health services

in the aftermath of climate related natural disasters,

extreme weather events,

focusing on wildfires in California and Australia

typhoons in small island developing states

in the Pacific.

So, that’s pretty much where we are.

I hope it gives you some ideas of the potentials

for not only using quantitative and qualitative methods,

but being a little creative in their use
to address important problems related to implementation for use.

Ah, thank you so much.

So, we'll open it up for questions and Mona hopefully we can hear it or whoever has questions.

There's nobody online.

I have a question. So hopefully everybody online can hear the question.

So, thank you so much.

I really enjoyed hearing about the RAPICE technique.

It's really eyeopening.

It reminds me a little bit of this idea of community based participatory research.

and I wonder to what degree that idea comes in, in other words, the participant observers,

to what degree do they set the purpose for the research question versus just working under the forgetting the name, the mixed methods consultant to kind of carry out the designing of the interview guides or analysis, et cetera.

So the community based version of RAPICE is much more explicit in that it does occur in the clinical ethnography as well.
But in both instances we’ve engaged community members or clinicians in identifying the questions to be asked, the issues to be addressed and participating in the analysis. So they, the term co-creation has become very popular these days. We have in a community setting adopted what’s called the community partner participatory research approach, so that it’s not just based in the community, but that the community members are equal partners. And we’ve used this not just in implementation studies, recently we used it in New Orleans and South Louisiana to look at how community-based organizations in low income neighborhoods like the Lower Ninth Ward were and preparing for hurricane season during the COVID pandemic, how COVID had impacted their ability to prepare for and respond to an increased frequency of more severe hurricanes. That involved having a community advisory board from the community, help us design the interviews, identify people to interview, and then participate in the analysis of the transcripts.
from those interviews.
You know, as I said, one of the things that we see as a real value to RAPICE is that it empowers communities. Rather than simply being passive participants, they’re actively engaged in the process. I’m curious to learn a little more in RAPICE, how are you following the quality of field observations and field notes and, you know, from both ends, from the mixed method consultant and also the participant observers that might be newly trained in ethnography or like conducting interviews and writing field notes.

What is of the process? So the iterative nature of that is that we,

on a regular schedule review field notes and any data that’s collected. I then meet with the participant observers or the consultant meets with the participant observers and queries them and makes recommendations at that point about the kinds of information. I mean, we begin, actually, I should say begin actually by training them on how to do participant observation.
So the who, what, when, where, why observation, how to collect information, how to record it in field notes, what we expect to see in field notes, the different types of observation and reflection. And then we use the information, the analyst uses the information that is provided to them to ask additional questions to get a better understanding of what was observed or what was heard or seen. From the analyst standpoint, the check is, the member checking. So when we come up with a preliminary analysis, we present it to a group of clinicians who participated in this study, or we presented to community members to get their reflections, to get their feedback. So in a member check, what the analyst does is review through a member checking process essentially.

Any questions from the ethernet? (Ashley chuckling) It’s like class, just a lot of black boxes. Okay, well, it’s one o’clock so I’m mindful that folks likely need to head off to their next thing. But please do let us know if you’re not on
any of our email lists or interested in learning more about our qualitative methods innovation program or just more about CMIPS, contact William Tootle.

And yeah, you can join me one more time in thanking Prof. Palinkas for his wonderful talk.

Yeah, so thank you, everyone.

Thank you so much. I have so many questions. (chuckles)

I guess that worked out okay in spite of the technical challenges.

No, I think it was great. Yeah.</v>

I have to say that shared.