Mixed Methods Research Designs: Applications to Public Health

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Overview of Presentation

• Background/rationale for mixed methods designs

• Descriptions of four primary types of mixed methods designs:
  1. Triangulated
  2. Embedded
  3. Explanatory
  4. Exploratory

• Examples of mixed methods studies from three U.S. studies focusing on drug use and public health:
  1. Migratory young injection drug users
  2. Overdose prevention among injection drug users
  3. Medical marijuana use among young adults

• Summary
# Comparing Quantitative vs. Qualitative Methods

<table>
<thead>
<tr>
<th></th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assumptions</strong></td>
<td>• Reality: objective</td>
<td>• Reality: socially constructed</td>
</tr>
<tr>
<td></td>
<td>• Variables: identified and measured</td>
<td>• Variables: complex and difficult to measure</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>• Generalizability</td>
<td>• Contextualizations</td>
</tr>
<tr>
<td></td>
<td>• Prediction</td>
<td>• Interpretation</td>
</tr>
<tr>
<td></td>
<td>• Causal explanations</td>
<td>• Process</td>
</tr>
<tr>
<td><strong>Approach</strong></td>
<td>• Begins with hypothesis and theories</td>
<td>• Ends with hypotheses and theories</td>
</tr>
<tr>
<td></td>
<td>• Manipulation/control</td>
<td>• Emergence/portrayal</td>
</tr>
<tr>
<td></td>
<td>• Experimental</td>
<td>• Naturalistic</td>
</tr>
<tr>
<td></td>
<td>• Deductive</td>
<td>• Inductive</td>
</tr>
<tr>
<td></td>
<td>• Seeks consensus/norm</td>
<td>• Seeks pluralism/complexity</td>
</tr>
<tr>
<td><strong>Researcher Role</strong></td>
<td>• Detachment/impartiality</td>
<td>• Personal involvement/partiality</td>
</tr>
<tr>
<td></td>
<td>• Objective portrayal</td>
<td>• Empathic understanding</td>
</tr>
</tbody>
</table>

What are Mixed Methods?

• As a research design, involves a plan of action that includes mixing qualitative and quantitative approaches in many phases of research.

• As a method, focuses on collecting, analyzing, and mixing qualitative and quantitative data in a single study.

• “Mixing”: connecting two datasets by having one build on the other, or embedding one dataset within the other so that one provides a supportive role for the other; or merging or converging two datasets by bringing them together.

• Central premise: combining qualitative and quantitative data results in better understanding than either approach alone.

• Complexity of current research problems calls for approach beyond qualitative or quantitative. A call for increased sophistication of evidence leads to collection of both qualitative and quantitative data.

Are Mixed Methods a New Approach to Study Design and Analysis?

Formative Period -- 1950s-70s
• Use of multiple quantitative methods
• Discussion of triangulating quantitative and qualitative data

Paradigm Debate Period -- 1980s
• Discussions of problems reconciling quantitative and qualitative assumptions and paradigms

Procedure Development Period -- 1990s
• Identification of types of mixed methods designs
• Develop a typology for types of designs to be used

Advocacy as Separate Design Period -- 2000-present
• Development of comprehensive approach to mixed method design/analysis
• Emergence of dedicated journals, e.g., Journal of Mixed Methods Research
• Government and scientific organizations publish guidelines on mixed methods

Le Suicide (1897) – Durkheim

Qualitative Data – Archival descriptions of suicide

Furthermore, many persons feel that by imitating their parents they yield to the prestige of example. Such was the case of a family observed by Esquirol: “The youngest (brother) of between 26 and 27 years became melancholy and threw himself from the roof of his house; a second who was caring for him reproached himself with the death, made several attempts at suicide, and died a year later from prolonged and repeated self-starvation. . . . A fourth brother, a doctor, killed himself. Two years before, he had told me with terrifying despair that he would not escape his fate.” 22 Moreau cites the following: an insane person whose brother and paternal uncle had committed suicide was influenced by the suicidal tendency. A brother had killed himself. Characteristics are called the suicidal tendency.

Thus, on one hand, the cases most favorable to the heredity of suicide do not suffice to prove its existence, and on the other, they readily admit of a different explanation. But in addition, certain statistical facts, the importance of which psychologists seem to have missed, are inconsistent with the hypothesis of hereditary transmission properly so-called. They are as follows:

Quantitative Data – Suicide Rates at Population Level

<table>
<thead>
<tr>
<th>TABLE IX *—Suicides at Different Ages (per million of each age)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>France</strong> (1835–44)</td>
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<tr>
<td>---------------------</td>
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<tr>
<td></td>
</tr>
<tr>
<td>16 years</td>
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<tr>
<td>16 to 20</td>
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<tr>
<td>20 to 30</td>
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<tr>
<td>30 to 40</td>
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<tr>
<td>40 to 50</td>
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<tr>
<td>50 to 60</td>
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<td>60 to 70</td>
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<tr>
<td>70 to 80</td>
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<tr>
<td>Above</td>
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</table>

* The elements of this table are taken from Morselli.
Mixed Methods Design Types

Triangulation Design

Characteristics

• Most common and well-known mixed methods design

• Quantitative and qualitative data are collected concurrently

• Combines strengths and non-overlapping weaknesses of quantitative (generalizability) and qualitative (contextualization) designs

• Used to expand or validate quantitative data with qualitative data or compare/contrast quantitative findings with qualitative findings

• Goal is to integrate quantitative and qualitative data to answer common set of research questions
Embedded Design

Characteristics:
• One dataset provides a supportive/secondary role to another dataset

• Often used when a researcher needs to embed a qualitative component within a quantitative design, e.g., experimental design

• May address different research questions with each component

• Data may be collected concurrently or in a two-phased approach

• Useful when funds or time are lacking for full-blown treatment of either approach
Explanatory Design

Characteristics:
- Design starts with the collection and analysis of quantitative data to be followed by collection and analysis of qualitative data. Qualitative phase is planned to follow from (or connect to) results from the quantitative phase.
- Qualitative phase helps explain or build upon initial quantitative results, e.g., explain significant (or non-significant) results, outlier results, or surprising results.
- Greater emphasis is typically placed on quantitative phase.
- Two phased design can be time consuming and expensive.
Exploratory Design

Characteristics

- Design starts with qualitative phase, to explore a phenomenon, and then builds to a second, quantitative phase.

- Design is based on the premise that an exploration is needed for one of several reasons: Measures or instruments are not available, the variables are unknown, or there is no guiding framework or theory.

- Since design begins qualitatively, it is best suited for exploring a phenomenon.

- Two phased design can be time consuming and expensive.
Examples of Mixed Methods Designs
Triangulation Design

Interpretation based on QUAN + QUAL results
Triangulation Methods – Example #1

Question
• What are the patterns of overdose response among injection drug users (IDUs) trained in overdose prevention techniques?

Significance
• Overdose is a leading cause of accidental death in the U.S.
• Among persons trained in overdose response techniques, barriers in responding to an overdose (OD) event are unknown

Study
• Study criteria: current injection drug user; 18 years old or older; trained in overdose prevention
• Sample: 30 IDUs were recruited from two syringe exchange programs in Los Angeles in 2009-10.
• Overdose Prevention: training included techniques to stimulate OD victim, rescue breathing, calling 911, and injecting naloxone, an opioid antagonist.
• Data: Quantitative frequencies of responses; qualitative descriptions of OD events

Analysis
• Quantitative data was analyzed using SPSS
• Qualitative data was analyzed using Atlas.ti

## Quantitative Data – Responses to witnessed overdose events

<table>
<thead>
<tr>
<th>Response to witnessed overdose by study participant</th>
<th>Total, n=30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Stimulated victim with knuckles</td>
<td>10</td>
</tr>
<tr>
<td>Called 911</td>
<td>23</td>
</tr>
<tr>
<td>Gave victim rescue breathing</td>
<td>33</td>
</tr>
<tr>
<td>Injected victim with naloxone</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response to witnessed overdose by other bystanders</th>
<th>Total, n=30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Stimulated victim with knuckles</td>
<td>0</td>
</tr>
<tr>
<td>Called 911</td>
<td>20</td>
</tr>
<tr>
<td>Gave victim rescue breathing</td>
<td>7</td>
</tr>
<tr>
<td>Injected victim with naloxone</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response to witnessed overdose (total)</th>
<th>Total, n=30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Stimulated victim with knuckles</td>
<td>10</td>
</tr>
<tr>
<td>Called 911</td>
<td>43</td>
</tr>
<tr>
<td>Gave victim rescue breathing</td>
<td>40</td>
</tr>
<tr>
<td>Injected victim with naloxone</td>
<td>57</td>
</tr>
</tbody>
</table>
Quantitative Data – Rationales for responses to witnessed overdose events

**Calling 911**
“I got ready to call the ambulance, 911. Then, she [wife] told me to just wait a minute...She stopped me from calling them. She didn’t want the police involved...She had just left a program that she was put in and she didn’t want to get locked up.”

“[Calling 911] was more of a concern [for the victim]. I didn’t want his neighbors and everyone to see the paramedics and the police and fire truck, whatever, coming around.”

**Injecting Naloxone**
There’s a trashcan there where everybody shoots up. I had my backpack and I had that baggie, the overdose kit...His [stranger’s] lips were getting purple already so I just remembered what she [trainer] had told me – to pick up the liquid from the vial and put it in him, skin popped it or muscled it...And I gave him breathing.

“The cops had me cuffed and they took it [naloxone]. She [officer] said, “Well, I’m not giving this back.” And she kept it. They said because it was narcotics.”
Triangulation Methods – Example #1 (Summary)

- Quantitative data provided overall picture of frequencies of response behaviors, including a sense of most common (inject naloxone) and least common behavior (stimulate victim with knuckles) among trained IDUs.

- Qualitative data offered explanations for why participants did or did not undertake a particular behavior, e.g., fearing arrest (911), naloxone taken by police, in response to witnessing an overdose.

- Combining quantitative and qualitative data in this manner can provide service providers with information so as to improve overdose prevention trainings, e.g., how to call 911 to avoid police, provide IDUs with naloxone refills.

- Overall, both types of data indicate that overdose prevention programs effectively train IDUs to respond to an OD event and lives are being saved as a result of these programs.
Triangulation Methods – Example #2

Questions
• What are the traveling patterns of homeless young injection drug users (IDUs) in the U.S.?
• How are traveling patterns connected to risk behaviors and service availability?

Significance
• Young IDUs are at increased risk of drug dependence, HIV/HCV, and drug overdose.
• Understanding patterns of mobility may aid in the development of interventions.

Study
• Study criteria: 16 to 25 year olds; IDU; injected ketamine once in past two years; identified as homeless traveler.
• Sample: 56 young IDUs recruited in Los Angeles during 2005 and 2006 who completed a baseline interview and one or more follow-up telephone interviews outside of LA (290 follow-up interviews conducted)
• Data collection (concurrent): quantitative demographic data, qualitative data on traveling patterns and rationale, zip codes at follow-up interview locations (quant).

Analysis
• Zip codes were plotted on map of U.S. using Global Information System (GIS)
• Qualitative data was analyzed using Atlas.ti

Quantitative Data – Plotting of 290 zip code locations

Figure 1: Location of Respondents at Follow-Up Interviews & Common Traveling Routes Across U.S.

- Pacific Ocean
- Atlantic Ocean
- Gulf of Mexico

56 Respondents Traveling During Follow-Up
290 Total Follow-Up Interviews
Qualitative Data

Traveling Routes
“After San Francisco, we went to Phoenix, Arizona and Tempe, and then El Paso, Texas and San Antonio and Austin, and then Tucson, Arizona, and then back to San Francisco. Then, down to Los Angeles overnight, and back to San Francisco, Eugene, Oregon, and now Portland. Originally, we were headed to New York and Philadelphia. So, we were just taking the southern route that way. Then, we decided to come back to Portland to drop off a friend’s truck and hop freight east, but then we got separated, and I’m still here.”

Syringe Availability
“I ask people where the drop-in centers are. I ask people that are walking around where there’s a needle exchange. Sometimes you can go to pharmacies and buy them, but not in a lot of towns. Like, you can in Baltimore, but you can’t do that in New Orleans. Even in Berkeley, I had to ask others for 3 days before I found some. I think I just wasn’t looking hard enough, but there are some areas, like in New York, you’re walking down the street and people are like, “Hey, do you need clean needles?” And you’re like, “Ok.”
Triangulation Methods – Example #2 (Summary)

• Mapping of zip code data (quantitative) revealed general traveling routes among this sample of young IDUs, i.e., West coast, South, Midwest, East Coast.

• Qualitative data revealed specific traveling routes of individuals, e.g., Los Angeles, San Francisco, Eugene, Portland.

• Furthermore, qualitative data contextualized challenges traveler IDUs face when accessing clean syringes and other services.

• Triangulated mixed methods design provided broader picture of traveling routes (quantitative) and specific behaviors of individuals (qualitative).

• Collectively, two types of data addressed research questions more comprehensively than either form alone.
Exploratory Design

QUAL \rightarrow \text{quan} \rightarrow \text{Interpretation based on QUAL quan results}
Exploratory Design/Methods – Example #3

Question
• What are the reasons for medical marijuana (MM) use among young adults in Los Angeles?
• Is there a relationship between MM use and health outcomes, such as psychological and physical health and patterns of drug use.

Significance
• Marijuana, a schedule I drug in the U.S., has been regarded as a potential gateway to harder drugs, such as heroin or cocaine.
• Public health outcomes and public policy implications of recommending MM to young adults are unknown.

Data: 16 to 25 year olds; high risk young adults; recent misuse of prescription drugs
• Qualitative Sample: (n=7) reported MM recommended by Dr.; 1st phase
• Qualitative Data: Descriptions of experiences of medical marijuana use
• Quantitative Sample: (n=56) reported MM rec by Dr.; 2nd phase
• Quantitative Data: Drug history; responses to standardized instruments

Analysis
• Quantitative data was analyzed using SPSS
• Qualitative data was analyzed using Atlas.ti
Qualitative Data – Different Uses for Medical Marijuana

Anxiety
“I used to be on Trazodone, Seroquel, and Klonopin. I was diagnosed with bipolar, ADHD, ADD and really bad anxiety. That’s the reason I got a weed card - because it helps me with my anxiety. Like the pills didn’t help. “

Insomnia
“Like there is like a bunch of pills that you could get prescribed. I figured weed was the best bet, and I haven’t had a problem sleeping this year. Its not an excuse to get high. I smoke a good size bowl about an hour before bed and then the appetite gets induced. And then I eat and sleeping is no trouble - especially if it’s good weed.”

Migraines/Pain
“I haven’t had a migraine since the day I started smoking pot. Even my muscle spasms, sometimes too. When I smoke, my muscle spasms go away for a few hours too and those can get pretty painful.”

“Stepping off” hard drugs
“My body is badly damaged by all these drugs [heroin, cocaine, crack] - very severely damaged internally. Marijuana does more for me now than it ever did, than any of these drugs. I can actually quit doing any of these drugs all together and just smoke pot and feel fucked out of my mind.”
Quantitative Data – Comparing Medical Marijuana Patients and Non-Medical Users

### Current Psychological/Physical Symptoms and Coping

<table>
<thead>
<tr>
<th>Standardized Assessment</th>
<th>MMP (n=56)</th>
<th>NMU (n=245)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPE**</td>
<td>3.47</td>
<td>3.08</td>
</tr>
<tr>
<td>ASRS (ADHD)**</td>
<td>2.97</td>
<td>3.17</td>
</tr>
<tr>
<td>BSI (Anxiety)*</td>
<td>5.49</td>
<td>6.98</td>
</tr>
<tr>
<td>BSI (Depression)</td>
<td>5.39</td>
<td>6.11</td>
</tr>
<tr>
<td>Recent Pain</td>
<td>34%</td>
<td>40%</td>
</tr>
</tbody>
</table>

* p<.10  ** p<.05  ***p<.001

### Lifetime Misuse of Drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>MMP (n=56)</th>
<th>NMU (n=245)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecstasy**</td>
<td>75.0%</td>
<td>87.3%</td>
</tr>
<tr>
<td>Cocaine**</td>
<td>67.9%</td>
<td>83.7%</td>
</tr>
<tr>
<td>Xanax</td>
<td>67.9%</td>
<td>74.7%</td>
</tr>
<tr>
<td>OxyContin</td>
<td>60.7%</td>
<td>65.3%</td>
</tr>
<tr>
<td>Meth**</td>
<td>48.2%</td>
<td>64.5%</td>
</tr>
<tr>
<td>Heroin</td>
<td>37.1%</td>
<td>48.2%</td>
</tr>
</tbody>
</table>

** p<.05
Exploratory Design – Example #3 (Summary)

• Findings on medical marijuana were collected during a study focused on prescription drug misuse among young adults in Los Angeles.

• Qualitative data collected during first exploratory phase of study revealed a range of legitimate medical uses for medical marijuana among young adults.

• Quantitative data collected during second phase of study suggested confirmation of several qualitative findings, such as reduced anxiety and less use of some hard drugs among young adults.

• Exploratory qualitative phase identified an emerging issue in sample – medical marijuana use among young adults – that could be examined quantitatively in second phase.

• Results from quantitative phase suggest that medical marijuana use among young adults may have beneficial health effects.

• Collectively, the results from this exploratory design mixed methods study suggest the need for new study focused exclusively on medical marijuana use among young adults in Los Angeles.
Aim 1: Determine the basis for medical marijuana patient (MMP) status and its impact on trajectories of physical and psychological health among emerging adults.

Aim 2: Determine the impact of MMP status on patterns of drug use among emerging adults, including intensity of marijuana use and misuse of alcohol, prescription drug, and illicit drug.

Aim 3: Describe the natural history of marijuana use in Los Angeles among MMP and non-medical users (NMU).
Summary –
Mixed Methods Approaches to Public Health

• Qualitative data (narrative) can be combined with a variety of quantitative data, such as frequency tables, GIS, and bivariate associations, to address research questions.

• More sophisticated quantitative methods, e.g., logistical regression, latent class analysis, etc., can be built into mixed methods designs too.

• Presentation highlights the distinction between design and methods: all three analyses emerged after qualitative and quantitative data were collected and were not part of original study design.

• Mixed method studies can be expensive to conduct, i.e., time and labor intensive.

• Triangulated designs are often the most time and cost efficient.
Summary – Value of Mixed Methods Research

• Quantitative data is weak in providing context or presenting voices of participants. Qualitative data is deficient in providing generalizable findings. Mixed methods can overcome these weaknesses.

• Provides more comprehensive evidence by offering researcher all available data collection and analytical tools.

• Helps to address questions either qualitative or quantitative could not answer alone.

• Encourages researchers to collaborate across disciplinary divides.

• Encourages use of multiple worldviews or paradigms rather than single paradigm.

• Practical since enables researcher to solve problems with both numbers and text.
Merci!