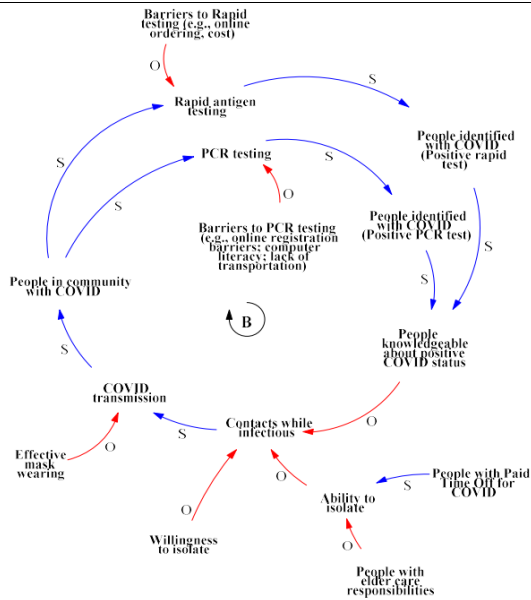


This document walks through feedback loops and dynamics described by the Building Community Capacity Workgroup within RADx-UP between January and August 2022 believed to be most important in shaping COVID testing in US communities. The group focused on the critical role and determinants of missing/misinformation and willingness to test.

Visualization of Loop and Related Structure	Explanation of Loop	Explanation of additional structure	Resources / Quotes
<p>Here, the segment of the larger causal loop diagram being described in the row is presented.</p>	<p>This section explains the loop structure in lay terms.</p>	<p>Any additional information in the diagram outside of the focal feedback loop is described here.</p>	<p>Quotes can bring the loop to life – they represent how stakeholders talked about this loop structure in their community. Resources can help you plan action.</p>
<p>Example Feedback Loops</p>			
<p style="text-align: center;">EXAMPLE NOT RELATED TO COVID</p>	<p>An increase in hens and roosters triggers an increase in the number of eggs laid. Some of these eggs hatch, increasing the number of hens and roosters. This loop describes the population growth of hens/roosters.</p> <p>Working the other way, the increasing number of chickens attracts predators, which then will prey on them and limit population growth until the flock is no longer desirable (allowing the population to recover).</p>	<p>A feedback loop is created when a chain of causal linkages circles around to affect a variable earlier in the loop -- over time -- closing the loop.</p> <p>A reinforcing loop (indicated with an "R" in the middle of the loop) illustrates a feedback loop where changes are reinforced over time, leading to exponential increased or decreases in connected variables.</p> <p>A balancing loop (indicated with a "B" in the middle of the loop) illustrates a feedback loop where changes are counteracted or balanced over time.</p> <p>An "S" on the arrow (along with blue color) indicates that the two connected variables move in the same direction (i.e., if the first variable increases in size/quantity/etc., the second variable also increases. And, if the first variable decreases, the connected variable decreases).</p> <p>An "O" on the arrow (along with red color) indicates that the two variables move in opposite directions (i.e., if the first variable increases in size/quantity/etc., the connected variable decreases; if the first variable decreases, then the connected variable increases).</p>	<p>Drawing Causal Loop Diagrams: https://thesystemsthinker.com/pocket-guide-guidelines-for-drawing-causal-loop-diagrams/</p>
<p>Feedback loop(s) A – Balancing – “Testing to control transmission”</p>			



These loops describe a **FIX** dynamic.

Explanation of Loops:

Done to control transmission, as testing increases identified cases of COVID-19 increase, which can lead to a decrease in contacts while infectious as people are aware of their status. This change is undertaken to decrease COVID-19 transmission and decrease the number of people with COVID-19 in the community. The decrease in COVID cases leads to a decrease in testing and restricted contacts, until COVID cases rise again.

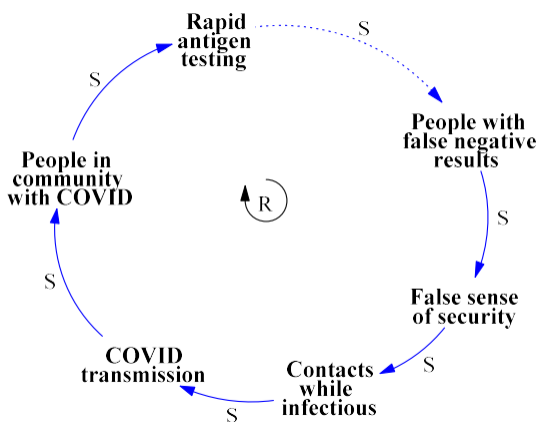
Explanation of additional structure

It is difficult to make behavioral changes for COVID-19 when individuals are unaware of their COVID-19 status. The RADx-UP grant was established on the basic principle of this loop; that an increase in COVID-19 testing could lead to a decrease in COVID-19 transmission. It is worth noting that barriers to testing, and ability and willingness to isolate while infectious impact this loop and may impact the ability to decrease COVID-19 transmissions. Effective mask wearing can synergistically decrease COVID transmission.

Resources / Quotes

"RADxUP Underserved Populations (RADx-UP) was created by the National Institutes of Health to ensure that all Americans have access to COVID-19 testing, with a focus on communities most affected by the pandemic." Source: <https://radx-up.org/>

Feedback loop B – Reinforcing – “Unintended Consequence of increased rapid antigen testing”



This loop describes a **PROBLEMATIC** dynamic.

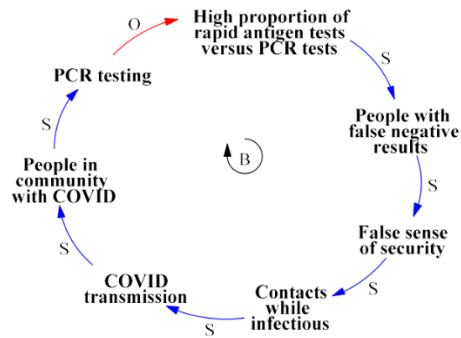
Explanation of Loop

Rapid antigen tests have a relatively high risk of returning false negative results. When someone who has a COVID-19 infection takes a test that gives them a “false negative” (or negative test reading even though the person has COVID), they may increase normal behaviors with a false sense of security, such as continuing to make contacts with others, increasing COVID infection in the community.

Explanation of additional structure

This loop shows one of the drawbacks of increased rapid antigen testing—this loop is not suggesting that rapid antigen testing should completely cease, just acknowledging this downside to its use, which needs to be understood and accommodated in COVID prevention efforts. The dotted line in this diagram indicates that other variables are in between the two variables, but we are summarizing this linkage to focus on the key variables in this loop.

Feedback loop C – Balancing – “PCR test results are generally accurate”

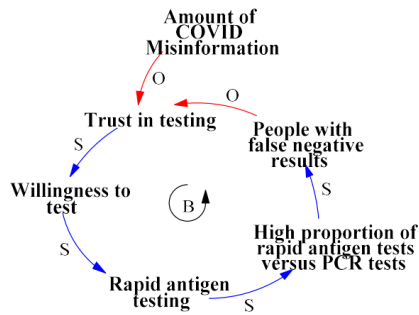


This loop describes a **FIX** dynamic.

Explanation of Loop

PCR tests generally give more accurate results with less likelihood of false negative results. As greater proportion of PCR tests are performed, there will be less people with COVID infection who falsely tested negative (i.e., with false negative result) and will contact others while infectious. Less contacts while infectious will decrease COVID infection in the community.

Feedback loop D – Balancing – “Misunderstanding role of rapid antigen tests”



This loop describes a **PROBLEMATIC** dynamic.

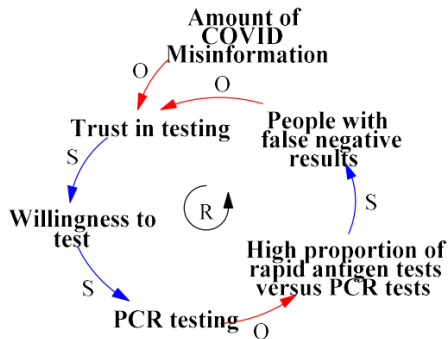
Explanation of Loop

Rapid antigen tests have a non-trivial risk of false negative test results. When people experience or hear about false negative results without having accurate information about rapid antigen covid tests, it can decrease their trust in testing – ultimately decreasing their willingness to test (at least with rapid antigen tests).

Explanation of additional structure

Accurate information about COVID (and specifically about the role and strengths/weaknesses of rapid antigen tests) can reduce the extent to which false negatives reduce trust in testing (and misinformation, conversely, can exacerbate its likelihood).

Feedback loop E – Reinforcing – “Benefits of PCR over rapid antigen tests”



This loop describes a **FIX** dynamic.

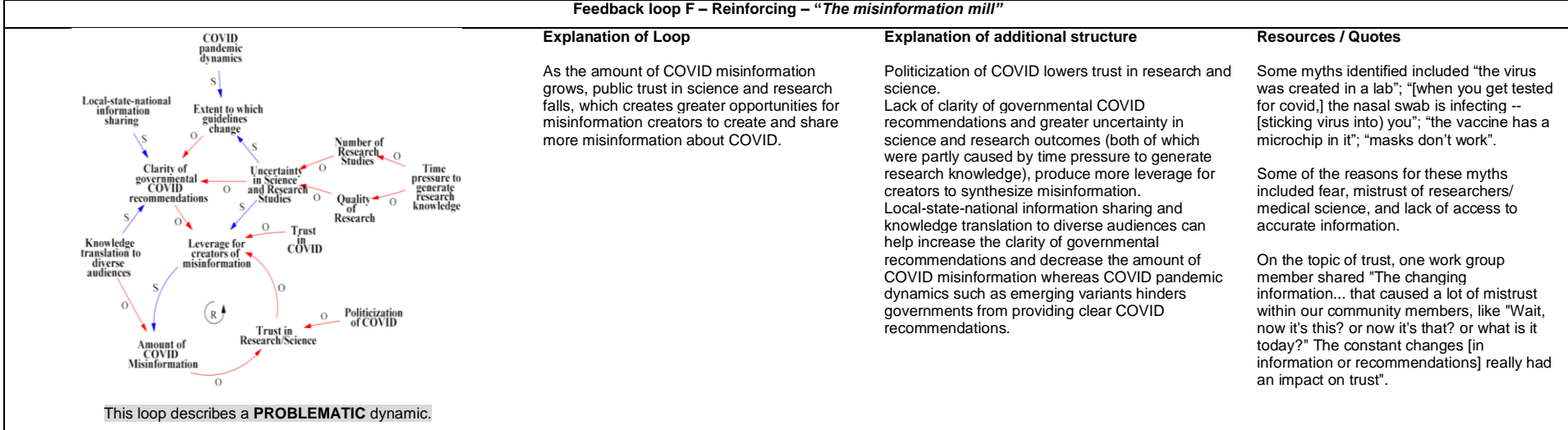
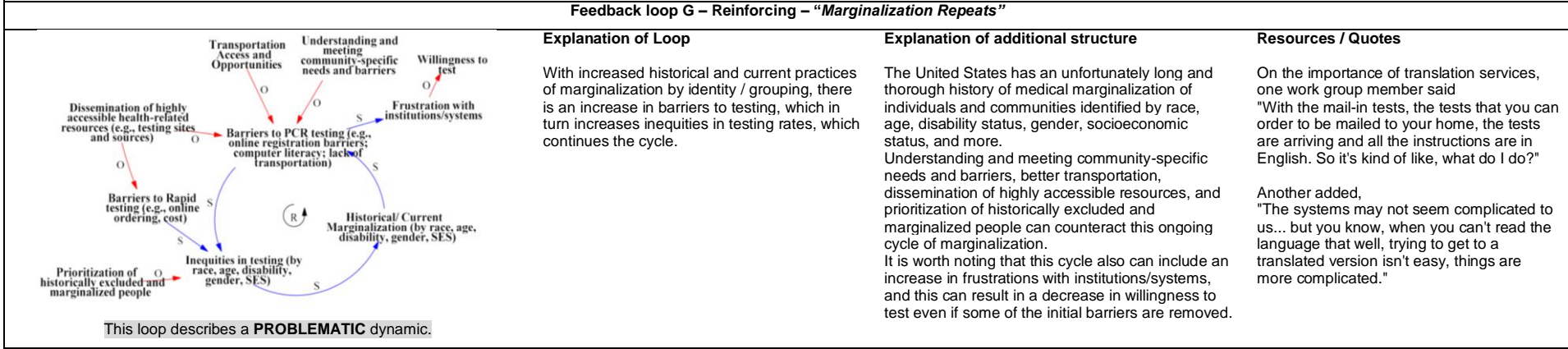
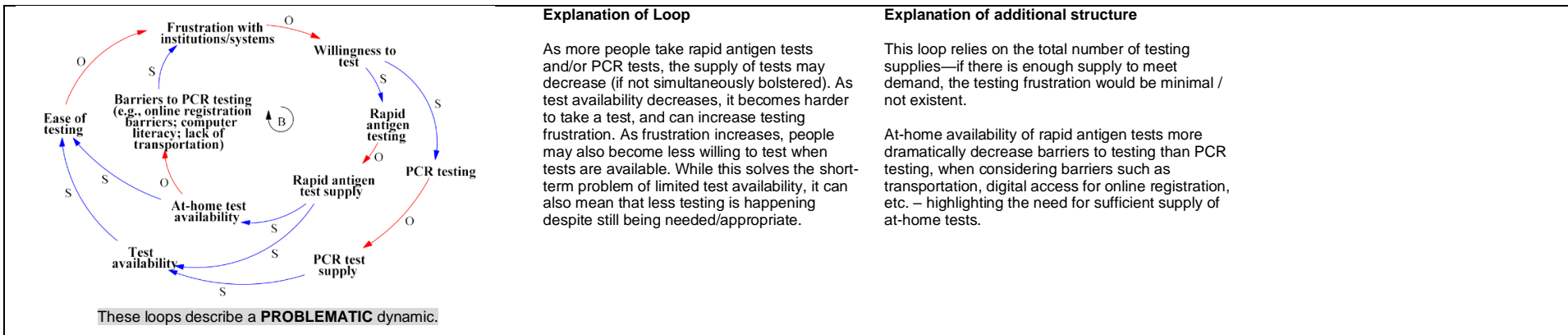
Explanation of Loop

When a larger proportion of COVID tests are PCR, fewer false negatives occur and trust in testing grows – triggering an increase in willingness to test.

Explanation of additional structure

Covid misinformation can still lead to a decline in public trust in testing.

Feedback loop(s) I – Balancing – “Supply and Demand”

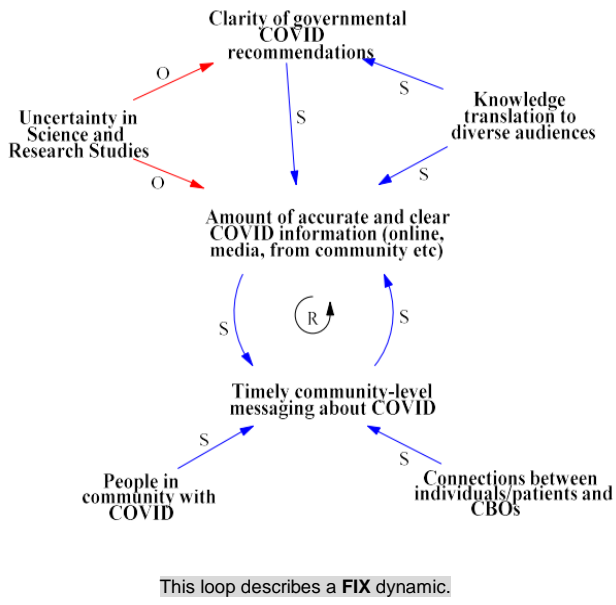


Feedback loop H – Reinforcing – “Timely messaging”

Explanation of Loop

Explanation of additional structure

Resources / Quotes

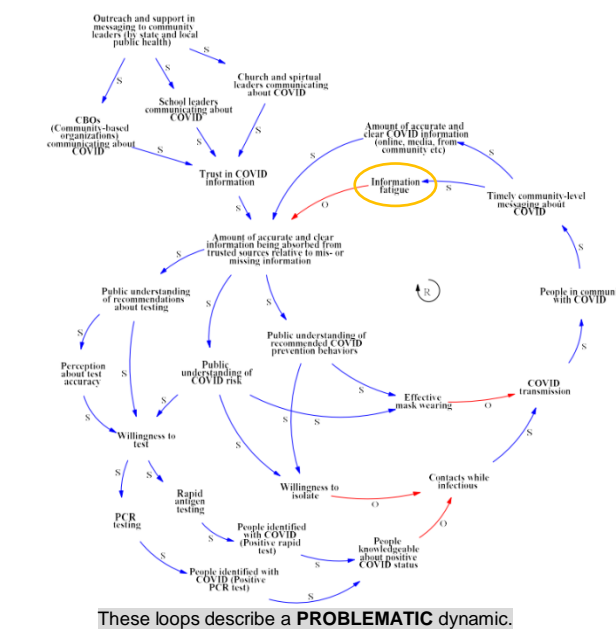


Timely community-level messaging increases the amount of accurate and clear COVID information, in media or community, which further enhances timely messaging and flow of clear and accurate information in community.

Uncertainty in science and research studies negatively affects this loop between the amount of accurate and clear COVID information and timely messaging, whereas knowledge translation to diverse audiences, more people in the community with COVID, and strengthening the connections between individuals and CBOs can facilitate/strengthen their relationship.

One work group member shared the importance of community health workers in sharing pertinent COVID information, "...We had our our community health workers, call every client that we had. And that's what they did. To say, "Hey, are you okay? What needs do you have? Do you have any questions? And they were on the phone calling everyone, and [clients] were like "Thank you! Thanks for reaching out." And they'd have questions about testing or things like that, and the [community health worker] would try to give them answers we knew, because we were passing that information to the [community health worker]...and all that information flowed from the CDC, to our [community health workers], to the community, and then the resources that became available went right to the community because we knew what was available, when it was available, how to access it."

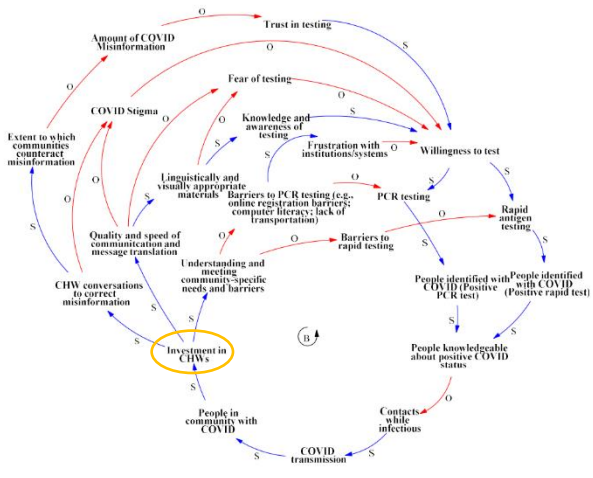
Feedback loop(s) K – Reinforcing – “Dangers of information fatigue”



Explanation of Loop
 More timely community-level messaging about COVID increases the amount of [both accurate and inaccurate] COVID information, leading to information fatigue. With more information fatigue, there is less accurate information being absorbed by individuals. This results in limited public understanding of COVID risk, recommendations about testing, and recommended COVID prevention behaviors, which would lower willingness to test, the number testing, mask wearing, and isolating practices. Reduced testing, mask wearing, and isolating would increase covid transmission (all else equal) and the number of people with COVID in community, triggering local trends and spurred messaging about COVID in community.

Explanation of additional structure
 Increasing public trust in COVID information can increase the amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information. This can be facilitated by increasing public health outreach and support in messaging to community leaders.
 We should be mindful that some community-level messaging come from well-intentioned efforts but we need to understand that the abundance of news and emerging information can overwhelm individuals. We need to better strategize on how to deal with individuals already overwhelmed by information overload and manage the delivery of information well in non-overwhelming ways. Some strategies could be providing more personal conversations and outreach through CHWs than local media outreach.
 The yellow circle indicates a place to focus on when looking at the loops explained in this structure.

Feedback loop(s) J -- Balancing – “How CHWs improve COVID, but also how their success degrades investment”



Explanation of Loop

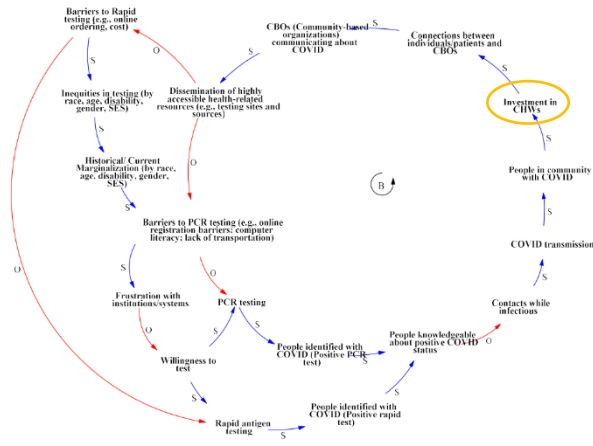
As community COVID transmission began to increase, so did the funding for COVID-19 mitigation strategies. Community health worker models can help mitigate misinformation, public fear, COVID stigma, mistrust, and frustration with health institutions/systems while meeting community-specific needs and barriers partly through connecting individuals with community-based organizations which can enhance their communication about COVID and dissemination of highly accessible health-related resources. During times in which COVID-19 may appear to be under control, funding for programs, like those who use community health worker models, may decrease. Decrease in funding decreases the successes that have kept COVID-19 transmissions low (such as creating linguistically and appropriate outreach materials, decreasing stigma, etc)

Explanation of additional structure

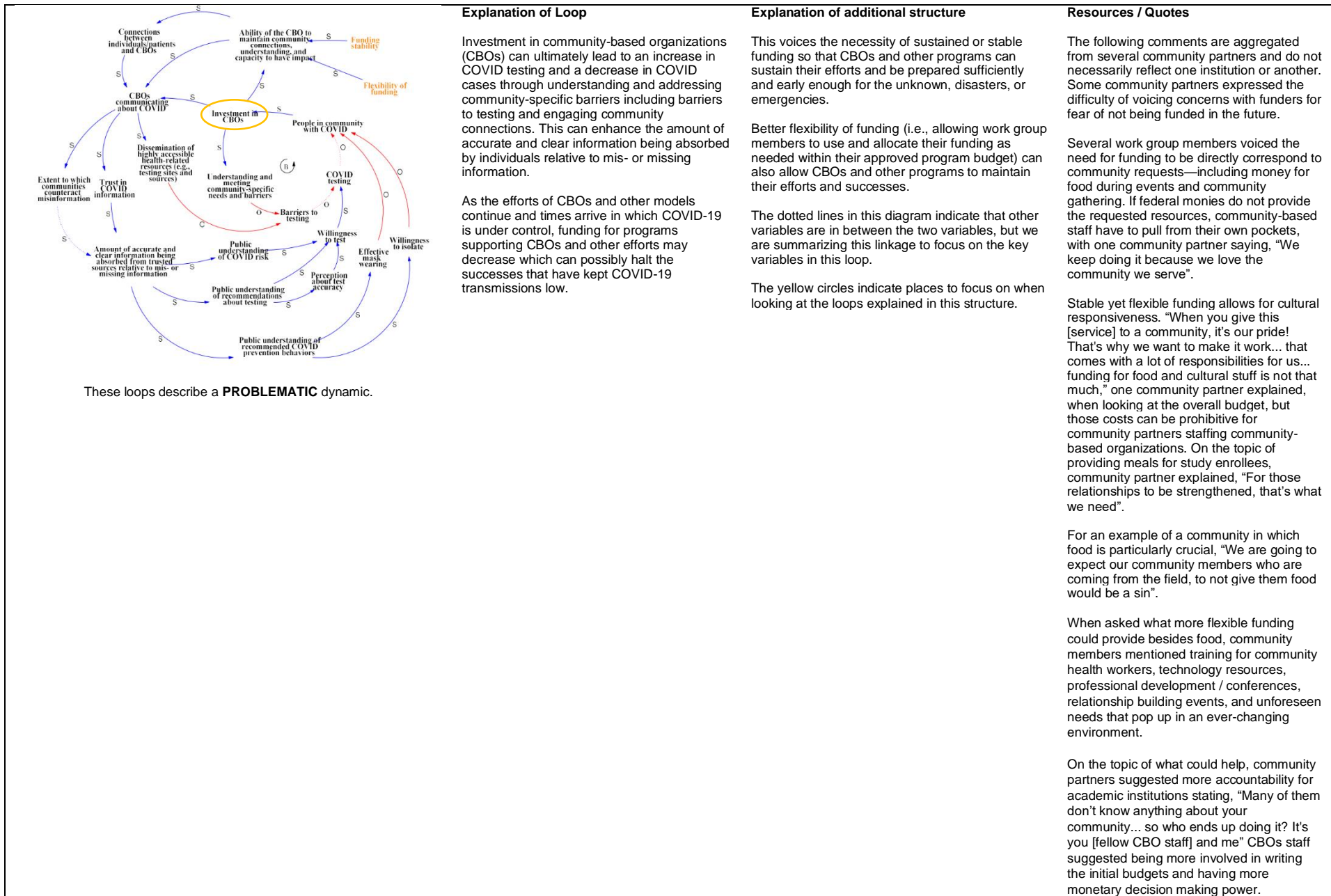
This loop shows the significance of what many community-based organizations have been explaining to funders: maintaining funding outside of an emergency can sustain or maintain healthy communities. The yellow circles indicate places to focus on when looking at the loops explained in this structure.

Resources / Quotes

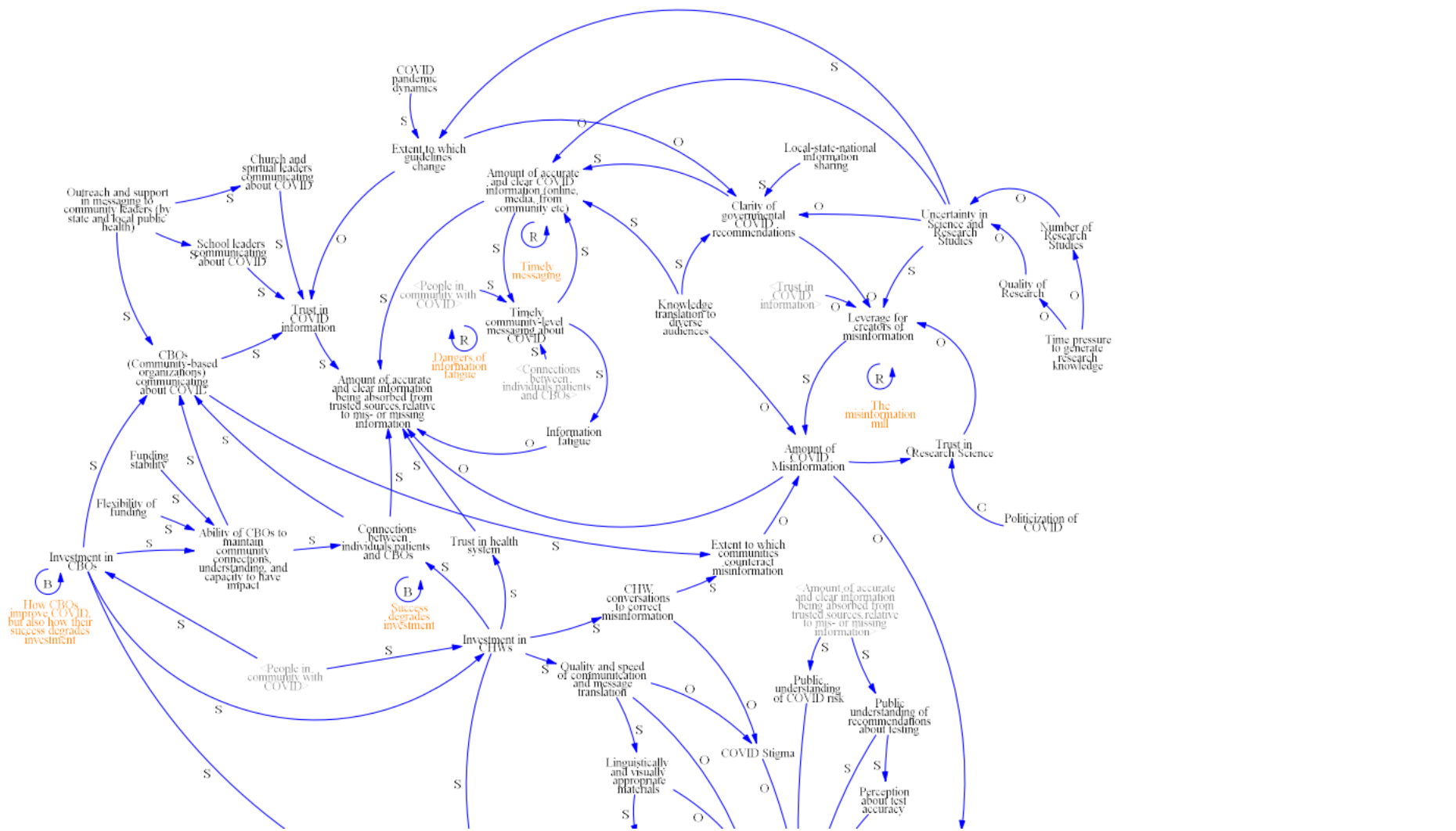
Several work group members have discussed that community health workers are not compensated enough even in times of emergency, and that continued funding and increased funding would support healthier communities.



These loops describe a **PROBLEMATIC** dynamic.



The image below is the entire causal loop diagram, including the loops from the table above and with additional elements. This image helps us see how the loops are all interconnected.



COVID pandemic dynamics

Trust in COVID information

- Outreach and support in messaging to community leaders (by state and local public health) → S → Church and spiritual leaders communicating about COVID
- Church and spiritual leaders communicating about COVID → S → Trust in COVID information
- School leaders communicating about COVID → S → Trust in COVID information
- Trust in COVID information → S → CBOs (Community-based organizations) communicating about COVID
- CBOs (Community-based organizations) communicating about COVID → S → Trust in COVID information
- Trust in COVID information → S → Amount of accurate and clear COVID information (online, media, from community etc.)
- Trust in COVID information → S → Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information
- Trust in COVID information → S → Connections between individuals, patients and CBOs
- Trust in COVID information → S → Trust in health system
- Trust in COVID information → S → Extent to which communities contract misinformation
- Trust in COVID information → S → Extent to which communities communicate misinformation
- Trust in COVID information → S → Public understanding of COVID risk
- Trust in COVID information → S → Public understanding of recommendations about testing
- Trust in COVID information → S → Perception about test accuracy

Investment in CBOs

- Investment in CBOs → S → Funding stability
- Investment in CBOs → S → Flexibility of funding
- Investment in CBOs → S → Ability of CBOs to maintain community connections, understanding, and capacity to have impact
- Investment in CBOs → S → Connections between individuals, patients and CBOs
- Investment in CBOs → S → Trust in health system
- Investment in CBOs → S → Extent to which communities contract misinformation
- Investment in CBOs → S → Extent to which communities communicate misinformation
- Investment in CBOs → S → Public understanding of COVID risk
- Investment in CBOs → S → Public understanding of recommendations about testing
- Investment in CBOs → S → Perception about test accuracy

Investment in CHWs

- Investment in CHWs → S → CHW conversations to correct misinformation
- Investment in CHWs → S → Quality and speed of communication and message translation
- Investment in CHWs → S → Linguistically and visually appropriate materials
- Investment in CHWs → S → COVID Stigma
- Investment in CHWs → S → Public understanding of COVID risk
- Investment in CHWs → S → Public understanding of recommendations about testing
- Investment in CHWs → S → Perception about test accuracy

Amount of Misinformation

- Amount of Misinformation → S → Trust in COVID information
- Amount of Misinformation → S → Trust in Research Science
- Amount of Misinformation → S → Extent to which communities contract misinformation
- Amount of Misinformation → S → Extent to which communities communicate misinformation
- Amount of Misinformation → S → Public understanding of COVID risk
- Amount of Misinformation → S → Public understanding of recommendations about testing
- Amount of Misinformation → S → Perception about test accuracy

Trust in Research Science

- Trust in Research Science → S → Uncertainty in Science and Research Studies
- Trust in Research Science → S → Leverage for creators of misinformation
- Trust in Research Science → S → Politicization of COVID

Amount of accurate and clear COVID information (online, media, from community etc.)

- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Clarity of governmental COVID recommendations
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Knowledge translation to diverse audiences
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Local-state-national information sharing
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Uncertainty in Science and Research Studies
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Leverage for creators of misinformation
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Public understanding of COVID risk
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Public understanding of recommendations about testing
- Amount of accurate and clear COVID information (online, media, from community etc.) → S → Perception about test accuracy

Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information

- Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information → S → Information fatigue
- Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information → S → Connections between individuals, patients and CBOs
- Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information → S → Trust in health system
- Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information → S → Extent to which communities contract misinformation
- Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information → S → Extent to which communities communicate misinformation
- Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information → S → Public understanding of COVID risk
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- Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information → S → Perception about test accuracy

Public understanding of COVID risk

- Public understanding of COVID risk → S → Uncertainty in Science and Research Studies
- Public understanding of COVID risk → S → Leverage for creators of misinformation
- Public understanding of COVID risk → S → Amount of Misinformation
- Public understanding of COVID risk → S → Extent to which communities contract misinformation
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- Public understanding of COVID risk → S → Perception about test accuracy

Public understanding of recommendations about testing

- Public understanding of recommendations about testing → S → Perception about test accuracy

Perception about test accuracy

- Perception about test accuracy → S → Amount of Misinformation
- Perception about test accuracy → S → Trust in Research Science

Other nodes and relationships:

- COVID pandemic dynamics → S → Extent to which guidelines change
- Extent to which guidelines change → S → Amount of accurate and clear COVID information (online, media, from community etc.)
- Extent to which guidelines change → S → Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information
- Extent to which guidelines change → S → Trust in health system
- Extent to which guidelines change → S → Extent to which communities contract misinformation
- Extent to which guidelines change → S → Extent to which communities communicate misinformation
- Extent to which guidelines change → S → Public understanding of COVID risk
- Extent to which guidelines change → S → Public understanding of recommendations about testing
- Extent to which guidelines change → S → Perception about test accuracy
- Local-state-national information sharing → S → Clarity of governmental COVID recommendations
- Clarity of governmental COVID recommendations → S → Knowledge translation to diverse audiences
- Clarity of governmental COVID recommendations → S → Amount of Misinformation
- Clarity of governmental COVID recommendations → S → Trust in Research Science
- Clarity of governmental COVID recommendations → S → Extent to which communities contract misinformation
- Clarity of governmental COVID recommendations → S → Extent to which communities communicate misinformation
- Clarity of governmental COVID recommendations → S → Public understanding of COVID risk
- Clarity of governmental COVID recommendations → S → Public understanding of recommendations about testing
- Clarity of governmental COVID recommendations → S → Perception about test accuracy
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- Leverage for creators of misinformation → S → Trust in Research Science
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- Leverage for creators of misinformation → S → Public understanding of recommendations about testing
- Leverage for creators of misinformation → S → Perception about test accuracy
- Information fatigue → S → Amount of accurate and clear information being absorbed from trusted sources relative to mis- or missing information
- Information fatigue → S → Trust in health system
- Information fatigue → S → Extent to which communities contract misinformation
- Information fatigue → S → Extent to which communities communicate misinformation
- Information fatigue → S → Public understanding of COVID risk
- Information fatigue → S → Public understanding of recommendations about testing
- Information fatigue → S → Perception about test accuracy
- Connections between individuals, patients and CBOs → S → Trust in health system
- Connections between individuals, patients and CBOs → S → Extent to which communities contract misinformation
- Connections between individuals, patients and CBOs → S → Extent to which communities communicate misinformation
- Connections between individuals, patients and CBOs → S → Public understanding of COVID risk
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- Public understanding of recommendations about testing → S → Perception about test accuracy
- Perception about test accuracy → S → Amount of Misinformation
- Perception about test accuracy → S → Trust in Research Science
- Amount of Misinformation → S → Trust in Research Science
- Trust in Research Science → S → Politicization of COVID
- Amount of Misinformation → S → Extent to which communities contract misinformation
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