Broadening Boundary Perception in a Multi-organizational Context: Study of a Community Mental Health Program in New York State

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Abstract

This paper reports how systems perspective and simulation modeling method can help healthcare administrators and practitioners broaden their boundary perception and create shared understanding of their system. The case used in this study involves a community mental health care program in New York State where systems thinking and system dynamics are used to uncover misalignment in the system boundary perceived by the different levels of health care administrators. The difference in the perceived system boundary can have a critical impact on the success of a healthcare program if the perception drives planning and assessment of the program implementation. More specifically, this study looks at how the perceived system boundary influences assessment of workload and capacity issues in the program. The study finds that without a systems perspective, unintended consequences of disparate boundary perception can persist without being recognized at the state level, as the local efforts are arranged to alleviate unwanted pressures in the system.

Key Words

Health policy, system boundary, mental model, systems thinking

Introduction

System dynamics has been applied to a variety of health care issues (Homer and Hirsch 2006). Examples include epidemics of different diseases (Dangerfield et al. 2001), planning and administration of health care delivery (Levin et al. 1976; Lane et al. 2000), long-term and short-term outcomes of health care interventions (Jones et al. 2006), and resource allocation between upstream and downstream service delivery (Eric 1999). These model-based studies identify leverage points for health care interventions that can result in optimal outcomes and minimize unintended consequences. In this study, we focus on the issues of program implementation in a multi-organizational health care context.

The case used in this study involves a community mental health program in New York State where system dynamics uncovered a misalignment in the system boundary perceived by health care administrators at different administrative levels. This difference in perceived system boundary can have a critical impact on the success of a health care program (Senge and Asay 1988) if the perception drives planning and assessment of the program implementation. This study finds that without a systems perspective, unintended consequences of disparate boundary perception can persist without being recognized at the state level, as the local efforts are arranged to alleviate the unwanted pressures in the system.

The modeling project was initiated with a broad objective of assessing the current status of a mental health program implementing "Kendra's Law" enacted in 1999. The program involves a provision of mandated community treatment for those with mental illness who require supervision in order to live safely in the community.[1] The New York State Office of Mental Health (NYS OMH) holds the main oversight responsibility for program implementation on the county level. The effort involves extensive cooperation with other government branches, local level government agencies, and health care providers. In order to meet the law requirements as well as for its own planning and evaluating purposes, OMH has been collecting extensive data and has carried out various assessment and evaluation studies using traditional quantitative and qualitative methods (NYSOMH 2005). In 2006, a system dynamics study was initiated to provide an additional dimension to the current understanding of the program implementation and performance.

This paper reports how systems perspective and simulation modeling method helped the health care administrators and practitioners broaden their boundary perception and create a shared understanding of their system.

Assisted Outpatient Treatment in New York State

"Kendra's Law" is named after a young woman, Kendra Webdale, who was killed in January 1999 by a mentally ill person who pushed her in front of a New York City subway train. The incident raised a strong public concern towards the mentally ill population living in the community without receiving appropriate treatment for the illness, and led to the state law allowing for involuntary outpatient commitment. The initiative is called Assisted Outpatient

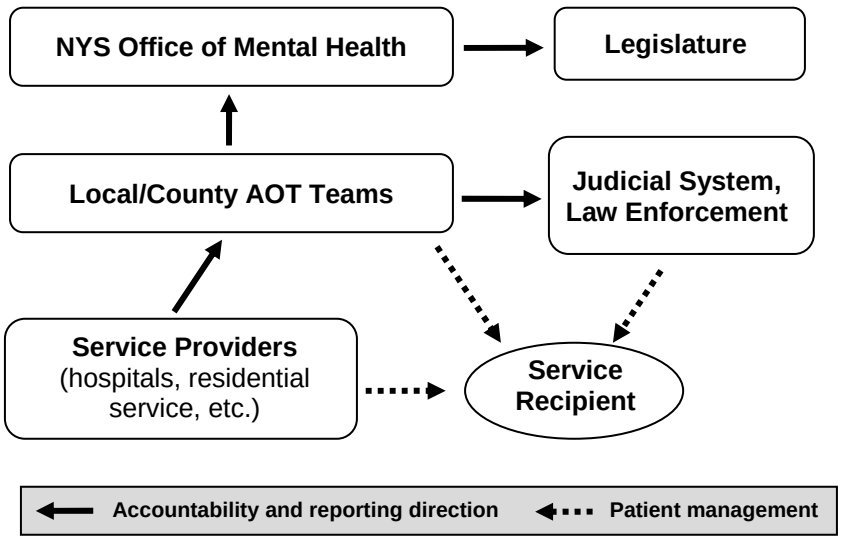
[1] New York State Mental Hygiene Law (MHL) §9.60.

Treatment (AOT). Under Kendra's Law, individuals who are likely to have difficulty living safely in the community if left without support and supervision receive close monitoring and mandatory participation in the treatment administered by local mental health authorities. An AOT status will grant a patient a priority access to various intensive services in the mental health system.

Figure 1 describes multiple players involved in the implementation of AOT. The OMH, accountable to the state legislature, oversees the statewide planning and implementation of AOT through its five AOT program coordinators. Each AOT program coordinator monitors and supports local/county level AOT teams in its region. Local AOT teams receive potential AOT patients from different referral sources, investigate the referral cases, and decide whether each case qualifies for an AOT status. If so, then the local AOT team will prepare a comprehensive treatment plan for the case that may include services such as intensive case management, therapy, medication, housing, and etc. Local AOT teams also prepare and file petitions for court orders. Once a court order is granted, the AOT team monitors the patient's compliance to the AOT treatment plan by closely communicating with case managers and other service providers. Local AOT teams also make decisions regarding the renewal of the court order at its expiration. In sum, an AOT recipient is managed by a close collaboration among the local AOT teams, judicial and law enforcement systems, and service providers.

In this study, the AOT system boundary perceived by the NYS OMH and by the local/county AOT teams are compared. Like other AOT evaluation studies undergoing at the OMH, the initial assessment of the AOT implementation in this study began with the state-level analysis. However, as the modeling project progressed, this study found that the state-level perspective may not provide a full picture of the system performance, because various constraints and pressures managed at the local level may not be observable at the state level.

Figure 1. Multi-organizational Context for Assisted Outpatient Treatment (AOT)



Method and Data

In order to explore the dynamic complexity of the Assisted Outpatient Treatment (AOT), this study employed qualitative systems mapping and formal system dynamics modeling. Although there have been rigorous efforts to introduce system dynamics to health care practitioners (for example, Levin, Roberts et al. 1976; Homer and Hirsch 2006; Jones, Homer et al. 2006; Sterman 2006), the method was relatively new to the AOT community.

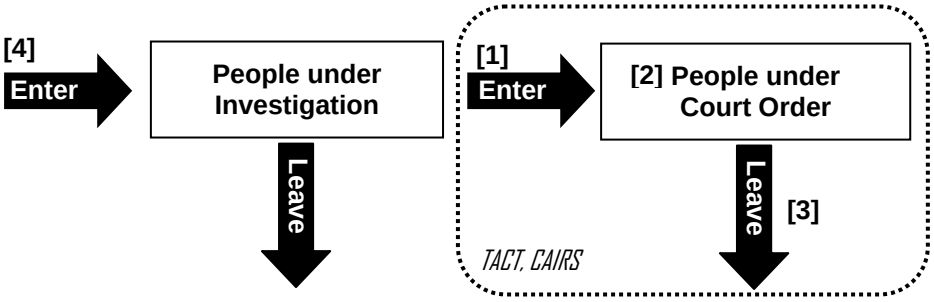
The modeling first began with the state-level data collection. The structural data has been collected via interviews with various state-level AOT administrators and via internal documents. Two databases maintained by OMH, the Tracking for AOT Cases and Treatments (TACT) and the Child and Adult Integrated Reporting System (CAIRS), were used for this study. The TACT provides extensive data on the flow of the court-ordered service recipients and the treatments they receive. The CAIRS tracks demographic characteristics of the service recipients, their health and behavioral records, and treatment results. Based on the data, a state-level simulation model was created and tested against the reference modes.

The first phase of the modeling provided an insight that the system boundary imposed by the state-level database leaves holes in understanding the overall performance of the system. Therefore, the model was expanded using data collected from local/county AOT teams. The field data mostly consisted of open-end interviews with key informants and focus groups. Especially, the modelers asked the informants to select key system variables and sketch their behaviors over time (Randers 1980; Richardson and Pugh 1981; Andersen and Richardson 1997). This allowed the informants to discuss issues that are important to themselves without restricting the agenda to questions framed by the modelers. Based on the data, a local-level simulation model was created and its structure was compared to the state-level model.

System Perceived at the State Level

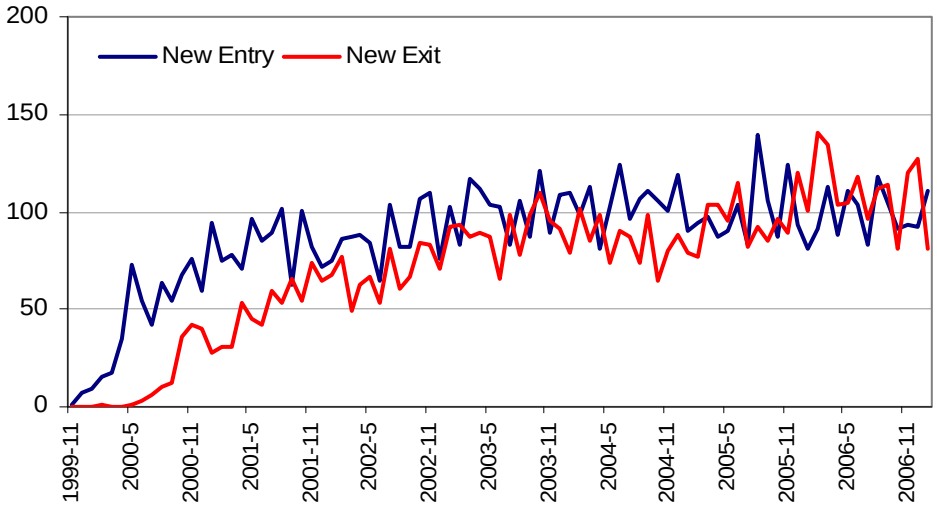
The focus of data collection and analysis at the state level is closely related to the scope of program evaluation and accountability. The program evaluation is designed to capture the effect of AOT by comparing pre- and post-AOT patient characteristics. Since the legislature holds the OMH accountable only for the court-ordered individuals, the main concern for the OMH evolved around the court-ordered AOT. The databases (i.e. TACT and CAIRS) maintained by the OMH mainly deals with information of those who enter and leave the court-ordered AOT as well as those who are currently under the court-ordered AOT. (See [1]~[3] in Figure 2.) OMH receives monthly reports from the local/county AOT teams that include the number of new referrals for investigations (i.e. [4] in Figure 2), but the reports are not used for analytical purpose. The resource availability for the program implementation, a critical sector for any service delivery system, does not receive much attention at the state level, because the law stipulates that anyone who requires the service must be provided with the service. In other words, in theory, the service capacity must meet all AOT needs and the capacity should not limit the level of service provided. In sum, due to various institutional and analytical reasons, the AOT system perceived at the state level is limited to the court-ordered AOT recipients.

Figure 2. System Boundary Perceived at the State Level



Based on the state level data, the growth of new entries into the court-ordered AOT has stabilized around year 2003 (See Figure 3). The new exit numbers follow the trend of new entry numbers with a time delay accounting for the length of stay under the court order. The stock of people under the court order, influenced by both of these entry and exit flows, has increased until year 2004, and started to stabilize since then (See Figure 4). The data suggests that the AOT system has reached an equilibrium.

Figure 3. Monthly New Entries and Exits of Court-Ordered AOT Recipients in New York State



What does this equilibrium mean? At the state level, this could mean that the system has adjusted well in meeting the program's growing needs and eventually saturated the target population. By looking at the investigation data reported from the local AOT teams, this hypothesis gains more support (See Figure 5). Those who come into the system in order to receive investigation for AOT admission have increased sharply with the enactment of Kendra's Law. However, the investigation numbers have decreased since then, and when compared to the new entry numbers for the court-ordered AOT, a greater fraction of those who are investigated becomes court-ordered AOT recipient. A typical delay time involved with the investigation process is less than

two months; therefore, it eliminates the alternative hypothesis that the new entry numbers are just keeping up with accumulated investigation needs.

Figure 4. Court-Ordered AOT Recipients in New York State

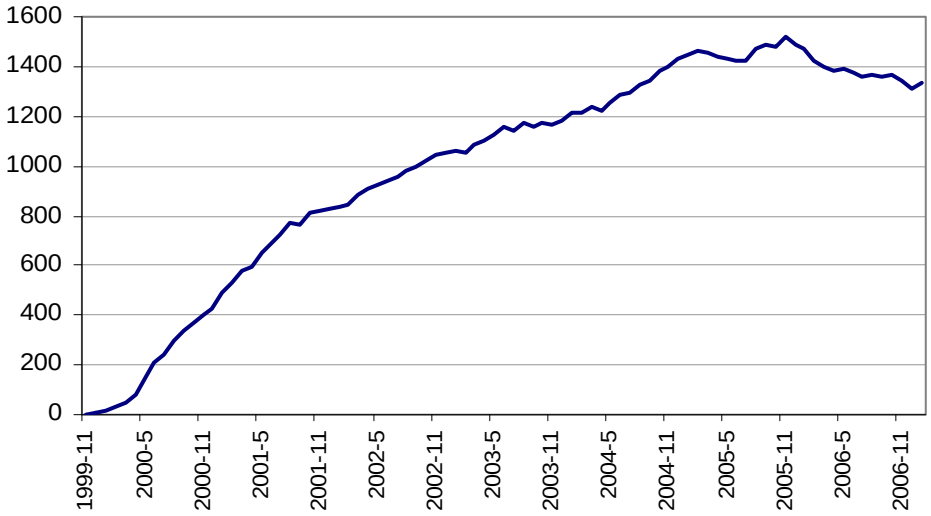


Figure 5. Monthly New Investigations and New Court-Ordered AOT Recipients in New York State

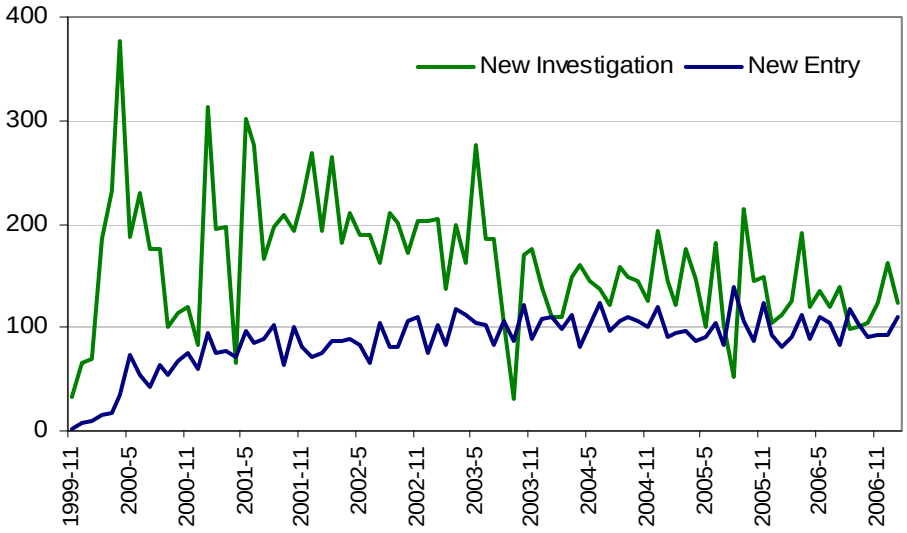
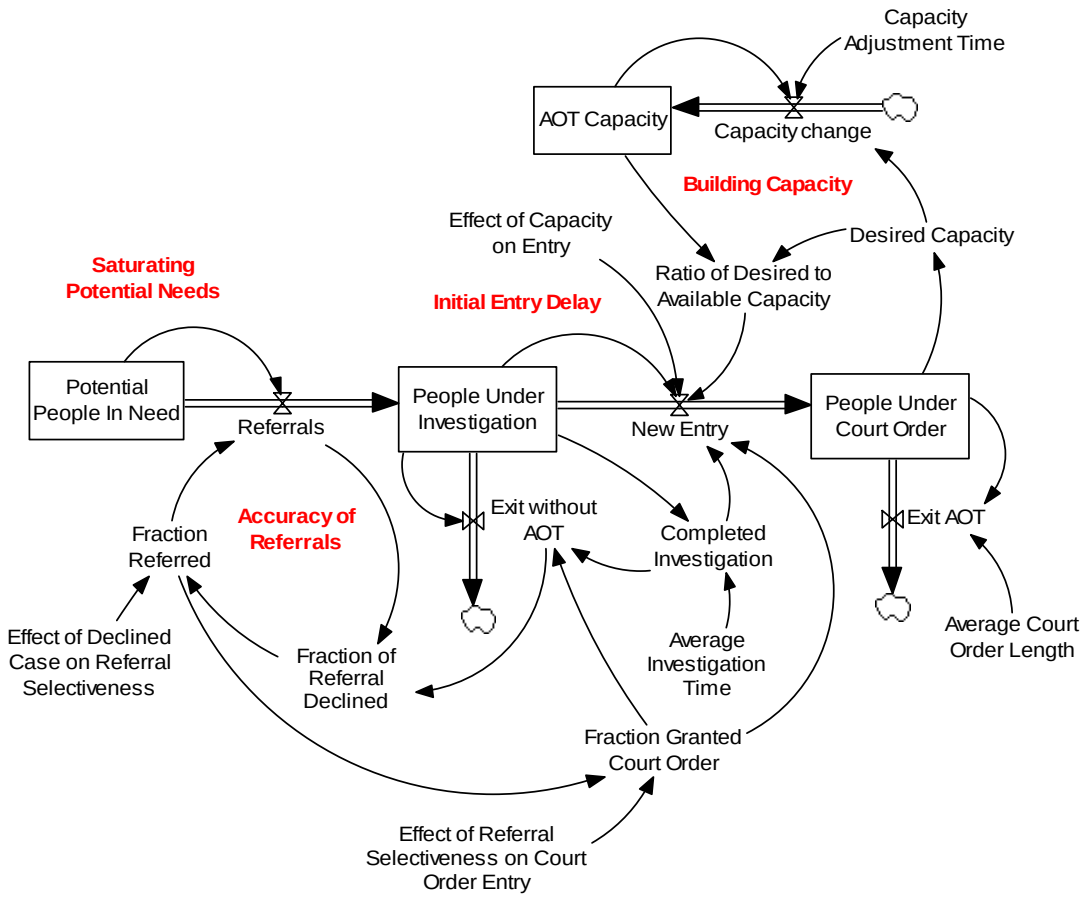


Figure 6 describes the system structure elicited from interviews with the state-level key informants that may explain the reference modes described in Figure 3~5. In order to examine the consistency of the structure with the observed behaviors, a formal model was developed at the state level. The formal simulation model and its results will be discussed in another paper as the focus of this paper is on exploring perceived system structure, or mental models, explaining the observed behavior. However, the simulation model could replicate the observed behaviors

when (1) the potential pool of people in need of AOT was fixed allowing for a saturation effect, and/or (2) the referral process, with experience, became more accurate in selecting the potential candidates for the AOT. In addition, the formal simulation model had to incorporate a structure that allows for a slow growth of new AOT entry in the beginning of the program implementation. By law, capacity should not limit the AOT service provision, but any new program requires an initial time delay for building the needed service capacity.

Figure 6. State-level Structure Explaining the Reference Modes



The state-level model assumes that those who have been investigated or served under the court order leave the system once their service engagement is over. It is based on the data that the rate of AOT recidivism is minimal. In addition to the hypothesized dynamics of improving referral accuracy and declining needs, this model predicts that AOT capacity increased to meet the desired needs in the beginning of the program implementation will be underutilized as the potential needs become saturated. The adjustment time for capacity reduction is longer than what it takes for the capacity to increase, because government has less flexibility in workforce reduction. This lag may encourage AOT entries more than necessary in order to utilize the existing capacity.

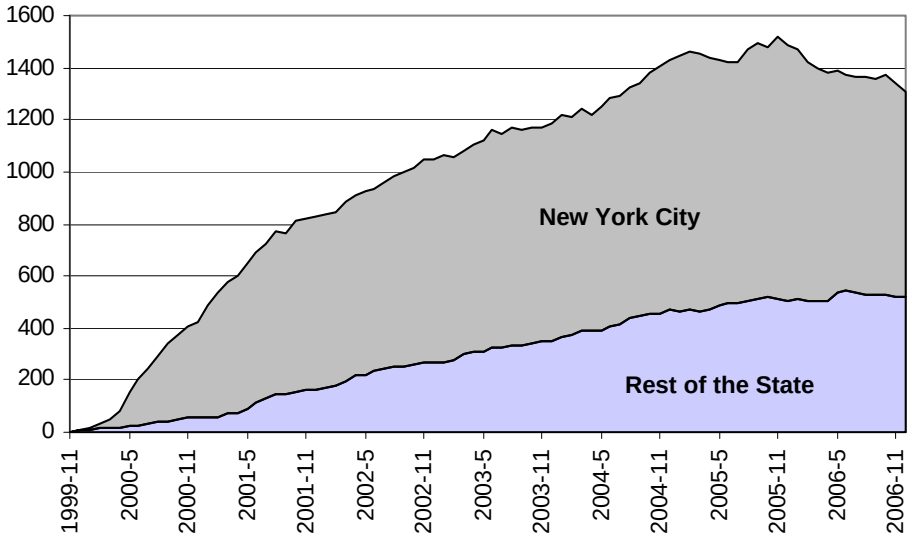
However, is underutilization of capacity actually happening at the local level? What happens to those people who leave AOT? Would the local AOT teams view the system in the same way? Is

the system working well without any pressure building up? With the limited system boundary perceived at the state level, it is hard to answer these questions. While richness of data available at OMH allows extensive in-depth research on AOT implementation and evaluation, this study attempts to contribute to the existing studies by expanding the scope of the perceived system boundary.

System Perceived at the Local/County Level

Each local AOT team has its own way of implementing the program with its own philosophy. Therefore, it is hard to generalize different work processes into one model. Especially, there is a big difference in the AOT implementation between New York City (NYC) and the rest of New York State (ROS). The difference may stem from their difference in population and its demographic composition, availability of local AOT infrastructure, staffing pattern, and judicial procedures. As shown in the stacked graph in Figure 7, NYC AOT recipients make up the majority of the New York State (NYS) AOT recipients. The result is that the NYS AOT trend is highly influenced by the NYC trend. In addition, the dynamics appears to be unfolding more rapidly in NYC than in the ROS. The pattern of the system behaviors observed in the ROS is similar, but smaller in its magnitude, to that of NYC in its early stage of AOT implementation. Therefore, in this study, the local/county level modeling was carried out mainly based on the data collected from NYC AOT teams composed of psychiatrists, psychologists, social workers, and administrative staff.

Figure 7. Proportion of New York City and the Rest of the New York State's Court-Ordered AOT Recipients



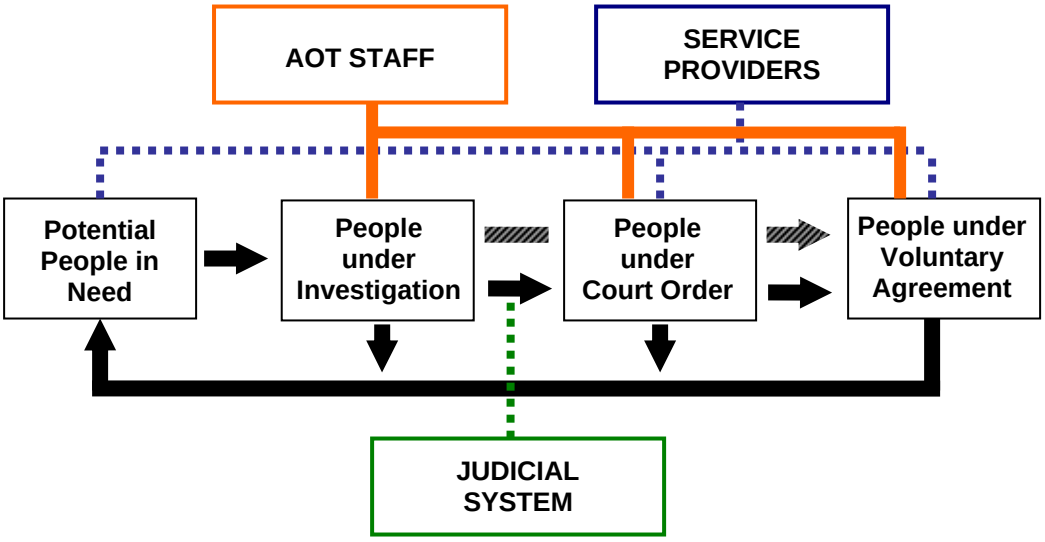
System Boundary

The data collected at the local/county level is mostly qualitative. Through open-end interviews, group discussions, and graphing of over-time behaviors of key system variables, the modelers

discovered that the perceived system boundary at the local level is substantially different from that of the state. The local AOT staffs presented different dynamic hypotheses to explain the system behaviors observed at the state level.

Figure 8 describes the system boundary perceived at the local level. Unlike the state-level system boundary, it includes sectors the local AOT teams (represented as "AOT Staff" in Figure 8) closely collaborate with: service providers and the judicial system. The boundary reflects the fact that the service providers and the courts may influence the AOT teams' decision on the flow of service recipients. Another interesting aspect of the local-level system boundary is its inclusion of voluntary agreement sector. A voluntary agreement status is similar to the court-ordered AOT except it does not involve court orders. If a patient has strong intention to engage in the treatment plan, then the person can sign up for a voluntary agreement and receive the level of monitoring and service similar to AOT without being forced into it. The service provided under the voluntary agreement is neither accountable to OMH nor to legislature, but it does require resources of local AOT teams and service providers. Finally, service providers serve not only the court-ordered AOT and voluntary recipients but also mental health population in general. Therefore, those who leave AOT teams' supervision after investigation, court-ordered AOT, or voluntary agreement, return to the original pool of potential people in need and may receive other types of mental health services.

Figure 8. System Boundary Perceived at the Local Level



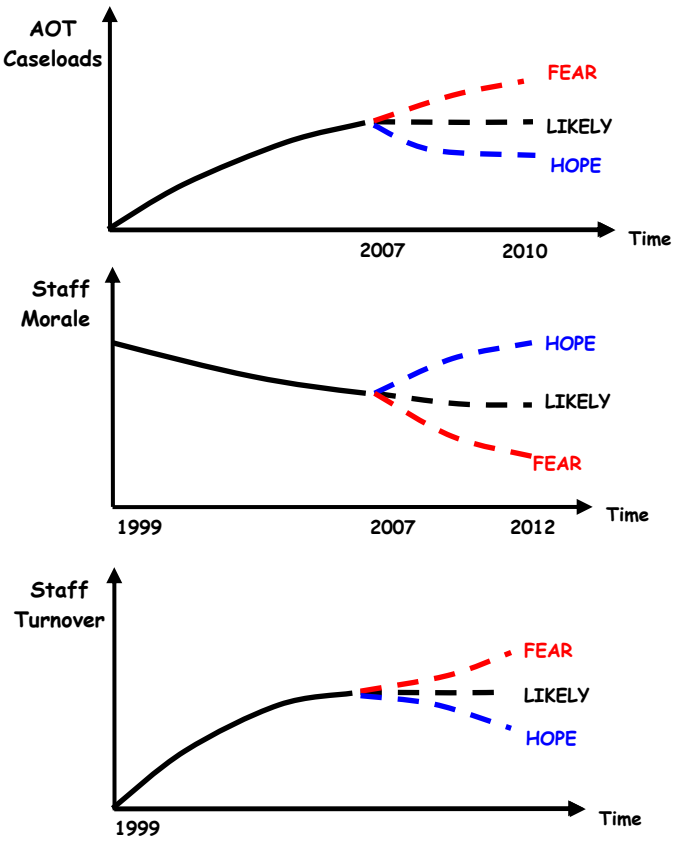
Workload Pressure

Unlike the state-level perception, the local AOT teams expressed their experience with high workload pressure and decreasing staff morale. Figure 9 shows a few of behavior-over-time graphs sketched by local AOT staffs. The caseload graphs in general portray the dynamics similar to the one shown in Figure 9. They are consistent with the trend of the AOT recipients in

NYS described in Figure 4. However, the AOT staffs hoped for a lower number of caseloads than the current status, preferably a 10 to 15 percept reduction in general. They argued that high number of caseloads is correlated with declining staff morale that leads to a higher staff turnover rate. High turnover rate means less workforce productivity as the team's experience with AOT implementation is lost. This structure is captured in Figure 10.

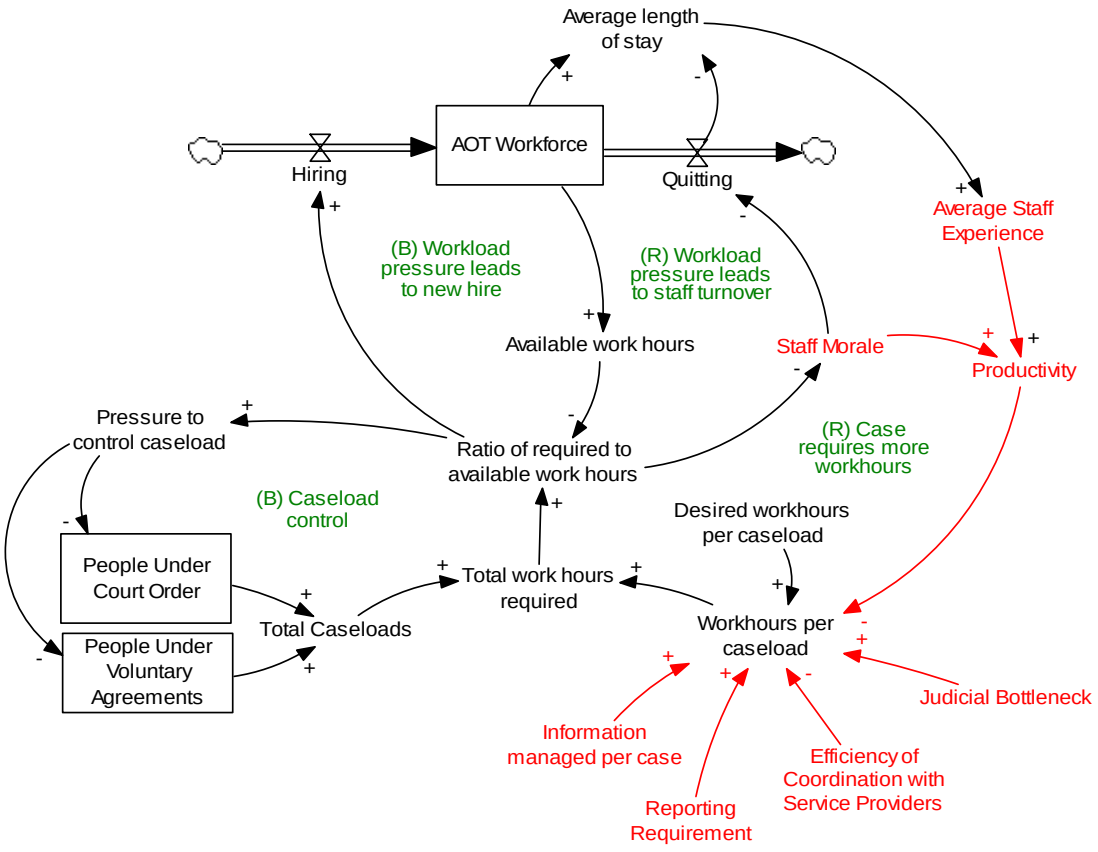
The interviews with the local AOT teams clarified that one cannot approximate the system's workload pressure by counting the number of court-ordered AOT caseloads. It is because the team's workload is also influenced by hours devoted to each case. The local AOT teams expressed their frustration with factors that increase work hours required per case. In Figure 10, these factors are described in red. As the AOT administration evolved, the amount of information managed per case has increased as well as the reporting requirements per case. The courts required more stringent documentations and evidences over time. As each service provider developed its own way of managing cases, communication between AOT teams and the service providers required more time and effort. All these factors contributed to an increase in work hours spent for data processing and documentation. Increasing proportion of paperwork resulted in less-than-sufficient amount of attention paid to each case, leading to a higher number of risky cases and a decrease in staff morale. One staff expressed such frustration by saying, "This is not psychiatry: this is accounting!"

Figure 9. Selected Behavior-over-time Graphs Sketched by Local AOT Staffs



Another reason that the court-ordered AOT caseloads do not give a full picture of the system's workload pressure is related to the existence of voluntary agreements. Once investigation is done, those who require community treatment program under AOT can either be served under the court-ordered AOT or the voluntary agreements. The potential AOT recipient's willingness to engage in the treatment plays a critical role in determining the appropriate treatment status. Since local AOT teams' work hours are devoted to both AOT and voluntary agreements, the workload pressure can only be assessed fully when the voluntary agreement sector is considered in addition to the court-ordered sector. Nevertheless, the state does not systematically keep track of the caseloads under the voluntary agreements. It is mainly due to the fact that the voluntary agreements are responsibilities of the county governments. They are peripheral to the OMH's system boundary. However, the field reports suggest that the ratio of monthly new court-ordered AOT recipients to voluntary agreement recipients is on average two to one, implying that a huge segment of the AOT workforce is devoted to the administration of the voluntary agreements.

Figure 10. Local-level Structure for Workload Pressure



According to local AOT teams, the current equilibrium level of the court-ordered AOT caseloads might represent a maximum level that the current workforce capacity can accommodate. The pressure is building up in the system, and it manifests itself as staff overtime and decreasing staff morale.

At the state level, it is hard to see how the AOT teams locally manage their workload pressure. The local AOT teams cannot simply cut down the caseloads (See Caseload Control Loop in Figure 10) to the level appropriate for their capacity, because unlike in the private sector where supply and demand are adjusted by a pricing mechanism, public programs often require service to be delivered whenever there is a need. Therefore, the teams need other ways that could alleviate the system pressure. Some possibilities are described in the following:

- *Divert patients away from the court-ordered AOT to the voluntary agreements*. This allows the AOT staffs to monitor and supervise patients closely while involving less paperwork and oversight associated with the court-ordered AOT.
- *Admit those who are likely to benefit the most from the court-ordered AOT*. As the AOT teams gained experience with the system, they acquired a sense of who is likely to benefit the most from the AOT program. For example, they say that AOT seems to be less helpful to those with anti-social issues or substance abuse problems. Also, those with less severe illness could be better off with less intensive treatment. This selection process is also consistent with the original AOT objective of serving those "likely to benefit from AOT."
- *Adjust the number of AOT renewals and expirations.* Whether to have an AOT order to expire or to renew is another decision made by the AOT teams. They can adjust this outflow based on their caseloads. Renewals may be preferred to new AOT orders, because they involve less paperwork. When there is an increase in the new AOT orders, AOT renewals might be reduced.

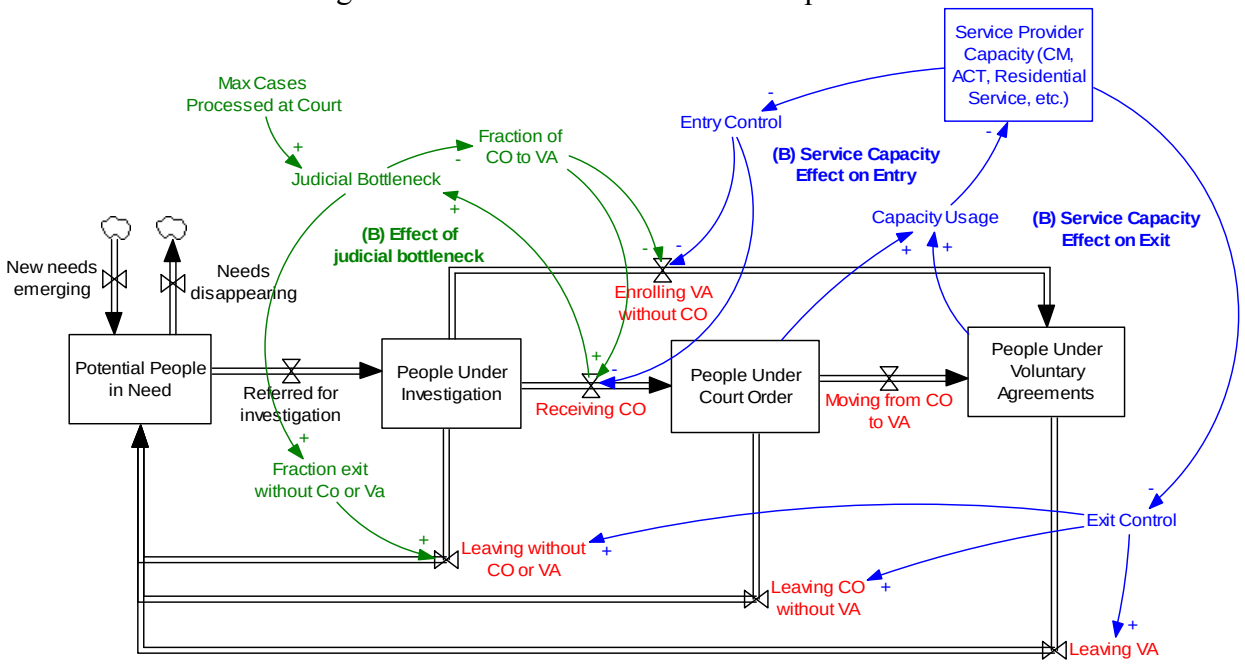
Figure 11 represents a stock-and-flow diagram of service recipients described at the local level. Unlike the state view, the pool of potential people in need is not a fixed pool of people. It changes with new needs emerging and disappearing. It reflects the fact that according to the local time horizon, the potential needs have never been saturated. Those who exit the AOT system from the investigation, the court-ordered treatment, or the voluntary agreement treatment return to the pool of potential people in need, and they are likely to share the service provider capacity with those in the court-ordered AOT and the voluntary agreements. Red variables in Figure 11 represent the flows that may be adjusted by the local AOT teams based on the criteria described above.

Influence from Other Sectors

The local AOT teams expressed that there are other factors influencing their decisions regarding the service recipient flows: service provider capacity and judicial bottleneck. In Figure 11, the service provider influence is described in blue. The service providers include various mental health care providers like case mangers (CM), Assertive Community Treatment (ACT) teams, hospitals, and residential services. The availability of service providers influence the local AOT staffs' AOT related entry/exit decisions. The judicial bottleneck, represented in green in Figure 11, implies various legal procedures that delays court-ordered AOT to take effect. In some courts, there is a limit on the weekly number of court orders that can be filed. When service capacity and the judicial bottleneck make patients wait too long, it could discourage further referrals and sometimes lead to unintended expiration of court orders. Unintended expiration of court orders

can take place when AOT petitions are not processed in timely manner, and it is directly related to the well being of patients as well as the community. Therefore, to minimize the consequences of unintended expiration of court orders, the local AOT staffs divert patients to voluntary agreements or to other step down services.

Figure 11. Local View of Service Recipient Flow



Referrals

If there is a workload pressure at the local level, then why is the greater proportion of investigated individuals receiving the court-ordered AOT as described in Figure 5? If the potential AOT need is saturating, then shouldn't the court-ordered AOT also be decreasing proportionally? The local teams' perspective on the referral trend tells a different story. They say the referrals mostly come from hospitals, and the referrers learned over time the characteristics of patients that are likely to get court orders. In other words, the system became more efficient and accurate in terms of selecting those who are likely to get court orders in the early stage. Another reason for the decreasing trend in the referrals, according to the local AOT teams, is that waiting line in the investigation and court order processing can discourage new referrals. Finally, rejected cases may also discourage new referrals. Therefore, as the workload pressure increases and the investigated patients are let out of the system without receiving court-ordered AOT or voluntary agreements, the referrers are less likely to make further referrals in the future.

Conclusions and Implications

This study applied systems thinking and system dynamics modeling to explore the system boundary perceived at the different levels of governments. In implementing and assessing the Assisted Outpatient Treatment Program in New York State, these perceived system boundaries

played a critical role. The study found that the system boundary defined at the state level had its own rationale behind it, but nevertheless, it may be too narrow for evaluating the program's overall performance. The state level data portrayed a picture of the system at an equilibrium without unwanted pressures building up. However, the study at the local level presented a different picture. The local AOT teams' system boundary was larger than that of the state, because the local staff had to make their management decisions based on their relationship with other participants in the system such as courts and service providers. In explaining the system behavior and evaluating the program performance, the local staff described a system structure that is very different from that of the state. The system was certainly under a lot of pressure that results from heavy workload. However, because the local AOT teams strive hard to alleviate the pressure at the local level, the strained system is not visible at the higher level until this systems study was carried out.

Implications of this study can be summarized as follows:

- Communication between different levels of organization is critical when a program is implemented in a multi-organizational context. A systematic way to align different perspectives owned by diverse system participants is important. In that sense, systems thinking and system dynamics offer valuable mapping and conceptual tools as boundary objects (Carlile 2002; Zagonel 2004).
- The system boundary must be defined in a comprehensive and holistic way from the planning stage. The perceived system boundary influences data collection and criteria for measuring program performance. For example, OMH has not collected data on the voluntary agreements, because the voluntary agreement sector was beyond its system boundary. However, this study found that it is a critical piece of information in assessing the capacity and workload pressure in the system.
- The same system behaviors can be explained differently if the scope of the system boundary is different. What is regarded as a desirable state may turn out to be a stressed state if the system boundary is adjusted. This type of insight is often generated by endogenous theory building in system dynamics. For example, the OMH may have believed the system has reached an equilibrium by looking at the trend of court-ordered caseloads. However, the study found that the system was in fact under stress, because the work hours spent per case have been increased.
- Inefficiencies around oversight and inter-agency communication create greater burden for the program administrators.

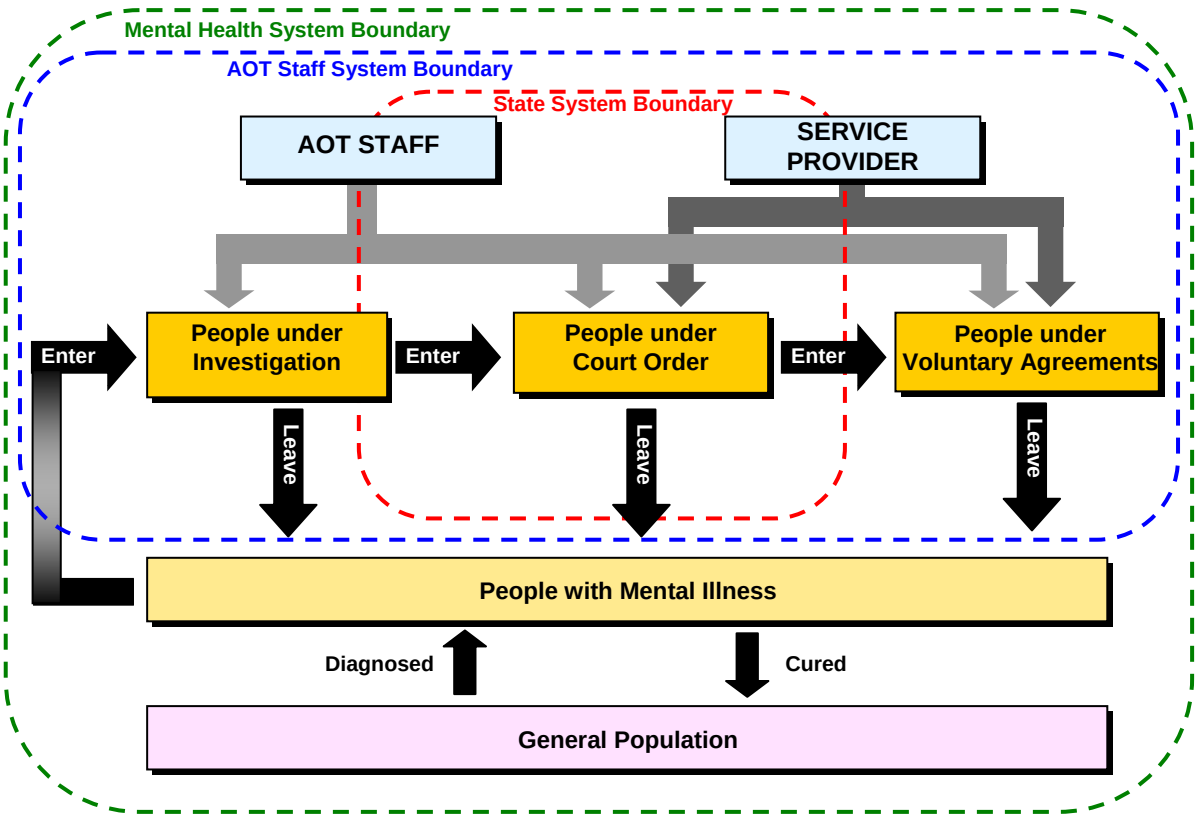
This study only examined the system boundary perceived at the state and the local level. However, the system boundary can be extended even further by incorporating perspectives of service providers and judicial sectors. Considering the fact that the court-ordered AOT and voluntary agreement status allow patients to receive various mental health services with priority, the AOT initiative is likely to have substantial influence on the general mental health system. The system boundary can expand further by examining such relationships between the AOT and non-AOT mental health populations. (See Figure 12.)

The systems study of AOT is still under progress. Future research areas include various simulation-based scenario analyses of AOT staffing policies and capacity investments, the

system-level evaluation of the local efforts to alleviate the workload pressure, and an AOT implementation study by different patient characteristics. The third topic is especially interesting, because there are two potential factors that might have changed the AOT recipient characteristics over time. One is the AOT staffs' learning on the types of patients that are more likely to benefit from the AOT engagement. The other is the effect of AOT on improving the mental health of individuals.

Since Kendra's Law became effective, the OMH collected an extensive amount of data and carried out various evaluation studies of the AOT outcomes. At the same time, it managed to administer the program with unknown needs without major dysfunctions in the system. Still, the OMH and the local AOT teams are looking for other tools and perspectives that can bring further insights. With such openness, they welcomed the recommendations generated from this systems study, and this study too benefited from the cooperation and supports from the AOT administrators.

Figure 12. Expansion of System Boundary to Cover General Mental Health Population



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