

Re-scaling the Parents as Teachers Program in Missouri

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2. Abstract

The Parents as Teachers program in the State of Missouri has begun a re-scaling effort to serve families through a more holistic approach by ensuring all components of their evidence-based model are implemented by each Parents as Teachers affiliate. Parents as Teachers seeks to help families by training and certifying parent educators who deliver monthly or bi-monthly home visits to families participating in the program. The program is open to families who are expecting a child, and it supports families until the child enters kindergarten. The Parents as Teachers model described in this paper supports the re-scaling efforts by the Parents as Teachers program and offers insights into the complexity of this issue and what the next steps might be for the Parents as Teachers program.

Keywords: system dynamics, Parents as Teachers, Missouri, re-scaling, program development

Re-scaling the Parents as Teachers Program in Missouri

What do parents want for their children? Most parents want to support their children so their children can become happy, active, productive citizens later in life. Raising a child is about loving, supporting, and fostering the growth of the child until the child is sufficiently independent. The initial years of parenting build the relationship between parent and child, and as a result, are crucial years of the parent-child relationship. There are several programs dedicated to helping parents of young children better understand the growth and development phases of their child's life to provide a stable and healthy foundation for parent-child interaction. One such early childhood program is Parents as Teachers (PAT). PAT is an evidenced-based early childhood home visitation model that seeks to build strong families and promote positive parent-child interaction so that children can be safe, healthy, and ready to learn (Quality Assurance, 2012).

3. Orientation to the Problem

Families can enroll in the PAT program during pregnancy and remain in the program until the child enters kindergarten. The goals for the PAT program are to increase parent knowledge of early childhood development and improve parenting practices, provide early detection of developmental delays and health issues, prevent child abuse and neglect, and increase children's school readiness and school success (Quality Assurance, 2012). Research has shown that the evidence-based PAT model achieves these goals (Wagner, Clayton, Gerlach-Downie, McElroy, 1999; Zigler & Pfannenstiel, 2000; Zigler, Pfannenstiel, & Seitz, 2008). The program consists of three components: group connections, home visitations, and health screenings. The PAT program trains and certifies parent educators who work with families to guide them through a curriculum to achieve these outcomes.

The cornerstone of the PAT program is the home visit component completed by PAT-trained and certified parent educators (Wagner et. al, 1999). Parent Educators (PEs) seek to provide information, support and encouragement to parents throughout the beginning years of parenthood, while also strengthening family wellness by using a curriculum that focuses on parental resilience, knowledge of parenting and child development, and social and emotional competence of children (Evidenced-based, 2012). The program seeks to build on the family's identified strengths and build protective factors within the family (Evidenced-based, 2012).

Since the program's inception in the 1970s in the state of Missouri, the Parents as Teachers program has been a great success (Caverly, Dyle-Palmer, & Young, 2012). The PAT program was created because Missouri educators were noticing that children were entering kindergarten with varying levels of school readiness (Caverly, et.al., 2012). Efforts were made to better understand how to equip families to prepare children for the first year of school. The program was initially launched in four communities in Missouri in 1981 (Caverly, et.al., 2012). The success of the program was immediately seen and soon the PAT program spread gaining state funding through the Department of Elementary and Secondary Education (DESE) to implement the program in school districts across the state (Caverly, 2012; Caverly et.al., 2012). The model was quickly adopted in many states throughout the country. Funding for PAT is different across the country with varying best practices for designating state funding to the respective programs. (Stepleton & Caverly, 2012). Missouri is the only state in the country that requires school districts to offer PAT (Caverly et.al., 2012). It should be noted that the Missouri

legislature has decreased PAT funding to less than half from \$32 million to \$13 million over the last ten years (Caverly, et.al., 2012; Caverly, 2012). In addition to being a national program in the United States, the PAT program is an international program with affiliates in the United Kingdom, Australia, and many other countries around the globe (Caverly, et.al., 2012).

With its quick growth and instant success, the PAT program model has been challenged to ensure the evidenced-based model of twelve to twenty four home visits during the course of a year, one to two visits per month, depending on family's protective factors. Commonly, the home visiting component of PAT, which is meant to offer no less than twelve home visits to families throughout a course of a year, is implemented by PAT programs at less than half or even one fourth of that amount of visits (Caverly, et.al., 2012). There are some PAT affiliates only implementing one to two home visits to families under the PAT program name (Caverly, et.al., 2012). The PAT program is run by PAT affiliate branches. Each affiliate is required to meet the essential requirements or show significant progress toward meeting these requirements in order to retain their PAT affiliate status (Caverly, et.al., 2012). If affiliates are not compliant with the new essential requirements, they will no longer be considered PAT affiliates.

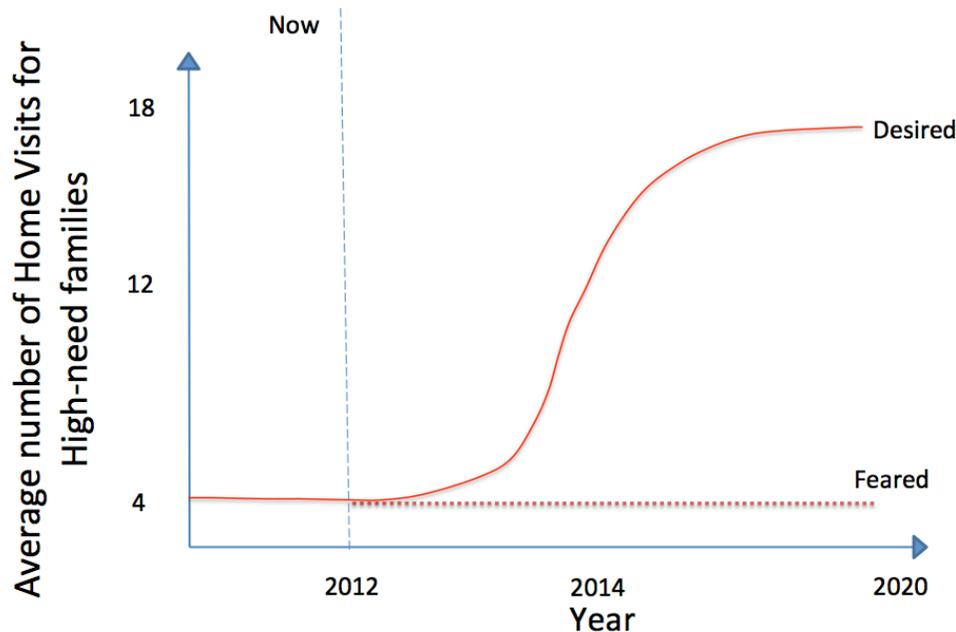
Since the PAT home visiting component has been such a challenge for PAT affiliates, the PAT national office is seeking to enforce the implementation of the home-visiting component of PAT gradually (Caverly, et.al., 2012). Since 2011, the goal of the national PAT office has been to restore the home-visiting component in its entirety to the PAT programs across the state of Missouri and the nation (Caverly, et.al., 2012). The goal is to strengthen the PAT program nationally, and by 2014, have made significant strides towards restoring the home-visitation component of this nationally known program (Caverly, et.al., 2012). By enforcing the program guidelines, PAT seeks to ensure their program is being replicated nationally, and offering families all over the country the same quality of program.

Currently, the national PAT office is seeking to guarantee that all PAT affiliates are implementing the home-visitation component at seventy-five percent of the required home visits for sixty percent of the affiliate's total caseload (Caverly, et.al., 2012). If affiliates do not meet this requirement, they will lose their PAT affiliation. In the state of Missouri, this means that each PAT affiliate is working with over half of their families to ensure those families receive seventy-five percent of the home visits they are entitled to receive, nine for families with few protective factors and 18 visits for families with a high number of protective factors.

Initially the authors were charged with the task of scaling-up the PAT program in the St. Louis region using a system dynamics approach. System dynamics modeling enables modelers to better understand a complex problem by mapping the system in a computer program and then simulating policies to understand the forecasted effects of those policies on the system. The initial work in building a system dynamics model to represent the strategy to scale-up the PAT program was informed in part by the declining number of families being served in the St. Louis region and significant loss of funding through the Missouri state government.

During the authors' initial attempts at building a model to scale-up the PAT program, the authors sought the help of PAT experts, many of whom were PAT representatives based out of the national PAT office located in St. Louis, Missouri. During the authors' initial interviews, it quickly became evident the PAT program was re-scaling their program with more targeted efforts to help families in need. Therefore, with the national PAT agenda of re-scaling, rather

than scaling up, authors' efforts were redeveloped to work in concert with the new agenda of PAT. Thus, the authors abandoned the idea of scaling-up the PAT program and refocused to develop a model that represented and supported the PAT program's efforts to increase the number of home visits per family per year. This would better reflect the possibility of having PAT affiliates succeed under the new goals by 2014. The authors embraced the new perspective and developed a model that would best represent this concept. The authors created a reference mode and sought to replicate the desired behavior seen below.



4. Description of the Model

When the authors were thinking about scaling up the Parents as Teachers Program (PAT), the initial attempt was trying to tackle the issue from an organizational structure perspective. Government Funds, Participating Districts, Families, and Parent Educators were considered as four main actors in the PAT program. These four parts became the main four stock and flow structures in later models.

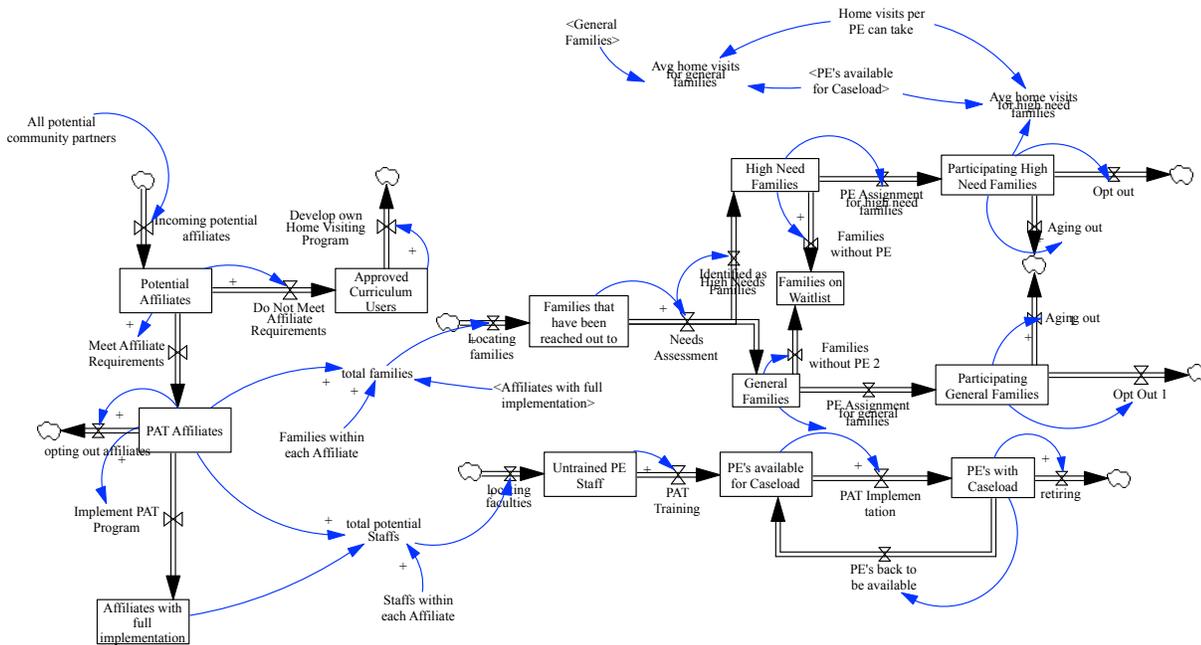
First, the stock and flow structure that referred to the affiliates was divided into “Approved Curriculum Users”, “PAT affiliates”, and “Affiliates with Full Implementation”. Since the authors acknowledged that the national headquarters of Parents as Teachers would like to implement more stringent requirements on affiliates to conduct the full number of home visits, especially for high needs families, the focus shifted towards a goal of increasing “Average Home Visits for High Needs Families” in relation to increasing “Affiliates with Full Implementation”. A table function was inserted to represent the relationship between these variables.

Second, the stock and flow that refers to “Available Funding” was developed to calculate the accumulated cost for the program implementation. The amount of “Available Funding” was not limited by the current funding amount, and the flow “Designation of Funds for Family Support” was not connected to any of the other three stocks and flows. The structure did not

consider the amount of funding as a limiting factor, but it integrated the analysis of cost when policies were tested.

Third, considering the goal was to increase the average number of home visits for high needs families, the authors separated “Families that have been reached out to” into “High Needs Families” and “General Families”. Both types of families share the same resource, Parent Educators. Thus, “Average home visits for high needs families” is directly affected by “Home visits per PE can take” and “FR of PE available for High Needs Families”, and indirectly affected by the extent to which general families have received PAT services.

Last but not least, a flow linked “PE with caseload” back to “PEs available for caseload”, which created a feedback loop so that Parent Educators (PEs) with caseload would be made available again for caseload due to families opting out or aging out of Parents as Teachers’ services.



5. Simulation Structure Framework

See Appendix I for a list of variable definitions and values. See Appendix II for the full simulation structure.

Figure 3

PE's Back to Available Loop

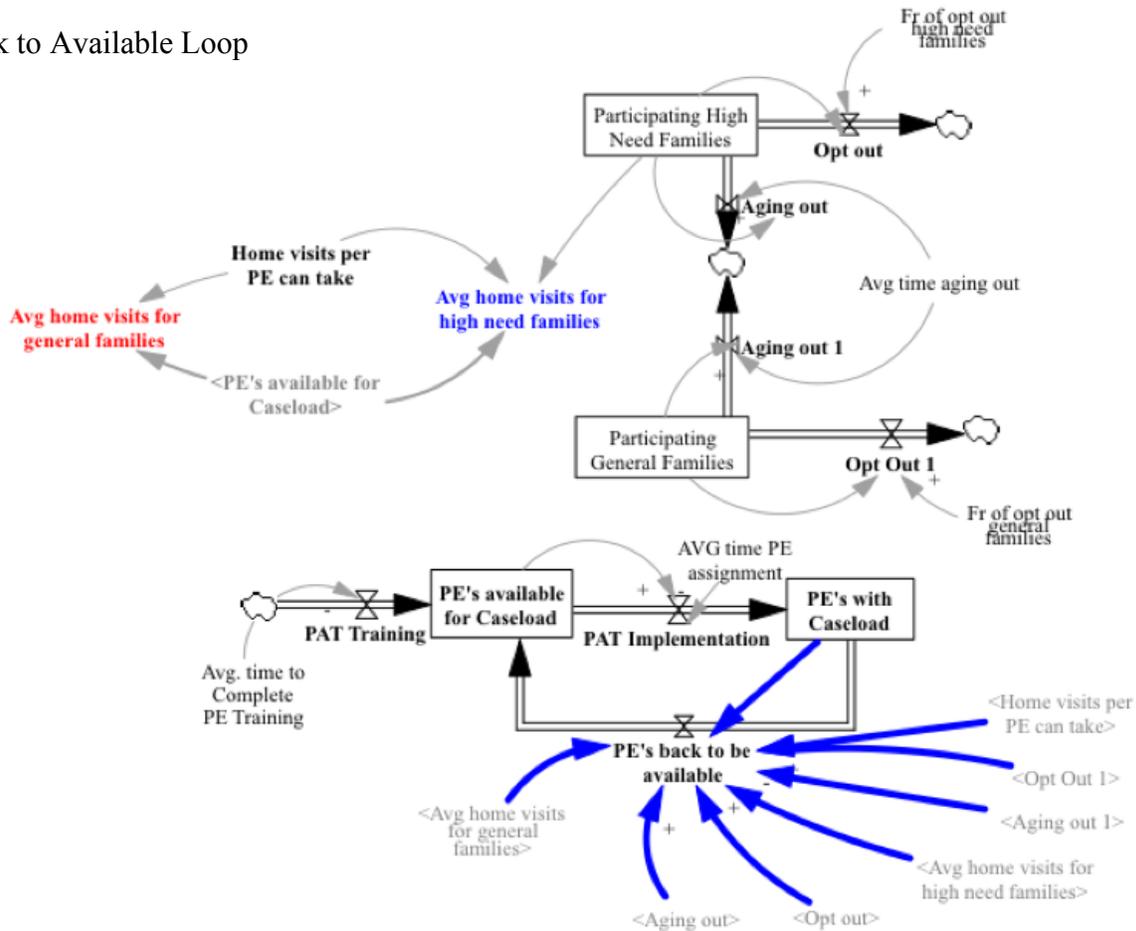


Figure 3 shows the construction of the formula for “PE’s back to available”. This variable is affected by the “Avg home visits” for general and high needs families, the rates of “Age out” and “Opt out” for both groups, along with the number of “Home visits per PE can take” in the following formula:

<p>PE's back to be available= PE's with Caseload-(((Avg home visits for general families*Aging out 1)+(Avg home visits for general families*Opt Out 1)+(Avg home visits for high need families*Opt out) + (Avg home visits for high need families*Aging out))/Home visits per PE can take) Units: people/Month</p>
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After receiving some feedback on our model, we recognize the flaws in this formulation, specifically in the number of variables factoring into this variable. It is bad modeling practice to have more than two or three variables factored into a formulation, but because this formulation provided us with desired behavior, we decided to leave it be.

The “Avg home visits for high need families” and “Avg home visits for general families” are our dependent variables of particular interest as they create our desired behavior in the reference mode. These values (highlighted in Figure 4) are dependent on the number of Parent Educators “PE’s available for Caseload”, the number of “Home visits per PE can take”, and the numbers of “Participating High Needs Families” and “Participating General Needs Families”.

Avg home visits for high need families=
 (Home visits per PE can take*Fr of PE available for high need families*PE's available for Caseload)/Participating High Need Families
Units: visit/family [0,24]

Avg home visits for general families=
 (PE's available for Caseload*Home visits per PE can take*(1-Fr of PE available for high need families))/General Families
Units: visit/family [0,12]

Figure 4

Average Number of Home Visits
 Loops

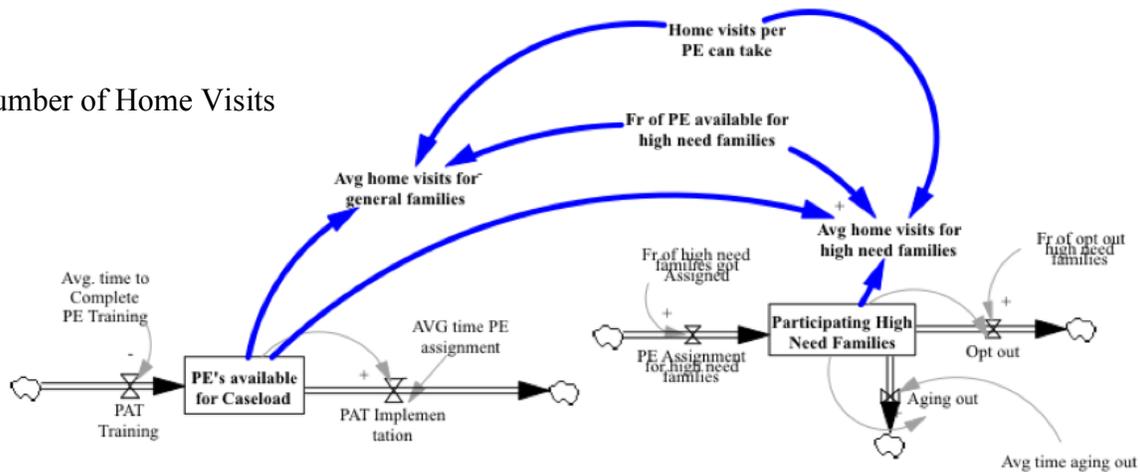


Figure 5

Needs Assessment and Qualifications as High Needs

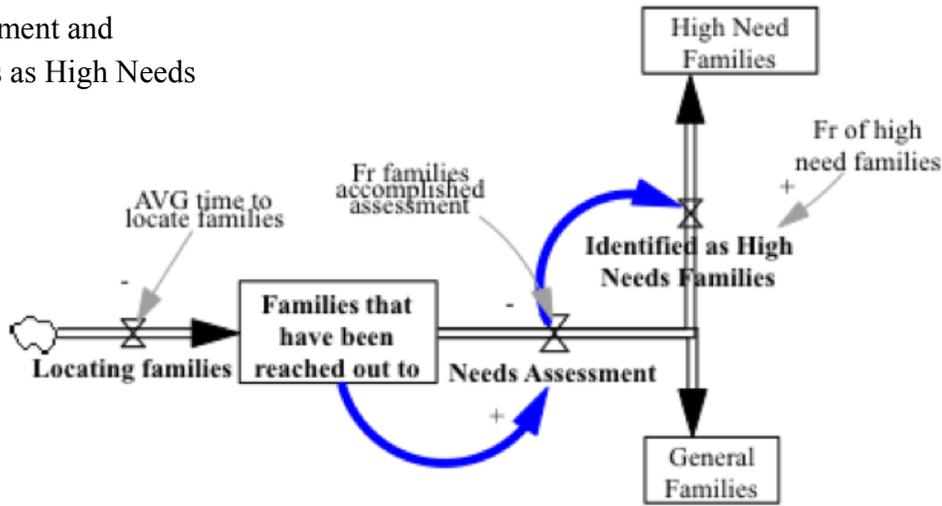
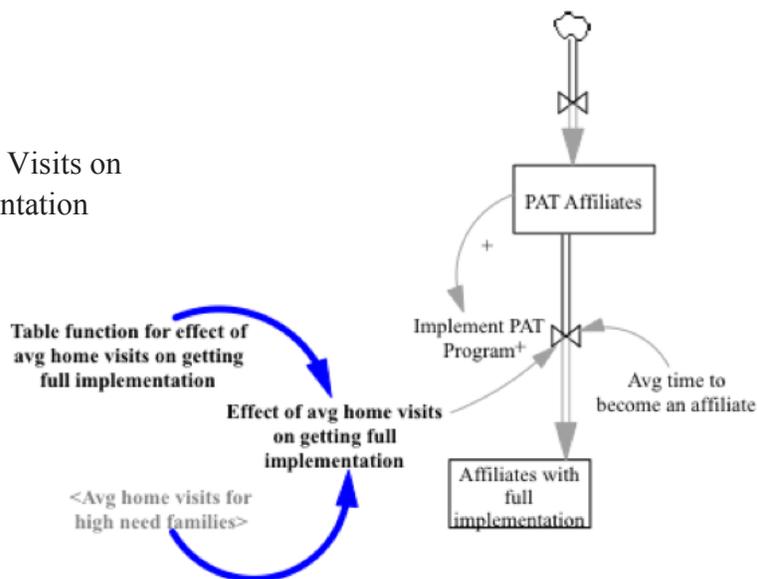


Figure 5 focuses on the part of the structure that addresses the means of needs assessment and qualification as a high needs family that we factored into our model’s structure. All families are put through needs assessment, and then a secondary means of qualification distinguishes generally qualified families as high needs or general needs. This structure better reflected the means of qualifying families seen in the real situation than our earlier models.

Figure 6

Effect of AVG Home Visits on Getting Full Implementation



After considering further the relationship between the “Avg home visits for high need families” and the “Effect of avg home visits on getting full implementation” (see Figure 6), we included a table function showing the changing, nonlinear effect of the increasing “Avg home

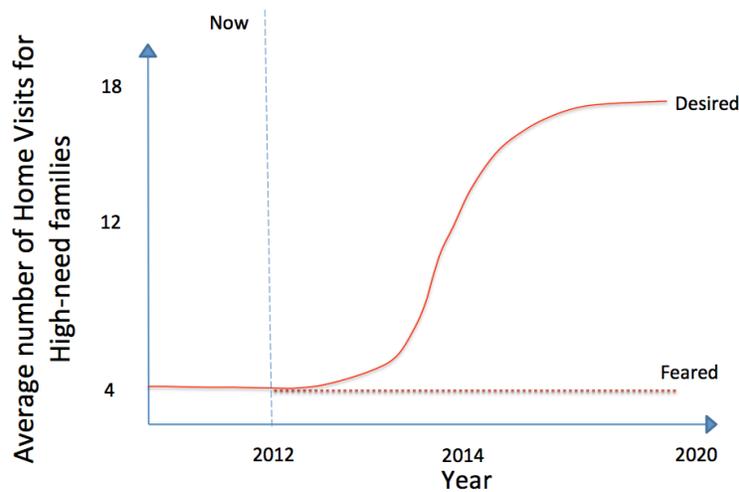
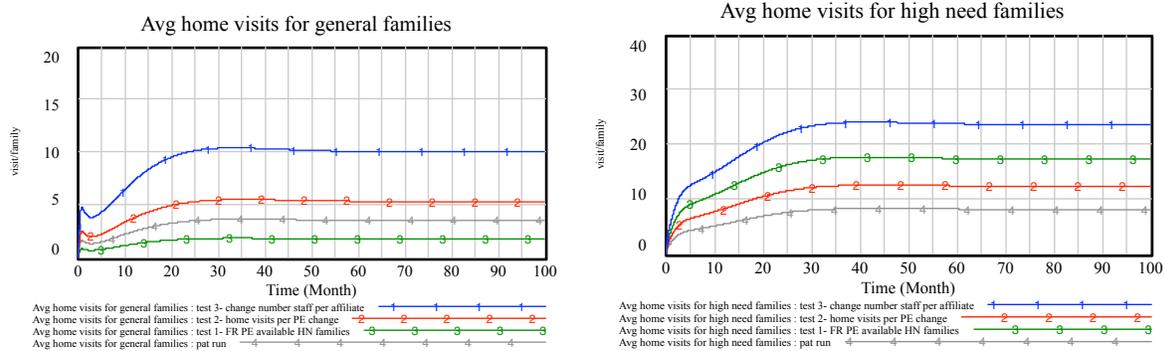
visits for high need families” on “Implement PAT Program” towards achieving higher numbers of “Affiliates with full implementation”.

In conclusion, the model behavior is mainly driven by two reinforcing feedback loops focused around “Participating High Needs Families” and “PEs available for Caseload”. However, these feedback loops are not strong enough so that the numbers of “Avg Home Visits for High Needs Families” and “Avg Home Visits for General Families” achieved our desired behavior. Policies tested took this into account, trying to rescale the program by increasing the efficacy of these reinforcing feedback loops.

6. Simulation

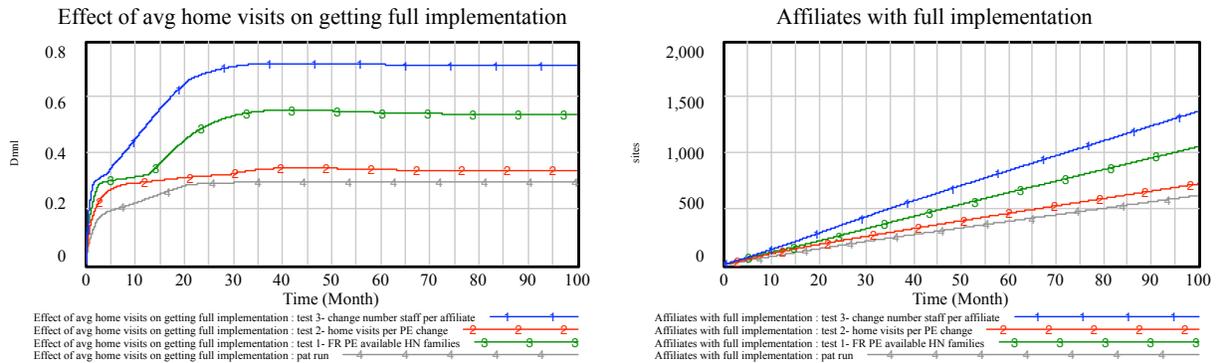
The model functions well in representing our expected behaviors.

First of all, the simulation results for “Avg Home Visits” for both high needs and general families show goal-seeking behavior toward the end of the time horizon, as expected. These results represent the current situation so that the average number of home visits for both types of families have reached equilibrium, but have not reached high enough to achieve the desired behavior. The resulting graph is shown below in comparison to our reference mode:

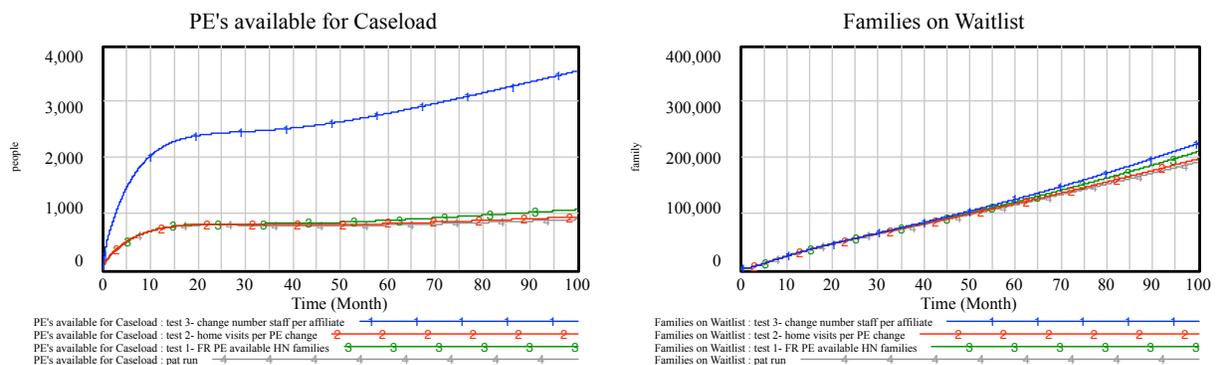


Second, because average number of home visits for high needs families did not achieve our desired behavior, the effect of average number of home visits on getting full implementation

was also short of our desired behavior. Shown as a goal-seeking behavior, it reached equilibrium around .3. As a result, the number of affiliates with full implementation shows smooth exponential growth. The resulting graphs are shown below:



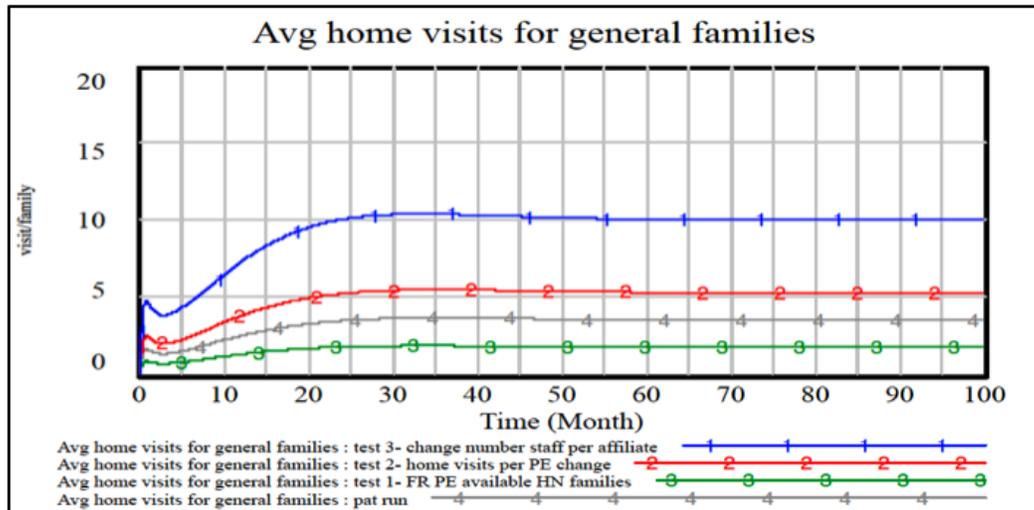
After applying more parameter assessment tests, the authors found an appropriate behavior for the variable “PE’s available for caseload”. The test results show that PE’s available for caseload fluctuates between 750 and 1000 people due to the different rates of inflow and outflow at various time steps. Although the average number of home visits for both types of families reached equilibrium, the number of families on the waitlist increased exponentially. Due to lack of information, the model did not have a maximum number for this variable. This result for the number of families towards the end of the time horizon may seem infeasible, but the desired results in other parts of the model outweigh this issue. The resulting graphs for “PE’s available for caseload” and “Families on Waitlist” are shown below:



7. Policy Changes and Insights

The authors ran simulations for three different policy changes and evaluated each policy by measuring its impact on four different model variables with 100-month time horizon. The policies tested were the following: **(1)** Increasing the fractional rate of PE availability to high need families from 0.3 to 0.65; **(2)** Increasing the maximum number of home visits per PE from 15 visits per family to 23, and; **(3)** Increasing the number of staff per affiliate from 5 to 15.

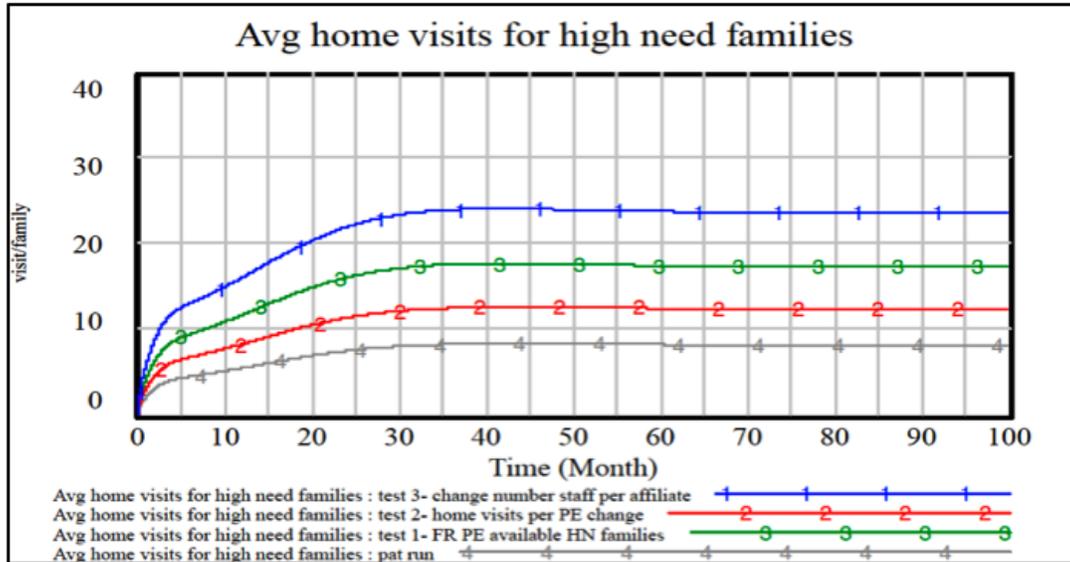
We evaluated each policy change by gauging its impact on the four following model variables: (1) Average home visits for general families, (2) Average home visits for high need families, (3) Total program cost with all families, and (4) Affiliates with full implementation.



First, we evaluated the impact that each policy had on the average number of home visits for general families. From the graph above, we noticed that general family home visits initially decreased over the first couple of months for each policy and even the base run. At five months we observed home visits increasing across the board, policy test 3 showed the largest gains.

By the ten-month mark, policy test 3 resulted in about twice as many home visits per general family when compared to the policy with the second best results, policy test 2. At around 25 months, average general family home visits leveled out for all of the tests. Policy test 3, increasing the number of staff at each affiliate, showed the greatest impact resulting in general families receiving an average of ten home visits per family. Policy test 2 leveled off at five home visits per general family, the base run was slightly less at around four home visits, and policy test 1 resulted in about two home visits per general family.

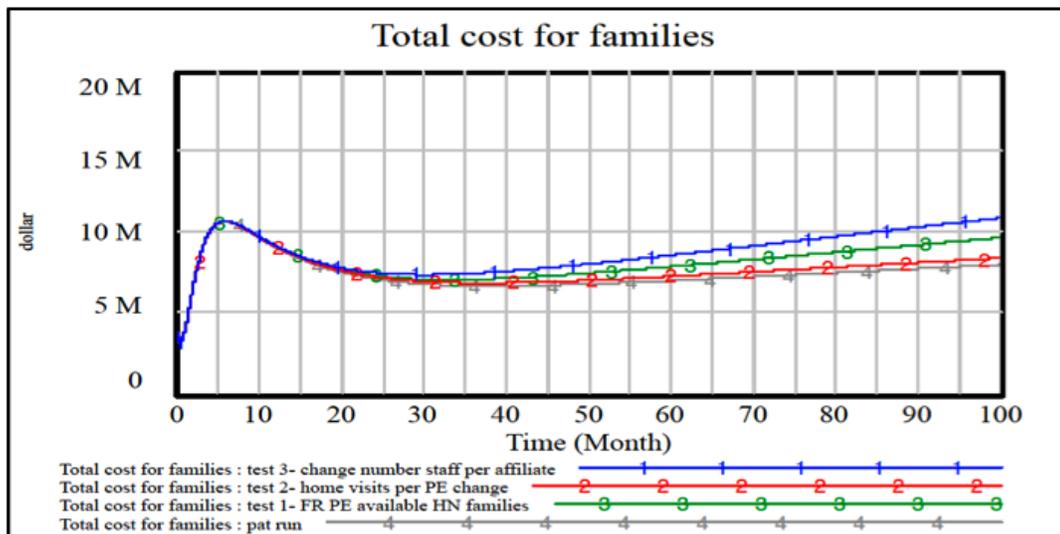
This is the only simulation where the base run outperformed one of the policy changes being tested. This is due to the fact that policy test 1 increases the FR of PE to high needs families, thus if we increased availability to high need families without making any other changes to the system, we were also inherently decreasing the availability of PEs to general families. This inherently decreased the average number of home visits for general families below the results from the base run.



Unlike the simulations above, for general family home visits, we perceived an immediate increase across the board for all policy tests and the base run. The initial separation between each policy test remained consistent throughout the time horizon. Policy test 3 produced the largest gains, increasing from ten home visits per family at three months to 24 home visits by month 30.

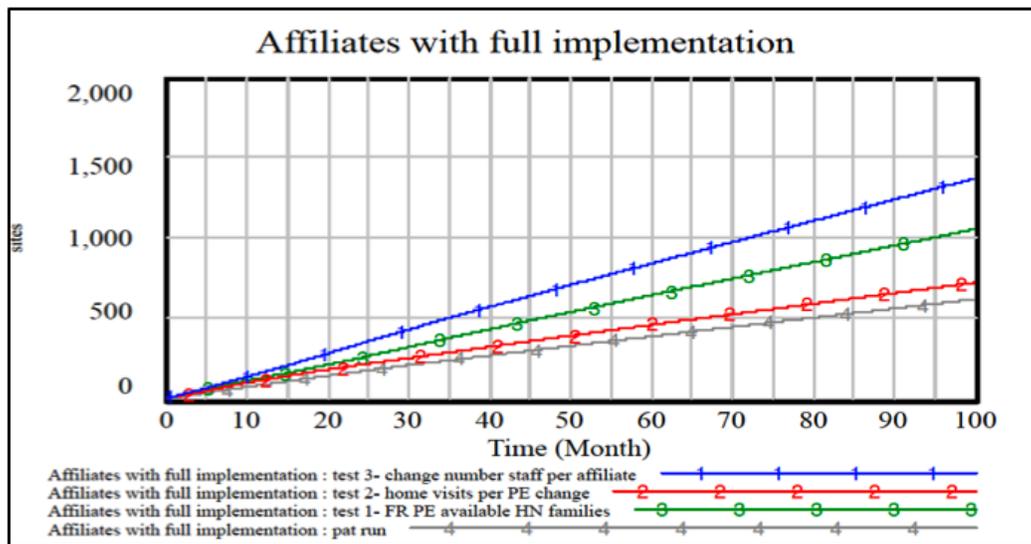
All the policy tests plateau around month 30, with policy test 3 showing the greatest impact. It plateaus at around an average of 24 home visits per family, policy test 1 had the second greatest impact with a final number of 18, followed by policy test 2 at 11 home visits per high needs family and nine home visits for the base run.

Here we see, that while policy test 1, increasing availability of PEs to high need families, directly addressed increasing PE access to high need families, it still was not as effective as policy test 3, increasing staff in each affiliate. This shows that while increasing availability of current PEs to high need families was effective in increasing the average number of home visits, there is additional need that cannot be met without hiring additional staff.



The third variable we observed was the total cost of providing the program for all families. We first noticed little to no separation in total costs between each policy change until around 25 months. At this point, policy test 3 and 1 began to increase and gain separation between policy test 2 and the base run. This initial separation, at 25 months, increased around the \$7 million mark.

Policy test 3 climbed steadily from \$7 million at 25 months to around \$11 million at 100 months. The second most expensive policy was policy test 1 ending at around \$10 million at 100 months. Policy option 2 and the base run both finished around \$8 million, about \$3 million less than the most expensive policy, increasing affiliate staff. While policy test 3 was the most expensive policy option we simulated, it was also the policy with the greatest impact.



Perhaps the most important model variable in gauging the impact of these policies was affiliates with full PAT implementation. Again, as with the previous simulations, policy tests 3 and 1 had the greatest impact, while policy test 2 only showed a modest increase over the base run. There was little initial separation between the policy tests until around 10 months when policy test 3 began to pull away, followed by policy test 1 around 25 months.

Policy test 3 resulted in a final number of around 1,400 affiliates with full implementation after 100 months, followed by policy test 1 with just over 1,000 full affiliates. The base run achieved 600 affiliates with policy test 2 finishing only slightly higher. With policy test 3 and 1 consistently shown to have greater impact than policy test 2 or the base run, this illustrated the barrier for many affiliates in reaching full implementation.

The barrier to full implementation for many affiliates is affiliates lacking resources to efficiently and effectively serve the highest need families. Policy test 1 directly addressed this problem by testing the impact of increasing PE availability to high need families. Policy test 3 more effectively addressed this problem of serving high needs families indirectly by increasing staff numbers, as shown in our second simulation above.

These findings are due to the fact that the number of staff is so integral to the model's structure. This insight accounts for such significant separation between policy tests 3 and 1. They

both help affiliates address high need families, but because staff are so integral to the model structure, Policy 3 had a greater impact overall than simply increasing PE availability. This is especially evident when comparing policy test 2, increasing home visits per PE, less effective by not being specific to high need families and obviously by not adjusting the number of staff per affiliate.

This brings us to an important next step for improving this system: looking at the funding and allocation structure more closely. There are several problems with the current system, where money is allocated to DESE from the state and then to the schools, which are inhibiting districts with the highest need families from receiving the full funding they need and deserve. Discovering a more equitable solution to funding allocation would increase affiliate resources to a level that would allow for the implementation of policy test 3, increasing the number of affiliate staff.

8. Limitations to the Structure

In terms of the model structure, the limitation lies in the fact that there is not a loop that links “Families on Waitlist” back to the “Needs Assessment” flow. In reality, families on the waitlist do not wait indefinitely and accumulate when they are not able to receive program services at a particular time. As they are put on the waitlist, they get priority over newly reached families to receive a new needs assessment, or they are assigned to an available Parent Educator. Future modelers of this problem should develop a structural mechanism to better address this issue we faced.

This model fails to take into account the effects of negative outcomes for families that do not receive the recommended number of visits from their parent educators. Without the recommended number of home visits, it is possible for the impact of Parents as Teachers services to have a negative effect on families, resulting in a negative Word of Mouth effect surrounding the reputation of PAT and the community level support for their programming. As such, in future iterations we need to take into account the impact of poor administration of services as it affects families being served.

Another issue we failed to incorporate into the identification of potential staff was the role that parents can play as volunteer Parent Educators. In certain communities, parents can see the benefits these services provide for families and make the decision to serve as volunteer Parent Educators for other families. This transition of parents into becoming potential staff is not captured in our current model, and we need to construct a mechanism to incorporate this insight.

9. Next Steps

In order to better understand the implications of increasing number of staff per each affiliate, we need to evaluate the distribution of allocated funds within the PAT affiliate programs. If more funding allocated towards Parents as Teachers could be shifted towards the hiring of more staff per affiliate, the average number of home visits per family could be increased towards our desired behavior more rapidly and efficiently. Because adding on staff is so cost intensive, and funding is so limited within Parents as Teachers, this policy suggestion is not remotely feasible until the organization is restructured towards increased use of evidence-based practices and more effective measurement of where funds should be distributed.

In addition to studying the distribution of funds within the Parents as Teachers affiliate programs, we plan to test more manipulations of parameters as they affect our desired behavior in average number of home visits for high needs and general needs families. Our hope is to continue to iterate upon our current model, such that we more effectively reproduce behavior found in data provided by PAT with their recently improving evidence-based practices.

Appendix I: Parameters

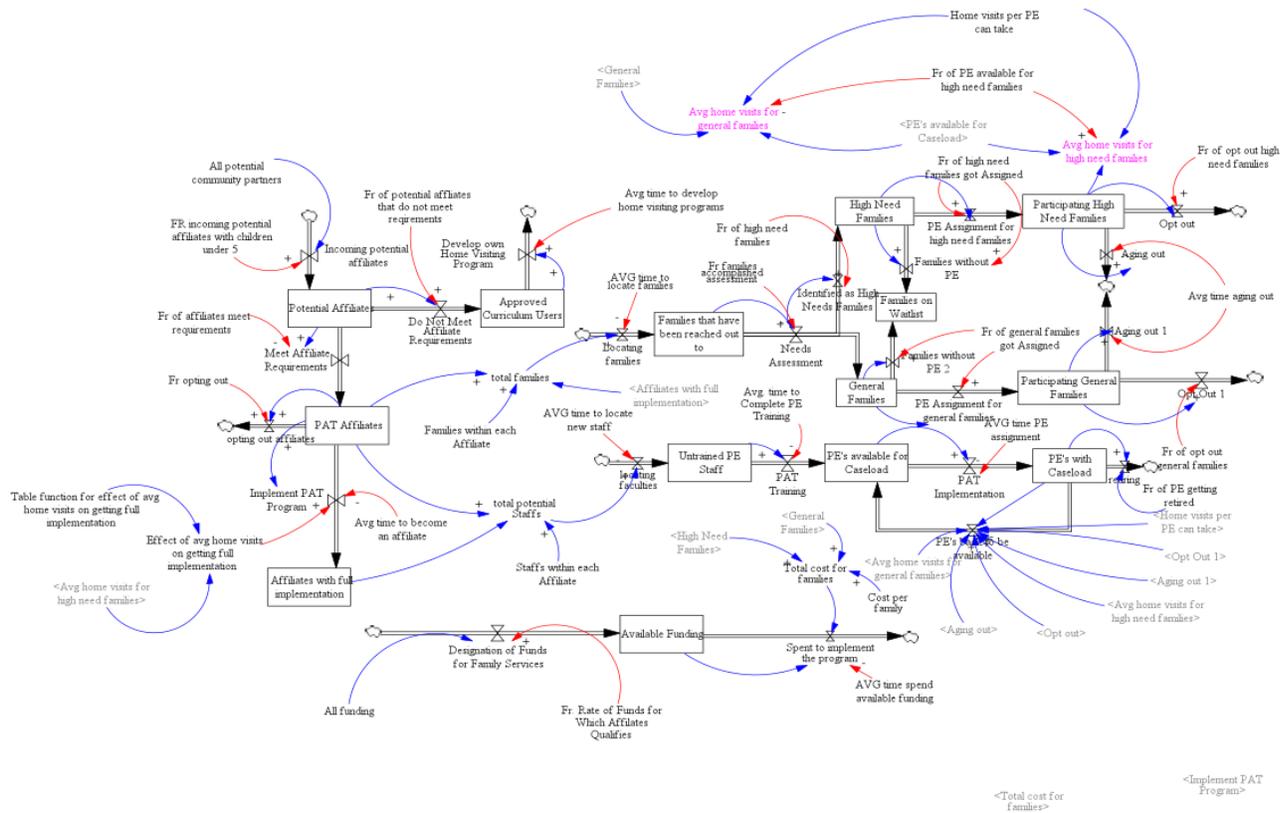
<u>Table of Parameters</u>	<u>Value with units</u>
All funding <i>Estimate of all available DESE and foundational funding</i>	1e+6 dollars
All potential community partners <i>Estimate of districts and outside community partners to be PAT Affiliates</i>	10,000 affiliates
Average time age out <i>Time for completion of PAT services for qualified families</i>	24 months
Average time PE assignment <i>Time to assign trained Parent Educators to qualified</i>	.3 months
Average time to spend available funding <i>Estimated time for allocated funding to be spent by PAT affiliates</i>	50 months
Average time to become an affiliate <i>Average time to fulfill Parents as Teachers requirements for new affiliates</i>	60 months
Average time to develop home visiting programs <i>Time for non-Parents as Teachers affiliates to develop independent programs</i>	12 months
Average time to locate families <i>Estimated time to locate families through outreach</i>	60 months
Average time to complete PE training <i>Time to complete training provided by interviews with PAT administrators</i>	.1 months
Cost per family <i>From Parents as Teachers website</i>	\$2652.97/ family
Families within each affiliate <i>Estimated number of families within each affiliate with</i>	100 families/ site

<i>children younger than 5 years old</i>	
FR families with needs assessment <i>Families that have received Needs Assessment for qualification</i>	.6 dmnl/month
FR incoming potential affiliates with children <5 <i>Main requirement for affiliates to receive PAT services and funding</i>	.03 dmnl/month
FR affiliates meeting requirements <i>Affiliates that meet more stringent qualification requirements of Parents as Teachers</i>	.05 dmnl/month
FR general families assigned PE's <i>Fraction of all qualified General Needs families assigned a Parent Educator</i>	.3 dmnl/month
FR high needs families <i>Percentage of all qualified families identified as High Needs</i>	.1 dmnl/month
FR high needs families assigned PE's <i>Percentage of High Needs families with assigned Parent Educators</i>	.45 dmnl/month
FR general families opt out <i>Percentage of General Needs families that opt out of receiving PAT services</i>	.2 dmnl/month
FR high needs families opt out <i>Percentage of High Needs families that opt out of receiving PAT services</i>	.2 dmnl/month
FR PE available for high needs families <i>Parent Educators assigned specifically to High Needs Families</i>	.3 dmnl/month
FR PE retiring <i>Percentage of trained Parent Educators that retire each month</i>	.1 dmnl/month

FR potential affiliates that don't meet requirements <i>Potential affiliates that don't fulfill evidence based practices and qualification as PAT</i>	.07 dmn/month
FR PAT affiliates opt out <i>Number of affiliates that opt out of Parents As Teachers certification</i>	.1 dmn/month
FR funds for which affiliates qualify <i>Fraction of all funding available for which PAT affiliates meet qualifications</i>	.1248 dmn/month
Home visits/ month each PE can take <i>Estimate based on average MSW caseload input and interviews with PAT</i>	15 visits/month
Staff members within each affiliate <i>Estimate based on interviews with Parents as Teachers administrators</i>	5 people
TIME STEP	.0125 months

Appendix I is a list of all the parameters in the model. These values were acquired through resources available through the Parents as Teachers website and our interviews with administrators in the organization. When certain values did not work as well to achieve desired behavior, we had to perform parameter assessment tests in order to debug our model and better prepare it to simulate.

Appendix II: Simulation Structure



Appendix II shows the simulation structure. This structure was excluded from the actual paper in order to avoid confusion with complexity of structure.

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