Application of system dynamics to inform a model of adolescent SBIRT implementation in primary care settings

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Study Design

- Multi-site cluster randomized trial
  - 7 adolescent primary care clinics in Baltimore City
  - Serving 3,600 patients ages 12-17 years
- Implementation Strategies for delivery of BI
  - Generalist
    - Primary Care Provider (PCP) conducts BI
  - Specialist
    - PCP does “warm handoff” to Behavioral Heath Counselor (BHC), who then conducts BI

Generalist *vs.* Specialist

- Generalist service delivery approach (*n* = 4)
  - Medical Assistant (MA) screens adolescent patients at all appointments
  - Enters info into Electronic Medical Record (EMR) and opens PCP response screen
  - **PCP conducts BA or BI**
    - Schedules follow-up or referral for assessment or treatment, if needed
- Specialist service delivery approach (*n* = 3)
  - MA screens adolescent patients at all appointments
  - Enters info into EMR and opens PCP response screen
  - **PCP conducts BA and does "warm handoff" to on-site BHC**
  - **BHC conducts BI**
    - Schedules follow-up or referral for assessment or treatment, if needed

SBIRT Training

- All clinical staff received training on SBIRT principles and screening process for adolescent alcohol, drug, and tobacco use, and associated HIV sexual risk behaviors
  - Conducted within each site, based on assignment to Generalist or Specialist Conditions
- PCPs and BHCs received additional BI training based on motivational interviewing

Supportive Elements

- Bi-monthly feedback on screening rates, intervention processes and model adherence
  - Email feedback through clinic managers
  - Hard copy feedback delivered to providers
- Quarterly booster trainings
  - In-person 30 minute refresher trainings
  - Walk-through numbers and trouble-shoot process

Purpose and Rationale

- System dynamics (SD) modeling was applied to help inform organizational strategies to support our understanding of effective adolescent SBIRT implementation strategies

- While both Generalist and Specialist service delivery models showed promise, SD modeling was presented as a means to foster deeper understanding about implementation outcomes

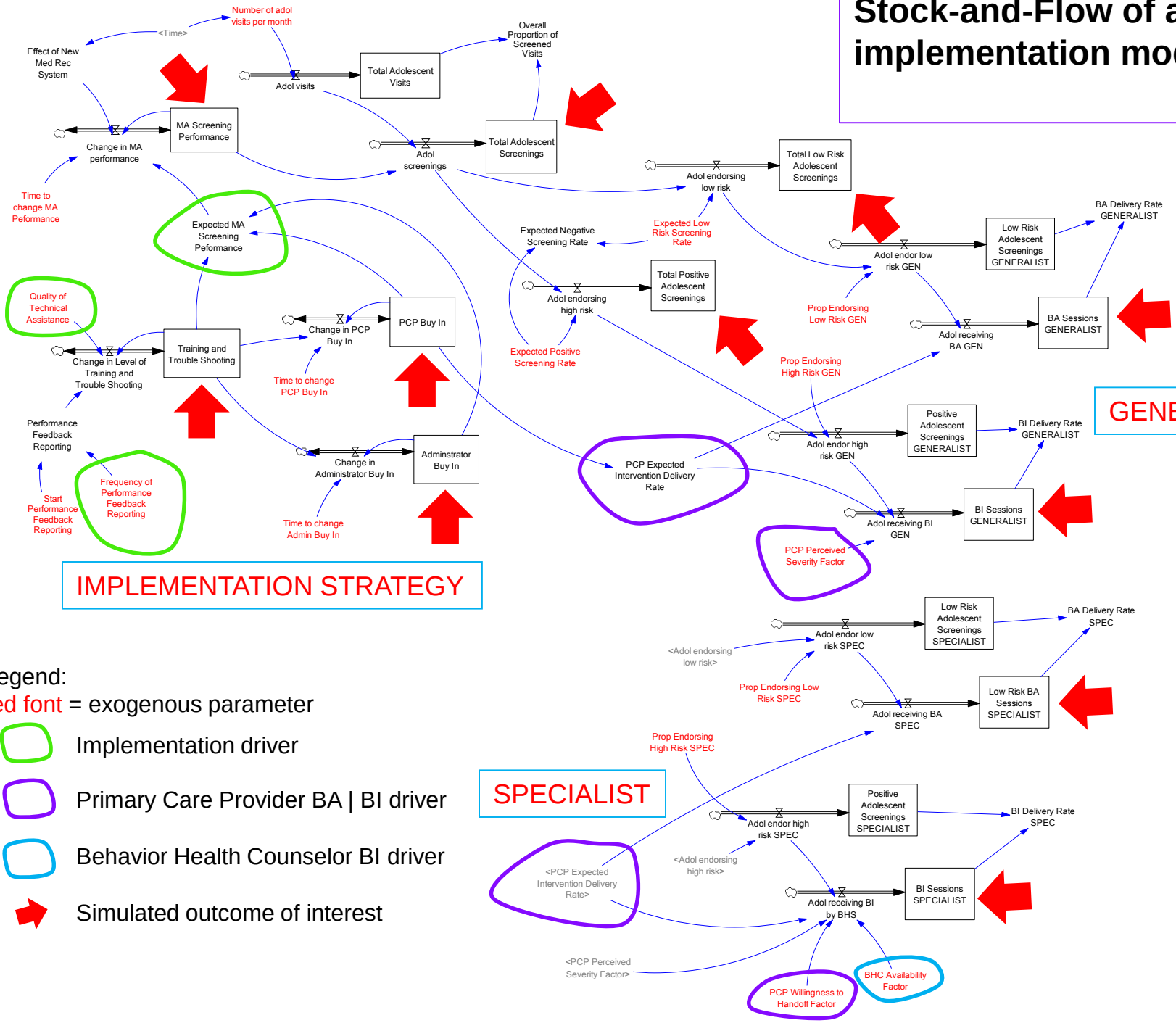
Sources of Implementation Data for SD Model

- Patient visit and screening data
  - Longitudinal (implementation period)
- Training data
  - initial and booster training sessions; longitudinal
- Staffing levels and staffing turnover
  - Longitudinal (implementation period)
- Qualitative provider interviews about knowledge of barriers and facilitators
  - baseline and follow-up (implementation and sustainability period)
- Organizational impact data
  - e.g., catastrophic breakdown of a clinic's electronic EMR

System Dynamics Modeling

- Vensim® software was used to develop the model and simulated outcomes
- Face-to-face and on-line meetings with key stakeholders were conducted to vet model's purpose and scope
- Model structure utilized first-order smooth to simulate effect of key implementation constructs:
  - Performance Feedback Reporting (PFR) rates
  - Quality of Technical Assistance (TA)

Stock-and-Flow of aSBIRT implementation model



Legend:

red font = exogenous parameter

- Implementation driver
- Primary Care Provider BA | BI driver
- Behavior Health Counselor BI driver
- Simulated outcome of interest

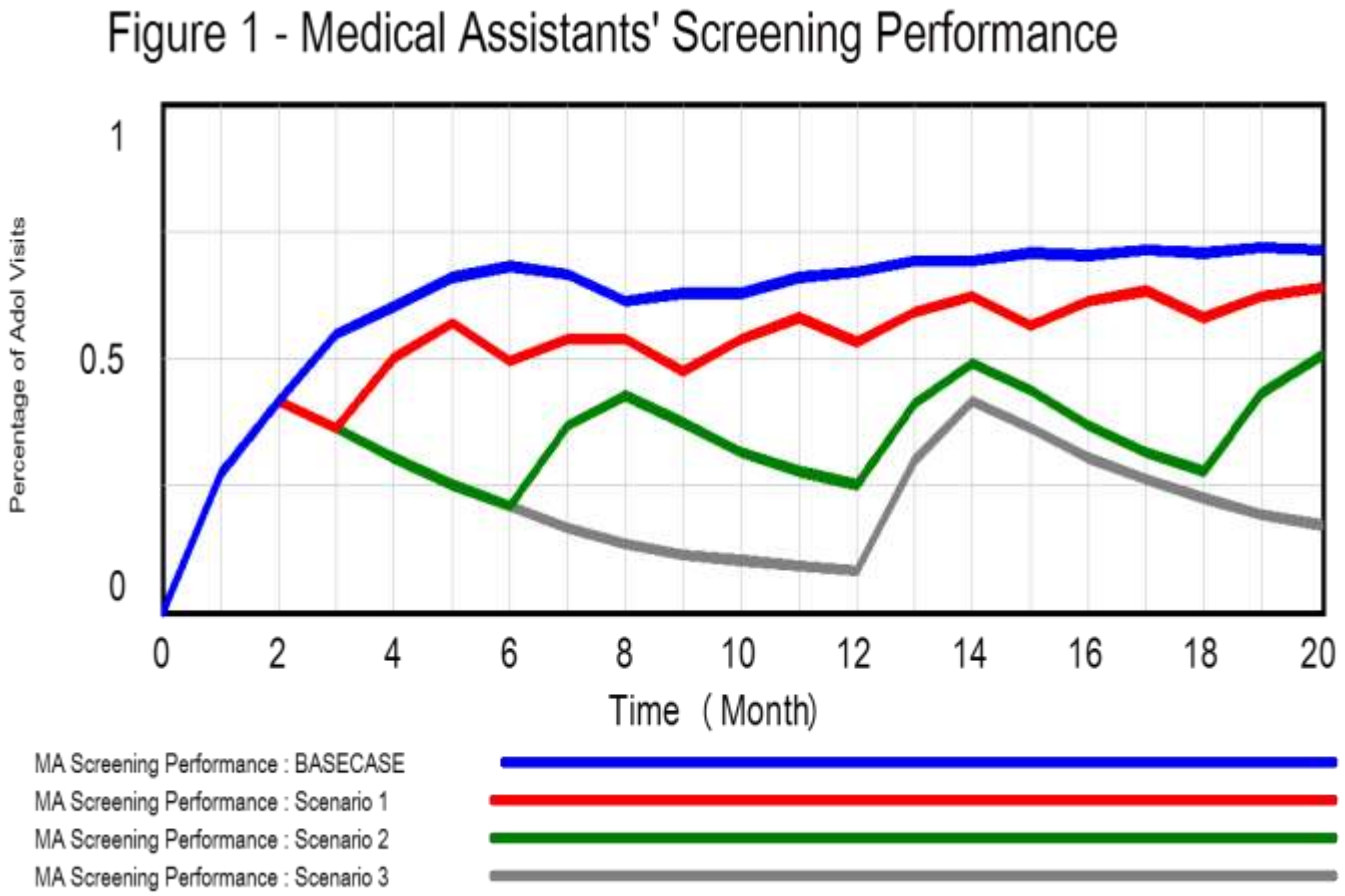
Simulated Output

- SD model structure effectively represented the SBIRT intervention
- For the 20-month implementation time horizon, basecase scenario settings were calibrated to reflect actual monthly volume of:
  - adolescent primary care visits (N=9,639)
  - screenings (N=5,937)
  - positive screenings (N=246), and
  - brief interventions (BIs; N=50) over the 20-month implementation period

Modifying Performance Feedback Reporting Rates

- Bi-monthly (basecase)
- Quarterly
- Semi-annually
- Annually

Decreasing Performance Feedback Reporting from bi-monthly to quarterly, semiannual, or annual intervals generated diminished screening patterns.

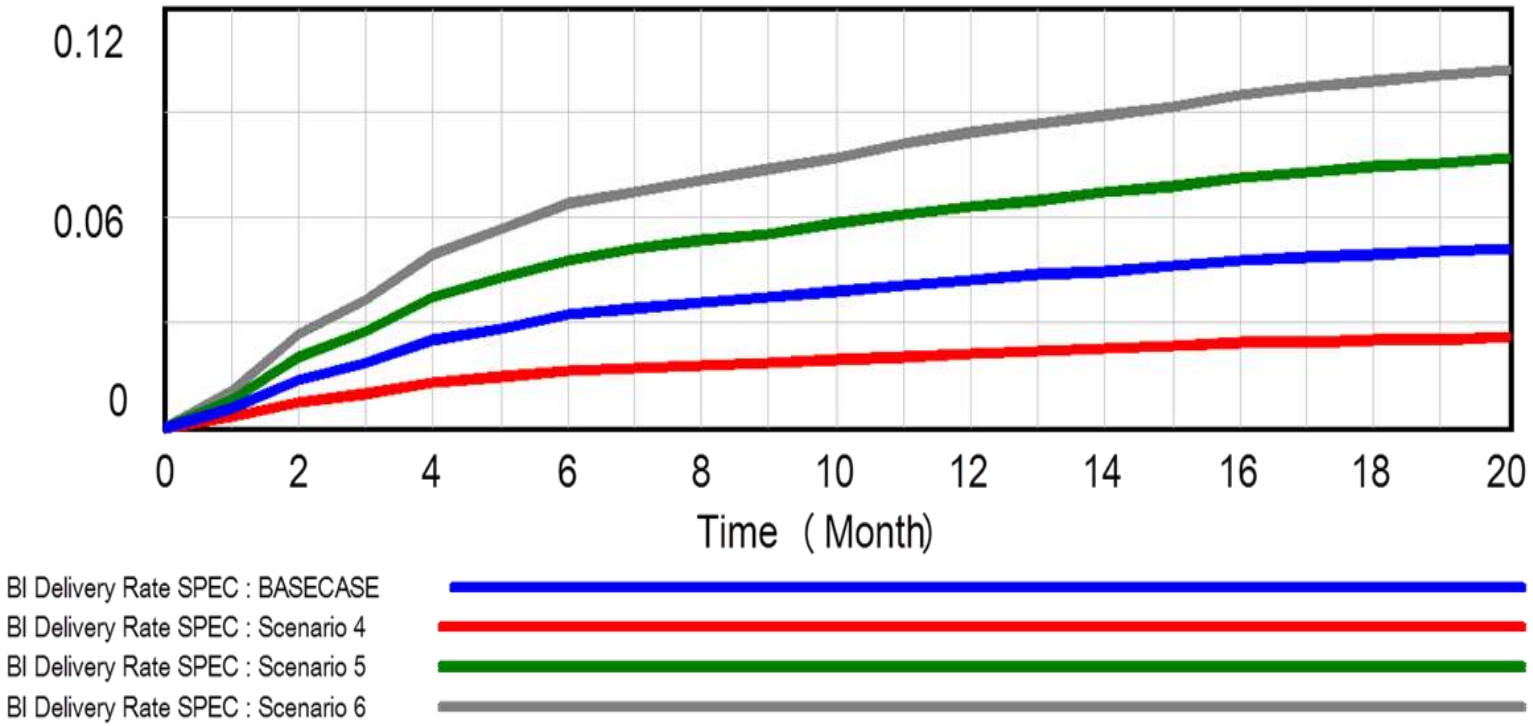


Modifying Availability of the Behavioral Health Counselor

- 25%,
- 50% (basecase)
- 75%
- 100%

Examination of BI delivery rates for the SPECIALIST condition, where availability of the Behavioral Health Counselor (BHC) varied from 25% to 100%, showed that, as expected, higher BHC availability generated higher BI delivery rates, although never exceeded 10% of positively screened adolescents.

Figure 2 - BI Delivery Rate - SPECIALIST Only



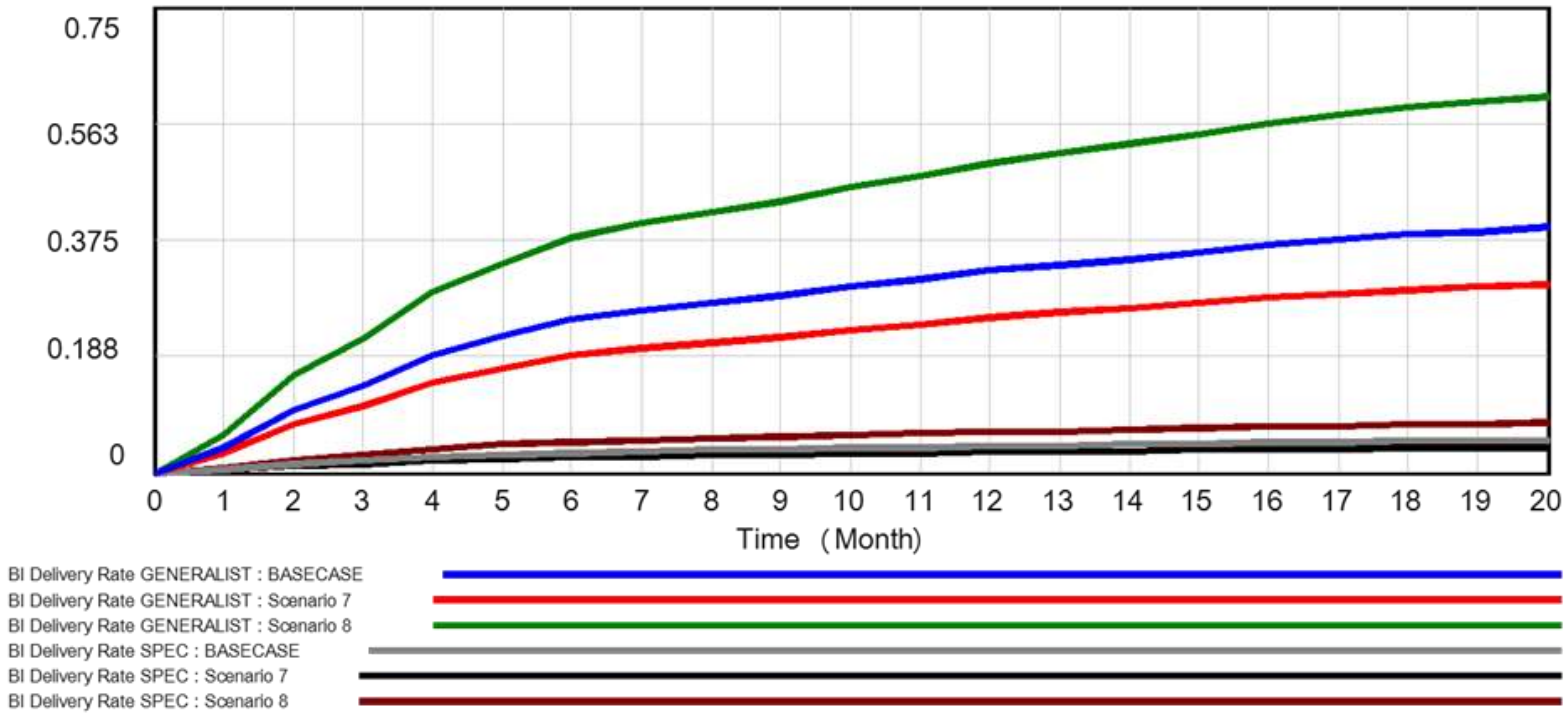
Modifying PCP Perceived Severity of Substance Use for Positive *vs* Negative Screens

- Somewhat more severe (basecase)
- Same severity
- Extremely more severe

Comparison of simulated differences in the PCP's likelihood to respond to a positive vs. a low risk adolescent patient (i.e., perceived severity) revealed high sensitivity, with BI delivery rates increasing from 39% to 61% (GENERALIST) and from 5% to 8% (SPECIALIST) by the end of the implementation period.

Results for the GENERALIST condition were substantively higher than in the SPECIALIST condition for all simulated values of PCP's perceived severity.

Figure 3 - BI Delivery Rate - GENERALIST vs. SPECIALIST



Discussion

- Implementation outcomes are sensitive to frequency of PFR, with bimonthly events generating the most rapid and sustained screening results
- Simulated trends indicate that availability of the BHC directly impacts success of the SPECIALIST model, but only slightly
- Similarly, understanding PCPs' perception of severity of need for intervention is key to outcomes in either condition
- Additional application of the SD model will explore post-implementation outcomes

Conclusions

- SD modeling is a robust method for implementation and dissemination science
  - Informed planning
  - Problem-solving
  - Monitoring strategies
- SD modeling can serve to synthesize multiple sources of information/data
- Collaborative modeling processes that begin from project inception constitutes best practice

Thank you

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