Implementation Science: Fidelity Predictions and Outcomes

Dean L Fixsen, Melissa Van Dyke, Karen A Blase

Active Implementation Research Network

Please cite as:

Fixsen, D. L., Van Dyke, M., & Blase, K. A. (2019). Implementation science: Fidelity predictions and outcomes. Chapel Hill, NC: Active Implementation Research Network. www.activeimplementation.org/resources

Implementation Science: Fidelity Predictions and Outcomes

Dean L Fixsen, Melissa Van Dyke, Karen A Blase

Active Implementation Research Network

What is science?

In his book *The Invention of Science*, Wootton (2015, p. 393) says "What makes it science is not that it provides an explanation but that it provides reliable predictions." According to Popper (1963, 2002), who defined the philosophy of science, predictions must be testable and refutable. Predictions are made in the form of if-then statements. If reliable predictions define science and testing predictions is the work of scientists, then implementation science is a science to the extent that 1) predictions are made and 2) those predictions are tested in practice.

How does science develop?

Wooton (p 393) notes that reliable predictions "move the problem of explanation to another set of factors." When testing predictions, if this is done and then that reliably occurs, then "if this" must be explained. That is, how to explain the factors that cause predictions to be valid.

Metaphorically, instead of peeling an onion, accurate predictions add layers to the onion with the realization that independent variables are dependent variables when viewed from the perspective of a higher order set of conditions.

In implementation science, every independent variable must be viewed as a dependent variable in a cascading series of causes and effects. It is ironic that implementation practice is required to produce implementation independent variables and assess their effects to advance implementation science.

What is the role of theory?

Theory is a source of predictions (if-then) and hypotheses (explanations of if-then relationships) that lead to observations to test those predictions and hypotheses. Theory is shaped by the results of prediction testing so that more precise theory-based predictions can be made and tested in the future. Theory provides explanations for predictions and concept labels for organizing discrete but related facts. Theory is generalizable and robust across variable conditions.

The Improved Clinical Effectiveness through Behavioural Research Group (2006) describes implementation frameworks such as the Active Implementation Frameworks as mid-range theories of implementation. Mid-range theories are operationalized and organize interrelated concepts that are a source of predictions.

Implementation Science

Implementation science is the study of factors that influence the full and effective use of innovations in practice. Implementation is defined as a specified set of activities designed to put into practice an activity or program of known dimensions. When thinking about implementation the observer must be aware of two sets of activities (intervention-level activity and implementation-level activity) and two sets of outcomes (intervention outcomes and implementation outcomes) (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005, p. 5).

In the descriptions provided below, the cited authors' language is used to describe innovations and implementation supports. When it is not obvious, the elements that relate to the Active Implementation Frameworks (a mid-range theory) are noted in brackets […] to provide conceptual labels and a common language to describe implementation and its effects.

Predictions

Prediction: if innovations are used as intended (i.e., with fidelity), then innovations will produce improved outcomes.

This prediction is fundamental to implementation science. If an innovation can be used a little bit or a lot or not at all and still produce intended benefits, then innovation science is sufficient and there is no need for implementation science.

In the following examples, note that the prediction that the use of innovations with fidelity improves outcomes is confirmed repeatedly in a broad range of programs, human service domains, countries, and circumstances ("generalizable and robust"). Also note the information related to how fidelity is produced and supported ("move the problem of explanation") by assuring Usable Innovations and using Implementation Drivers, Implementation Stages, Improvement Cycles, Implementation Teams, and Systemic Change (i.e., the Active Implementation Frameworks). This small sample of many studies confirms Implementation Science as a science that can help improve the wellbeing of people in every country.

Adult Mental Health

Problem: Beginning in the 1960s federal policies focused on closing down institutions where abusive practices and lack of treatment were well documented. While institutions for adult mental health patients were being closed there was not an equal emphasis on developing community-based alternatives (Stein & Santos, 1998; Test, 2010). Effective community-based intervention practices began to be developed and be supported by implementation best practices.

- **Assertive Community Treatment**: The Program of Assertive Community Treatment (PACT), a multidisciplinary team approach, delivers integrated community-based treatment, rehabilitation, and support services to help persons with severe and persistent mental illness to avoid psychiatric hospitalization and to live independently in typical community settings.
    - Twenty five randomized clinical trials of PACT and its close adaptations, conducted over three decades in several countries, demonstrate its effectiveness for this population in reducing use of inpatient psychiatric services and sustaining tenure in normalized housing (Gold et al., 2003)

    - Higher-fidelity uses of PACT had support from effective administrative and program leadership [Implementation Leadership Drivers], sound personnel practices, low staff turnover, and skilled staff [Implementation Competency Drivers], and they allocated sufficient resources in terms of staffing, office space, and cars [Implementation Organization Driver - Facilitative Administration] (Mancini et al., 2009).
- **Individual Placement and Support (Supported Employment) model**:
    - Supported employment for people with severe mental illnesses is an evidence-based practice, based on converging findings from four studies of the conversion of day treatment to supported employment and nine randomized control trials comparing supported employment to a variety of alternative approaches. The outcomes of this research suggest that about three times more recipients enrolled in supported employment obtain competitive employment compared to similar recipients who are not enrolled in supported employment (Bond, 2004).
    - Higher fidelity to the supported employment model is associated with better employment outcomes (McGrew & Griss, 2005).
    - The benefits of participation in supported employment persisted for several years with 75% of the participants continuing to work beyond the initial study period, and 33% who worked at least five years during the ensuing ten-year period (Salyers, Becker, Drake, Torrey, & Wyzik, 2004).
    - Supported employment saves $3.04 for every dollar spent to provide the individual placement and support services (http://www.wsipp.wa.gov/BenefitCost).

Fidelity, an implementation outcome, is an important contributor to the outcomes achieved for this vulnerable population. These programs are being scaled up in New York state with attention to fidelity (Covell et al., 2014) to impact the entire population of adults with severe mental health disabilities.

Delinquency

Problem: Delinquent youths have been incarcerated in abusive residential care facilities that provide little care and little hope for the future. The deinstitutionalization movement for this population left many children in foster care, mental health facilities, or on the streets (Wooten, 1976). In the ensuing decades effective innovations have been produced and supported by effective implementation.

- In a meta-analysis of 548 experimental studies, three factors emerged as major correlates of program outcomes: a "therapeutic" intervention philosophy, serving high risk offenders, and quality of implementation. With regard to implementation, "the quality with which the intervention is implemented [Fidelity] has been as strongly related to recidivism effects as the type of program, so much so that a well-implemented intervention of an inherently less efficacious type can outperform a more efficacious one that is poorly implemented" (Lipsey, 2009).

  Recidivism (delinquency) outcomes for the best most efficacious programs were two times better when used with fidelity. Outcomes for the less efficacious programs were infinitely better with an average effect size of 0.24 when used with fidelity and an average effect size of 0.00 when not used with fidelity.

- **Multisystemic therapy (MST):** MST is an evidence-based home-based treatment model for youth with serious delinquent behavior who are at high risk for out-of-home placement. With more than 100 peer-reviewed outcome and implementation journal articles published as of January 2016, the majority by independent investigators, MST is one of the most extensively evaluated family-based treatments.
    - Outcome research has yielded almost uniformly favorable results for youths and families (Henggeler & Schaeffer, 2016).
    - Implementation research has demonstrated the importance of treatment and program fidelity in achieving such outcomes, and the importance of coaching for supporting high fidelity use of MST by therapists (Schoenwald, Sheidow, & Letourneau, 2004).
    - Implementation research has demonstrated the links between organization change and high fidelity use of MST where the outcomes for youth were two times better when MST was conducted in a purposefully supportive organization context (Glisson et al., 2010).
    - MST saves $2.43 for every dollar spent to provide intensive MST services (http://www.wsipp.wa.gov/BenefitCost).

  Coaching and facilitative administrative practices support high fidelity use of effective innovations and improved outcomes for the difficult to treat population of youths in the delinquency system. Given these implementation data, MST has established "network partners" [Implementation Teams] who support the high fidelity use of MST by practitioners in the US, Canada, Europe, and Australia. A fidelity assessment for network partners has been developed (Brunk, Chapman, & Schoenwald, 2014).

    - For network partners in the top quartile, nearly three times more of their treatment teams provided sustained services that were two times more effective in terms of youth outcomes when compared to the network partners in the lowest quartile. MST used with fidelity is more effective and high fidelity supports for MST by network partners magnifies those outcomes (Brunk et al., 2014).

- **The Teaching-Family Model:** The model developed "regional partners" called Teaching-Family Sites [Implementation Teams] and developed a fidelity assessment for Sites that support high fidelity use of the Teaching-Family Model by practitioners (Blase, Fixsen, & Phillips, 1984).
    - With Implementation Teams embedded in each Site, treatment program sustainability for five or more years increased from 23% to 84% (Fixsen & Blase, 2018).
    - The time to develop a Teaching-Family Site was reduced by about half while the success of developed Sites almost doubled (Fixsen & Blase, 2018).
    - The use of the treatment model was scaled and sustained for over 50 years with a focus on Site Development [Implementation Teams] and fidelity assessment at the Site and practitioner levels provided by the Teaching-Family Association (Fixsen & Blase, 2018).

Health – Tuberculosis (TB)

Problem: The drugs required to cure TB must be taken on schedule each day for the prescribed number of days. Failure to follow the regimen results in relapse and the development of a more virulent and drug resistant strain of TB.

- **The Directly Observed Treatment System (DOTS)**: DOTS was developed by the global health community to help assure high fidelity intake of the medications. The DOT system engages neighbors to visit TB patients at the assigned times to visually witness the ingestion of the medications [Fidelity].

  The DOT system is effective but not easy to use in practice. Diagnosis requires multiple visits to a health facility. Use of microscopy requires trained technicians, a regular supply of reagents of good quality, a satisfactory microscope, and, ideally, a reliable electricity supply. Treatment requires the availability of a range of drugs for at least six months. Minor adverse effects of drugs are common. Recordkeeping is simple but requires training and supervision. Thus, although TB control is inexpensive and effective, it is more complex than some other public health programmes, e.g., immunization (Khatri & Frieden, 2002).

  - In 1998 India established clinics and included DOTS in their treatment for rural populations. After four years the clinics reached nearly 1 million people with TB and saved 200,000 lives (Khatri & Frieden, 2002).
  - Khatri and Frieden (2002) describe how DOTS [Fidelity] depends on (1) getting the science right and ensuring technical excellence [Usable Innovation], (2) building commitment and ensuring the provision of funds and flexibility in their utilization [Exploration and Installation Stages]; (3) maintaining focus and priorities [Leadership]; (4) systematically appraising each area before starting service delivery [Exploration Stage]; (5) ensuring an uninterrupted drug supply [Facilitative Administration]; (6) strengthening the established infrastructure and providing support for staff [Implementation Drivers]; (7) supporting the infrastructure required in urban areas [Leadership]; (8) ensuring full-time independent technical support and supervision, particularly during the initial phases of implementation [Initial Implementation Stage; Implementation Drivers]; (9) monitoring intensively and giving timely feedback [Fidelity; Decision Support Data System; Improvement Cycles]; and (10) continuous supervision [Coaching].

Health – Neonatal and Maternal Care

Problem: The most efficient and cost-effective way to address pediatric Human immunodeficiency virus (HIV) globally is to reduce mother-to-child transmission (MTCT) (World Health Organization, 2006). However, little is known about the coverage of services required to prevent transmission of HIV from mother to child.

- **Nevirapine**: WHO has recommended Nevirapine (NVP) for single-dose prophylaxis to reduce the risk of MTCT (World Health Organization, 2006). All clinical sites in identified African countries used at least single-dose nevirapine to prevent mother-to-child HIV transmission and some sites used additional prophylaxis drugs. Population nevirapine coverage was measured in a random sample of 43 clinics. High fidelity use was defined as the proportion of HIV-

exposed infants in the sample with both maternal nevirapine ingestion (confirmed by cord blood chromatography) and infant nevirapine ingestion (confirmed by direct observation).
    - Using fidelity of the use of nevirapine as a metric, the authors found only 51% coverage for at risk babies across the participating countries (Stringer, Ekouevi, Coetzee, & et al., 2010).

Problem: Neonatal death remains a global challenge contributing to 45% of all under-five deaths (Das et al., 2018). With rising institutional delivery intended to accelerate a decline in neonatal mortality rate (NMR), improvement in the quality of perinatal care requires attention.

- The intervention package included improving facility readiness for newborn care [Exploration Stage], training of the birth attendants (on essential newborn care and newborn resuscitation using the modified three days module), establishment of skill laboratories for practice (four units in each district) and supportive supervision [Implementation Drivers]. All the birth attendants in the district including the doctors, nurses, and auxiliary nurse midwives (ANMs) were trained on essential newborn care and newborn resuscitation using the modified three days module. The supporting team members at these facilities, including the pharmacy, store, data, supervision, and administrative team members, were also orientation on the system strengthening components directed at perinatal and newborn care [Systemic Change] (Das et al., 2018).
    - The results showed there was marked improvement in newborn service availability: skilled birth attendants (51%), resuscitation (30%), and kangaroo mother care (27%) at these facilities. A multifold rise in newborn resuscitation efforts and documentation (n = 4431 post intervention vs. n = 144 in preintervention period) with high success rate (98.6%) was observed. There also was improvement in obstetric care services including partograph use (31%) and active management of third stage of labor (46%). However, several infrastructure indicators (electricity, water supply, toilets, and sanitation) remained unchanged (Das et al., 2018).

Problem: As per the World Health Organization, the maternal mortality ratio estimates ranged from 3 per 100,000 live births in Finland, Greece, Iceland, and Poland to 1,360 per 100,000 live births in Sierra Leone in 2015 (World Health Organization, 2015). Attention needs to be paid to improve the quality of services so that these disparities are reduced globally.

- **Basic Emergency Obstetric and Newborn (BEmONC):** BEmONC is a primary health care level initiative promoted in low- and middle-income countries to reduce maternal and newborn mortality. Access to BEmONC has improved but the quality of the services provided is still lacking.
    - Tailored support, including BEmONC training to providers, mentoring [Coaching] and monitoring [Fidelity] through supportive supervision [Coaching], provision of equipment and supplies, strengthening referral linkages [Facilitative Administration], and improving infection-prevention practice [Training, Coaching], was provided in a package of interventions to 134 health centers, covering 91 rural districts of Ethiopia to improve timely BEmONC care (Tiruneh et al., 2018).
    - The BEmONC implementation strength index score [Fidelity], with index scores that range between 0 to 10, increased significantly from 4.3 at baseline to 6.7 at follow-up. Correspondingly, the health center delivery rate more than doubled (24% to 56%). For

every unit increase in BEmONC implementation strength score [Fidelity] there was a corresponding average of 4.5 percentage points increase in facility-based deliveries. In addition, a higher score for BEmONC implementation strength [Fidelity] of a health facility at follow-up was associated with a higher met need (Tiruneh et al., 2018).

Problem: In low resource settings handwashing with soap is an existing but erratic practice. About 25% of residents washed their hands with soap after defecation and cleaning a child's anus and fewer than 1% washed their hands before preparing food. Open defecation is not extensively practiced by adults; around 11% found ever practiced during baseline. However, only about half the population has access to improved sanitation facilities that hygienically separate human excreta from human contact. Malnutrition in Bangladesh is still high and estimated that approximately 36% of children under 5 are stunted (Masud Parvez et al., 2018)

- **Water, Sanitation, Handwashing (WSH) and Child Nutrition Interventions**: Community health workers (CHWs) delivered individual and combined water, sanitation, handwashing (WSH) and child nutrition interventions to 4,169 enrolled households in geographically matched clusters. Households received free enabling technologies [Facilitative Administration; Technical Leadership] (insulated water storage container; sani-scoop, potty, double-pit, pour-flush latrine; handwashing station, soapy-water storage bottle), and supplies (chlorine tablets, lipid-based nutrient supplements, laundry detergent sachets) integrated with parallel behavior-change promotion. Behavioral objectives were drinking treated and safely stored water, safe feces disposal, handwashing with soap at key times, and age-appropriate nutrition behaviors [Usable Innovation].
    - Surveys administered monthly and spot-checks at households [Fidelity] from randomly selected clusters were conducted for six months early in the trial. If any fidelity measures fell below set benchmarks, a rapid response mechanism was triggered [Improvement Cycles] to improve fidelity (Rahman et al., 2018).
    - In the first three months, functional water seals were detected [Fidelity] in 33% (14/42) of latrines in the sanitation only arm; 35% (14/40) for the combined WSH arm; and 60% (34/57) for the combined WSH and Nutrition arm, all falling below the pre-set benchmark of 80%. Other fidelity indicators met the 65 to 80% uptake benchmarks.
    - Rapid qualitative investigations determined that households concurrently used their own latrines with broken water seals in parallel with those provided by the trial. In consultation with the households, the researchers closed pre-existing latrines without water seals, increased the community health workers' visit frequency to encourage correct maintenance of latrines with water seals, and discouraged water-seal removal or breakage [Improvement Cycles].
    - At the sixth assessment, 86% (51/59) of households in sanitation only; 92% (72/78) in the combined WSH; and 93% (71/76) in the combined WSH and Nutrition arms had latrines with functional water seals (i.e., fidelity more than doubled in each arm of the trial) (Rahman et al., 2018).

Education

Problem: Education outcomes in the U.S. have remained virtually unchanged since the 1960s, hovering around a mediocre mean literacy score of 215 on a 500-point scale for 9-year old children. At 9 years old, children who have not learned to read will struggle to read to learn throughout their

education and subsequent careers. The mediocre mean literacy score of 215 for generations of children has sustained in spite of decades of massive investments in improvement initiatives at local, state, and federal levels and investments in educational research and evidence-based interventions.

- **Building Implementation Capacity in State Education Systems:** The U.S. Department of Education Office of Special Education Programs funded a National Implementation Team to develop implementation capacity in state education systems to support the use of evidence-based instruction in classrooms. Predictions based on the Active Implementation Frameworks were made in the context of designing an approach that included the development of linked Implementation Teams and use of Systemic Change methods.
    - The National Implementation Team set a benchmark at 60% for "acquisition" of implementation knowledge, skills, and abilities and at 80% for "proficiency" of state Implementation Teams developed and embedded in state education systems (Fixsen et al., 2018; Ryan Jackson et al., 2018).
    - In Study 1 (2008-2012), engagement in implementation and scaling capacity development was conducted in five states. The work ended by mutual agreement in two states after 20 and 23 months (States 2 and 3 respectively). Semi-annual State Capacity Assessment (SCA) scores in those two states were under 30%. SCA scores in State 1 remained low at about 20% for all five years. SCA scores in States 4 and 5 improved over five years from baseline scores in the 20-40% range to the 60% acquisition benchmark after 45 months. SCA scores at or above 60% sustained for two consecutive administrations (one year) for one state (State 4).
    - In Study 2 (2013-2017) with five more state education systems, the National Implementation Team used improved methods learned during Study 1 [Improvement Cycles] to produce relatively rapid and reliable development of implementation capacity. Each state moved from baseline scores in the 20 – 40% range and reached the 60% acquisition goal within 24 months. The 80% proficiency goal was approached (e.g., 75% or more) by the 36-month mark.
    - The data are a) the first repeated assessments of state capacity development in education, b) the first to show that purposeful development of implementation capacity is possible in complex state education systems, c) the first to show the deliberate use of data-based Improvement Cycles by a National Implementation Team so that effectiveness and efficiency increased from one cohort to the next, and d) the first to show that purposeful capacity development can be replicated across state departments of education that are unique and highly variable with respect to history, size, and operations.
    - The predictions built into the design generally were supported by outcomes in the tenth year of this research.

In 2018 the Carnegie Foundation recognized this program as a national example of education improvement and invited presentations to the Carnegie Board of Directors and to Congressional Committees to "spotlight" the seminal contributions to education.

Results of Poor Fidelity

The lack of predicted outcomes in large scale studies point to lack of attention to providing implementation supports for fidelity of the use of innovations as the problem.

- In education, $2 billion spent over five years to support the use of evidence-based programs in 8,000 schools produced no difference in student outcomes. In one of the few evaluations at this scale that included measures of implementation factors, the researchers assessed fidelity and the supports for teachers' use of the evidence-based programs in the schools. The authors found the teachers were not supported with adequate training and coaching and high fidelity use of the programs occurred in only 10% of the schools (Vernez, Karam, Mariano, & DeMartini, 2006).
- In another example, a study of facilitation of the use of evidence-based programs in 24 long-term nursing care sites [Systemic Change] in four European countries found no difference in use of those programs (Seers et al., 2018). Post hoc analyses found it was likely because the researchers did not provide adequate implementation supports for high fidelity use of the prescribed facilitation strategies (Harvey, McCormack, Kitson, Lynch, & Titchen, 2018).

These are two examples of many studies such as these dating back several decades (Rossi & Wright, 1984; Watkins, 1995) and the problem is not going away. Kruk et al. (2018) conducted an extensive analysis of data from the 2016 Global Burden of Disease study. They calculated mortality amenable to personal health care for 61 United Nations Sustainable Development Goals conditions by comparing case fatality between each LMIC (low or middle-income country) with corresponding numbers from 23 high-income reference countries with strong health systems.

- 15.6 million excess deaths from 61 conditions occurred in LMICs in 2016. After excluding deaths that could be prevented through public health measures, 8.6 million excess deaths were amenable to health care of which 5.0 million were estimated to be due to receipt of poor-quality care and 3.6 million were due to non-utilisation of health care.
- Poor quality of health care [Fidelity] was a major driver of excess mortality across conditions, from cardiovascular disease and injuries to neonatal and communicable disorders.

Fidelity matters when attempting to improve outcomes and the investment must be made in Implementation Teams who have the expertise to improve fidelity and, therefore, outcomes.

References

Blase, K. A., Fixsen, D. L., & Phillips, E. L. (1984). Residential treatment for troubled children: Developing service delivery systems. In S. C. Paine, G. T. Bellamy, & B. Wilcox (Eds.), *Human services that work: From innovation to standard practice* (pp. 149-165). Baltimore, MD: Paul H. Brookes Publishing.

Bond, G. R. (2004). Supported employment: evidence for an evidence-based practice. *Psychiatric Rehabilitation Journal, 27*(4), 345.

Brunk, M. A., Chapman, J. E., & Schoenwald, S. K. (2014). Defining and evaluating fidelity at the program level: A preliminary investigation. *Zeitschrift für Psychologie, 222*, 22-29. doi:10.1027/2151-2604/a000162

Covell, N. H., Margolies, P. J., Myers, R. W., Ruderman, D., Fazio, M. L., McNabb, L. M., . . . Dixon, L. B. (2014). State Mental Health Policy: Scaling Up Evidence-Based Behavioral Health Care Practices in New York State. *Psychiatric Services, 65*(6), 713-715. doi:10.1176/appi.ps.201400071

Das, M., Chaudhary, C., Mohapatra, S., Srivastava, V., Khalique, N., Kaushal, S., . . . Chatterji, S. (2018). Improvements in essential newborn care and newborn resuscitation services following a capacity building and quality improvement program in three districts of Uttar Pradesh, India. *Indian Journal of Community Medicine, 43*(2), 90-96. doi:10.4103/ijcm.IJCM_132_17

Fixsen, D. L., & Blase, K. A. (2018). The Teaching-Family Model: The First 50 Years. *Perspectives on Behavior Science*. doi:10.1007/s40614-018-0168-3

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M., & Wallace, F. (2005). *Implementation research: A synthesis of the literature*: National Implementation Research Network, University of South Florida, www.activeimplementation.org.

Fixsen, D. L., Ward, C., Ryan Jackson, K., Blase, K., Green, J., Sims, B., . . . Preston, A. (2018). *Implementation and Scaling Evaluation Report: 2013-2017*. Retrieved from National Implementation Research Network, State Implementation and Scaling up of Evidence Based Practices Center, University of North Carolina at Chapel Hill:

Glisson, C., Schoenwald, S. K., Hemmelgarn, A., Green, P., Dukes, D., Armstrong, K. S., & Chapman, J. E. (2010). Randomized trial of MST and ARC in a two-level evidence-based treatment implementation strategy. *Journal of Consulting & Clinical Psychology, 78*(4), 537-550.

Gold, P. B., Meisler, N., Santos, A. B., Keleher, J., Becker, D. R., Knoedler, W. H., . . . Stormer, G. (2003). The program of assertive community treatment: Implementation and dissemination of an evidence-based model of community-based care for persons with severe and persistent mental illness. *Cognitive and Behavioral Practice, 10*(4), 290-303.

Harvey, G., McCormack, B., Kitson, A., Lynch, E., & Titchen, A. (2018). Designing and implementing two facilitation interventions within the 'Facilitating Implementation of Research Evidence (FIRE)' study: a qualitative analysis from an external facilitators' perspective. *Implementation Science, 13*(1), 141. doi:10.1186/s13012-018-0812-z

Henggeler, S. W., & Schaeffer, C. M. (2016). Multisystemic Therapy®: Clinical Overview, Outcomes, and Implementation Research. *Family Process, 55*(3), 514-528. doi:10.1111/famp.12232

Improved Clinical Effectiveness through Behavioural Research Group. (2006). Designing theoretically-informed implementation interventions. *Implementation Science, 1*(4).

Retrieved from http://auraserv.abdn.ac.uk:9080/aura/bitstream/2164/114/1/Iceberg2952.pdf.
Khatri, G. R., & Frieden, T. R. (2002). Rapid DOTS expansion in India. *Bulletin of the World Health Organization, 80*(6), 457-463.
Kruk, M. E., Gage, A. D., Joseph, N. T., Danaei, G., García-Saisó, S., & Salomon, P. J. A. (2018). Mortality due to low-quality health systems in the universal health coverage era: a systematic analysis of amenable deaths in 137 countries. *The Lancet, 392*(10160). doi:https://doi.org/10.1016/S0140-6736(18)31668-4
Lipsey, M. W. (2009). The primary factors that characterize effective interventions with juvenile offenders: A metaanalytic overview. *Victims and Offenders, 4*, 124-147. doi:10.1080/15564880802612573
Mancini, A. D., Moser, L. L., Whitley, R., McHugo, G. J., Bond, G. R., Finnerty, M. T., & Burns, B. J. (2009). Assertive community treatment: facilitators and barriers to implementation in routine mental health settings. *Psychiatric Services, 60*(2), 189-195.
Masud Parvez, S., Azad, R., Rahman, M. M., Unicomb, L., Ram, P., Naser, A. M., . . . P. Luby, S. (2018). Achieving optimal technology and behavioral uptake of single and combined interventions of water, sanitation hygiene and nutrition, in an efficacy trial (WASH benefits) in rural Bangladesh. *Trials, 19*(358). doi:10.1186/s13063-018-2710-8
McGrew, J. H., & Griss, M. E. (2005). Concurrent and predictive validity of two scales to assess the fidelity of implementation of supported employment. *Psychiatric Rehabilitation Journal, 29*(1), 41-47.
Popper, K. (1963). *Conjectures and refutations: The growth of scientific knowledge*. New York: Harper Torchbooks.
Popper, K. (2002). *The logic of scientific discovery*. New York: Routledge.
Rahman, M., Ashraf, S., Unicomb, L., Mainuddin, A. K. M., Parvez, S. M., Begum, F., . . . Winch, P. J. (2018). WASH Benefits Bangladesh trial: system for monitoring coverage and quality in an efficacy trial. *Trials, 19*(1), 360. doi:10.1186/s13063-018-2708-2
Rossi, P. H., & Wright, J. D. (1984). Evaluation Research: An Assessment. *Annual Review of Sociology, 10*, 331-352.
Ryan Jackson, K., Fixsen, D., Ward, C., Waldroup, A., Sullivan, V., Poquette, H., & Dodd, K. (2018). *Accomplishing effective and durable change to support improved student outcomes*. Retrieved from National Implementation Research Network, University of North Carolina at Chapel Hill:
Salyers, M. P., Becker, D. R., Drake, R. E., Torrey, W. C., & Wyzik, P. F. (2004). A ten-year follow-up of a supported employment program. *Psychiatric Services, 55*(3), 302-308.
Schoenwald, S. K., Sheidow, A. J., & Letourneau, E. J. (2004). Toward effective quality assurance in evidence-based practice: Links between expert consultation, therapist fidelity, and child outcomes. *Journal of Clinical Child & Adolescent Psychology, 33*(1), 94-104.
Seers, K., Rycroft-Malone, J., Cox, K., Crichton, N., Edwards, R. T., Eldh, A. C., . . . Wallin, L. (2018). Facilitating Implementation of Research Evidence (FIRE): an international cluster randomised controlled trial to evaluate two models of facilitation informed by the Promoting Action on Research Implementation in Health Services (PARIHS) framework. *Implementation Science, 13*(1), 137. doi:10.1186/s13012-018-0831-9
Stein, L. I., & Santos, A. B. (1998). *Assertive Community Treatment of Persons with Severe Mental Illness.* New York: Norton.

Stringer, E. M., Ekouevi, D. K., Coetzee, D., & et al. (2010). Coverage of nevirapine-based services to prevent mother-to-child hiv transmission in 4 African countries. *JAMA, 304*(3), 293-302. doi:10.1001/jama.2010.990

Test, M. A. (2010). History of ACT. Retrieved from http://www.actassociation.org/origins/

Tiruneh, G. T., Karim, A. M., Avan, B. I., Zemichael, N. F., Wereta, T. G., Wickremasinghe, D., . . . Betemariam, W. A. (2018). The effect of implementation strength of basic emergency obstetric and newborn care (BEmONC) on facility deliveries and the met need for BEmONC at the primary health care level in Ethiopia. *BMC Pregnancy and Childbirth, 18*(1), 123. doi:10.1186/s12884-018-1751-z

Vernez, G., Karam, R., Mariano, L. T., & DeMartini, C. (2006). *Evaluating comprehensive school reform models at scale: Focus on implementation*. Retrieved from Santa Monica, CA: http://www.rand.org/

Watkins, C. L. (1995). Follow Through: Why didn't we? *Effective School Practices, 15*(1), 57-66.

Wooten, K. (1976). *Weeping in the playtime of others: America's incarcerated children*: Ohio University Press.

Wootton, D. (2015). *The invention of science: A new history of the scientific revolution*. New York: Harper Collins.

World Health Organization. (2006). *Antiretroviral Therapy of HIV Infection In Infants And Children: Towards Universal Access Recommendations for a Public Health Approach*. Retrieved from https://www.who.int/hiv/pub/guidelines/paediatric020907.pdf?ua=1

World Health Organization. (2015). *Trends in maternal mortality: 1990 to 2015: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division*. Retrieved from http://apps.who.int/iris/bitstream/10665/194254/1/9789241565141_eng.pdf?ua=1.