



DEFENSE CENTERS
OF EXCELLENCE

For Psychological Health
& Traumatic Brain Injury

Analyzing Program Evaluation Data: How to Interpret Quantitative Data on Processes and Outcomes

Capt. Armen H. Thoumaian, Ph.D., USPHS

Richard Best, Ph.D.

Carter Frank, M.A., M.S.

Carmina Aguirre, M.A.

May 19, 2014



Webinar Details

- This webinar presentation has been pre-recorded
- A live question-and-answer session will be held at the conclusion of the presentation
- Questions may be submitted anonymously at any time via the “Question” pod
- Audio for this presentation will be provided through Adobe Connect; there is no separate dial-in
- Live closed captioning is available in the “Closed Captioning” pod through Federal Relay Conference Captioning

Materials for Download

- Materials from this series and other program evaluation resources are available in the “Files” pod and at:

http://www.dcoe.mil/About_DCoE/Program_Evaluation.aspx

- For information on other DCoE webinar and training series, visit:

http://www.dcoe.mil/Training/Monthly_Webinars.aspx

Continuing Education Details

- This continuing education activity is provided through collaboration between DCoE and Professional Education Services Group (PESG).
- DCoE's awarding of continuing education (CE) credit is limited in scope to health care providers who actively provide psychological health and traumatic brain injury care to active-duty U.S. service members, reservists, National Guardsmen, military veterans and/or their families.
- The authority for training of contractors is at the discretion of the chief contracting official. Currently, only those contractors with scope of work or with commensurate contract language are permitted in this training.

Continuing Education Details (continued)

- If you wish to obtain a CE certificate or a certificate of attendance, you must complete the online CE evaluation.
- After the webinar, visit <http://dcoe.cds.pesgce.com> to complete the online CE evaluation, and download your CE certificate/certificate of attendance.
- The CE evaluation will be open through Tuesday, May 26, 2015.

Presenter

Capt. Armen Thoumaian, Ph.D., USPHS **Deputy Chief of the Office of Integrated Services , DCoE**

Capt. Armen Thoumaian is a scientist director in the Commissioned Corps of the U.S. Public Health Service (USPHS) with more than 30 years experience in health and mental health program design and evaluation.

In January 2012, Capt. Thoumaian joined the staff at the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) to help design and implement program evaluation and improvement efforts in the Defense Department.

He holds a B.A. in psychology and sociology, an M.A. in general experimental psychology, and a Ph.D. in social welfare and social work, and has completed a National Institute of Mental Health fellowship in Community Mental Health.



USPHS Capt. Armen Thoumaian, Ph.D.

Presenters

Richard Best, Ph.D.

Research Scientist, Contract Support for DCoE

Dr. Richard Best is an industrial and organizational (I/O) psychologist with 14 years of experience conducting health services research in both the Veterans Health Administration and the Defense Department's Military Health System. He has extensive experience in research design, qualitative and quantitative data collection and analysis, and collaborating with clinical experts to translate research results into actionable recommendations. Dr. Best holds a M.S. and Ph.D. in I/O psychology and is certified in Prosci's Change Management Process.



Dr. Richard Best

Carter Frank, M.A., M.S.

Research Scientist, Contract Support for DCoE

Mr. Carter Frank has over 15 years of experience in program development and management at local, regional and national levels. The breadth of his 33-year career includes 11 years of military service, spans military and civilian environments, clinical and non-clinical mental health operations, training, human resource management, business development and government contracting. Mr. Frank holds a B.S. in mathematical sciences, a M.A. in counseling, and a M.S. in management information systems. He is a licensed clinical professional counselor.



Mr. Carter Frank

Moderator

Carmina Aguirre, M.A.

Research Scientist, Contract Support for DCoE

Ms. Carmina Aguirre has over 14 years of experience within the Defense Department. Her background includes executive leadership, psychological health, sexual assault prevention and response, and public affairs. In addition to supporting DCoE, she serves as Chief of Public Affairs in the Florida Air National Guard. Ms. Aguirre holds a B.A. in psychology and a M.A. in human services with a specialization in executive leadership.



Ms. Carmina Aguirre

Overview and Objectives

This training presentation will provide an in-depth description of how to analyze and interpret quantitative program data on processes and outcomes. Quantitative data include numeric responses to questionnaires, learning assessments, and structured screening protocols.

- At the conclusion of this webinar, participants will be able to:
 - Explain key types of quantitative analysis used in program evaluation
 - Demonstrate basic knowledge of how to use program data to examine process and outcome metrics
 - Perform basic quantitative analyses and interpret quantitative findings
 - Select and implement strategies to address common challenges related to quantitative data analysis

Agenda

- Introduction to Quantitative Data Analyses
- Process Analyses
- Outcome Analyses
- Common Challenges
- Conclusion
- Resources
- Feedback and Q&A Session

Introduction to Quantitative Data Analysis



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

What Do the Data Have to Say?

“Numbers have an important story to tell.
They rely on you to give them a voice.”

-Stephen Few

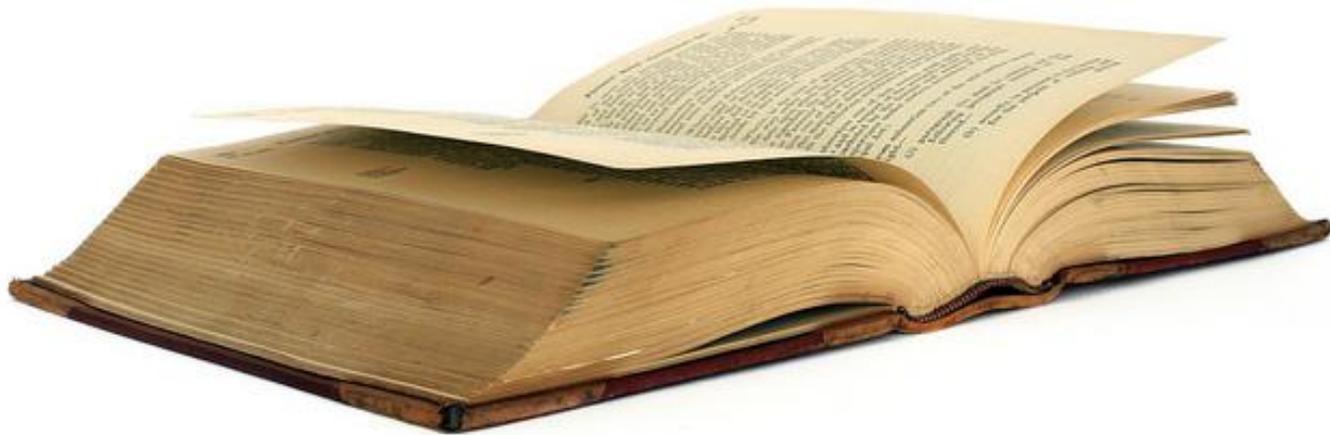
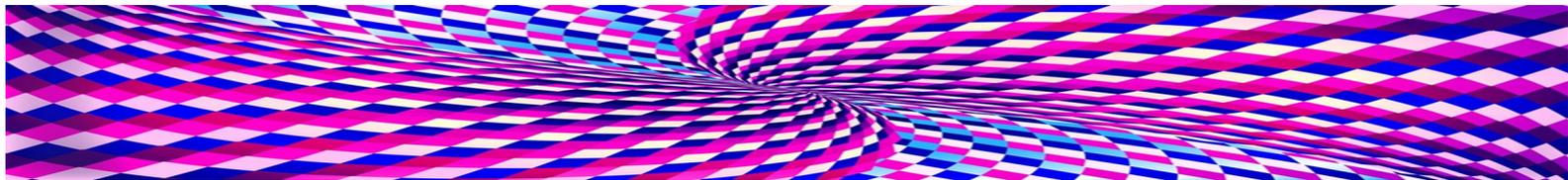


Image courtesy of Brenda Clarke

What Is Data Analysis, and Why Is It Important?

- Data analyses will help you summarize important evaluation information and help you present information to your stakeholders
- Unless you measure and analyze data, there is no way to tell how well a program is working
- Data analyses allow you to describe information, detect patterns, develop explanations and test hypotheses



Prepare Data for Analysis

To begin, organize data and compare response to ensure the data are ready for the next step in analysis:

- Develop standard operating procedures (SOPs) for “missing” or “not applicable” responses
- Tabulate data on a question-by-question basis
- Recode data
 - Ensure data have the same meaning
 - Address “small cell” issue (< 5 per cell)
- Look at summary results for each item

Descriptive Statistics

Use descriptive statistics to:

- Describe the data
 - Counts (frequencies, percentages)
 - Central tendency (mean, median, mode)
 - Variability (range, standard deviation, variance)
- Determine the most appropriate analysis for the evaluation questions
- Identify data entry errors, incomplete data or outliers
- Determine whether statistical assumptions are met (e.g., normal distribution)
- Influence the type of inferential analyses to be performed

Frequencies and Percentages

- Frequency counts
 - A frequency count tells us “how many”
 - Counts often serve as the basis for other calculations, such as for percentages
- Percentages
 - Use the correct denominator for percentages
 - Round percentages to the fewest decimals needed (17.6 versus 17.5714)
 - Add percentages only when categories are mutually exclusive
 - Do not add percentages to obtain an average percentage across groups

Central Tendency: Mean, Median, Mode

Understand what is typical for your participants

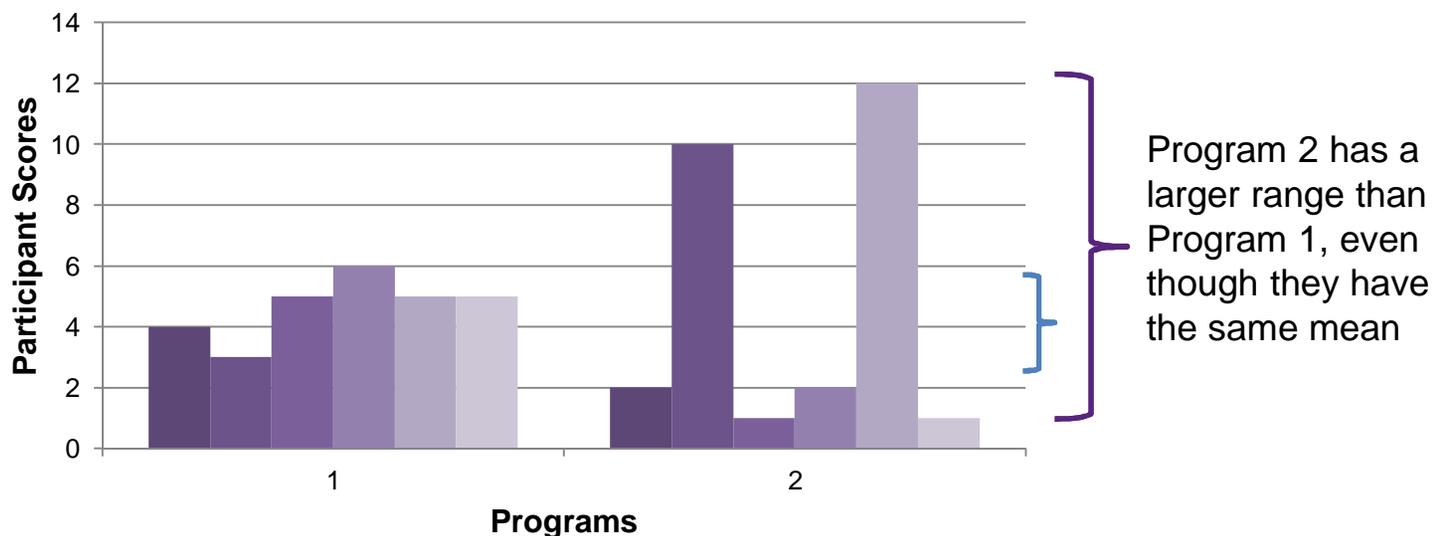
Mean = the average; sum of all answers or scores divided by the total number of participants

Median = the middle value or mid-point; half of the values are above and half fall below

Mode = the most commonly occurring value

Variability: Range

Understand how much your data differ

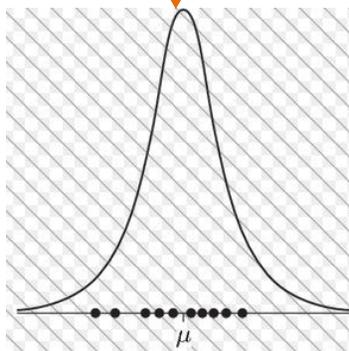


A range provides the difference between the lowest and highest scores

Variability: Standard Deviation

Standard deviation (SD) is the degree to which individual values vary from the mean. It is the average distance that scores lie from the mean

A small SD indicates responses are similar to the mean



A large SD means responses vary greatly from the mean

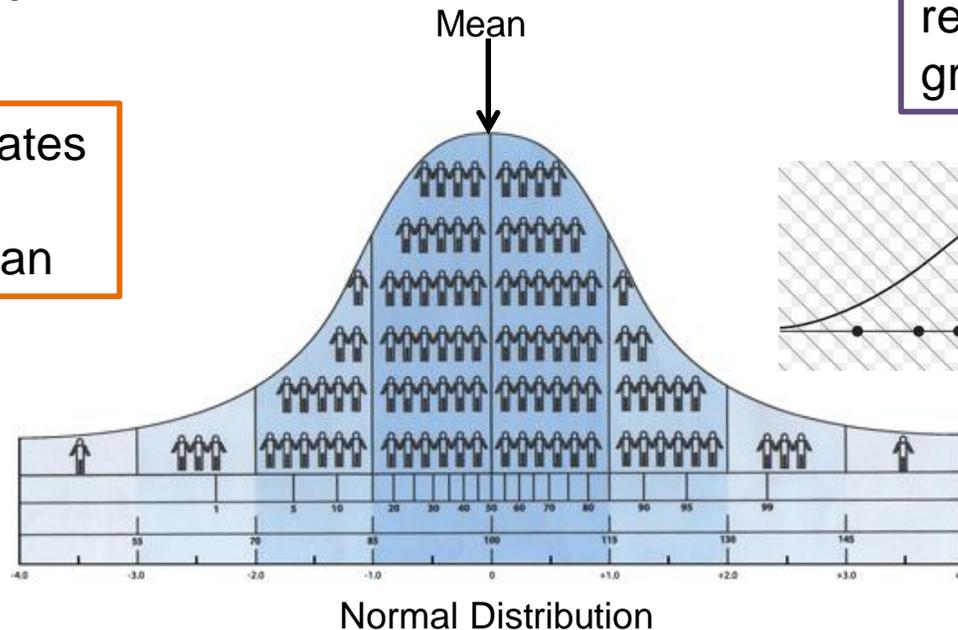
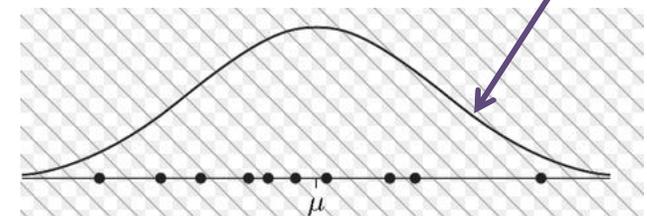


Image sources: <http://www.home-speech-home.com/speech-therapy-resources.html>
<http://systmic.ac.uk/textbook/3.4-introducing-confidence-intervals.html>

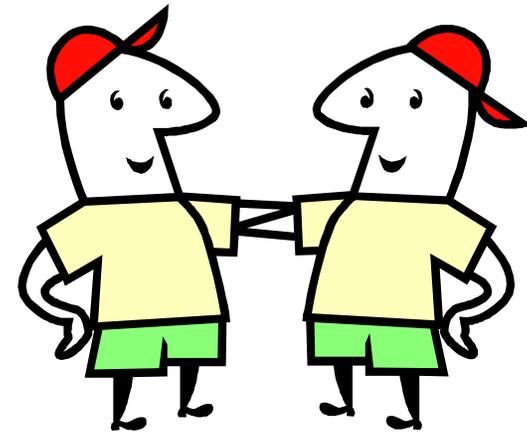
Inferential Statistics



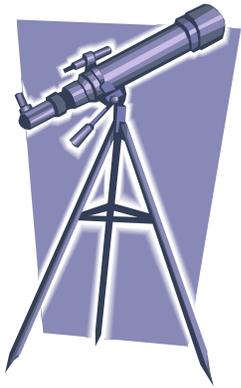
- Inferential statistics help determine whether:
 - a change or outcome is meaningful or significant
 - a change is specifically related to program activities
 - the findings of a sample can be generalized to larger populations
- They can also be used to assess the probability of certain findings

Comparison Groups

- Comparison groups may be used to establish that participant changes were the result of your program's intervention and not some other factor
- In the best case scenario, members of comparison groups are similar to your participants in every way except for program participation
- Statistical procedures can be used to compare groups with respect to age, gender, race, ethnicity and other characteristics



Examine Patterns in the Data



- Create charts, tables, lists and graphs
- View the findings from different perspectives
- Create crosstabs
- Highlight significant findings



Inputs Required for Data Analysis



- Training in administration of the measure
- Spreadsheet or database for data entry and storage
- Training for data entry
- Data analysis software (e.g., Excel, SPSS, Stata, SAS, R)
- Personnel to conduct data collection and/or data analyses
- Funding to support the evaluation effort
- Time to conduct the evaluation effort

Process Analysis



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Components of Process Analysis

- Resources (e.g., facilities, staffing, space)
- Barriers (e.g., inadequate funding, space, training or staff numbers)
- Services/activities (e.g., clinical, outreach, education, research)
- Exposure (e.g., population exposed to program, recruitment/retention strategy)
- Context (e.g., environment)

Process Categories and Associated Metrics

Process Categories:

- **Participation** – track calls to helpline, session attendance, target population, participant demographics, participant referral source
- **Program Satisfaction** – track satisfaction ratings, likelihood of referring others to the program
- **Activities** – track frequency and length of each activity, number and type of each activity, number of sessions held, number of referrals made

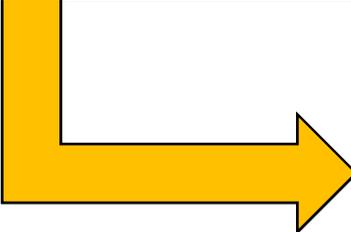
Process Questions

Core Question:

- Was the program implemented with fidelity?

Other Questions of Interest:

- How does the program operate?
- What is the program expected to achieve?
- How is the program expected to accomplish what it has set out to achieve?
- How do participants perceive the program?



How do these processes affect program outcomes?

Process Analysis Example

Mission: At Program Sierra, we seek to ensure that service members who are wounded, ill or injured successfully reintegrate into civilian life or return to duty in the military. By performing our mission effectively, we hope to enhance force readiness and improve the quality and efficiency of services across the Defense Department.



DoD photo by Pat Cubal

Process Analysis Example: Key Evaluation Questions

Key evaluation questions:

- Was Program Sierra implemented with fidelity?
 - How much of the target population are we reaching?
 - What are the demographic characteristics of Program Sierra's participants?
 - How satisfied are the participants with Program Sierra's services?
- What should be improved or changed in Program Sierra to enhance its quality and effectiveness?

Process Analysis Example: Process Metrics

Evaluation Question: Was Program Sierra Implemented with Fidelity?

Metrics	Implementation	Currently	Degree of Change
Coverage	What percent of the target population was covered by Program Sierra at implementation?	What percent of the target population is currently being covered by Program Sierra?	Has coverage increased, decreased or remained unchanged? Why?
Content	What activities were conducted?	What activities are currently being conducted?	Are the same activities being conducted that were implemented?
Frequency	How frequently were activities being conducted at implementation?	How frequently are activities currently being conducted?	Has the frequency of each activity remained the same or changed over time?
Duration	What was the duration of each activity at program implementation?	What is the duration of each activity currently?	Has the duration of each activity remained the same or changed over time?

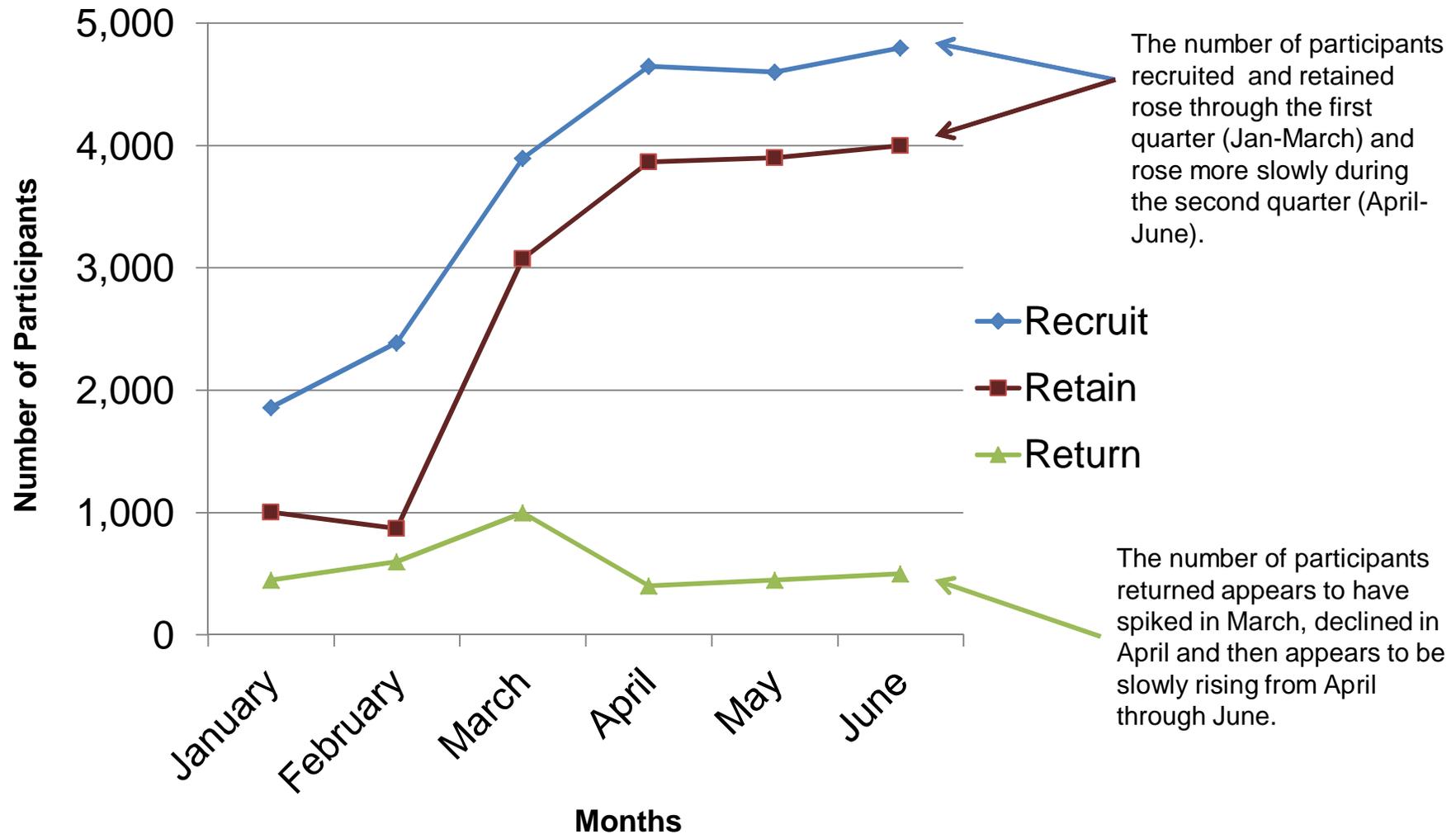
Process Analysis Example: Coverage and Participant Demographics

	Target Population	Participant Population	
	Number (N)	Number (n)	Percent (%)
Demographics			
Total	29,694	25,931	87
Service Branch			
Active Duty	22,959	19,915	87
National Guard	3,481	3,251	93
Reserve	3,254	2,765	85
Participant Sex			
Males	22,271	20,744	93
Females	7,423	5,187	70

Program is reaching only 87% of the target population

Program is reaching only 70% of females

Process Analysis Example: Recruitment, Retention and Return Trends



Process Analysis Example: Participant Satisfaction

How satisfied were program participants with the services offered?

Satisfaction Response Options	Number (n)	Percentage (%)
Extremely	3,890	15
Very	7,779	30
Neither Satisfied or Dissatisfied	1,297	5
Somewhat	5,186	20
Not at all	6,483	25
No response/Missing	1,297	5
Total	25,932	100

Only 45% of program participants were very or extremely satisfied with the services offered.

50% of program participants were not at all, somewhat or neither satisfied or dissatisfied with the services offered

Low number of non-responses does not present a concern.

Process Analysis Example: Frequency of Program Activities Over Time

Activity	Implementation	Currently	Was there a change?	Reason(s) for change
Psychological health screening	Every visit	Initial visit & every 60 days	Yes	Scientific evidence
Outreach	3 times per week	3 times per week	No	N/A
Resilience Education	Every visit	Every visit	No	N/A
Research	None	Annually	Yes	Compare participant outcomes to baseline

Program started comparing participant outcomes to baseline scores to determine effectiveness

No changes occurred from implementation to currently therefore providing a reason is not applicable.

Program changed the frequency of their program activity because of scientific updates

Connecting Processes to Outcomes

- Determines extent to which outcomes may be affected
- Fidelity has impact on program success
- Moderates intervention and program outcomes
- Prevents false conclusions about program effectiveness

PROCESSES  OUTCOMES

Outcome Analysis



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

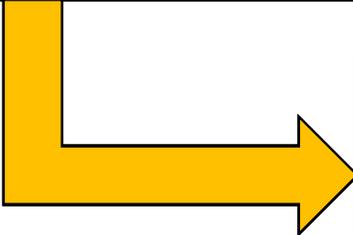
Use Outcome Evaluation Questions to Guide Program Improvements

Core Question:

- Did the program achieve its intended outcomes?

Other Questions of Interest:

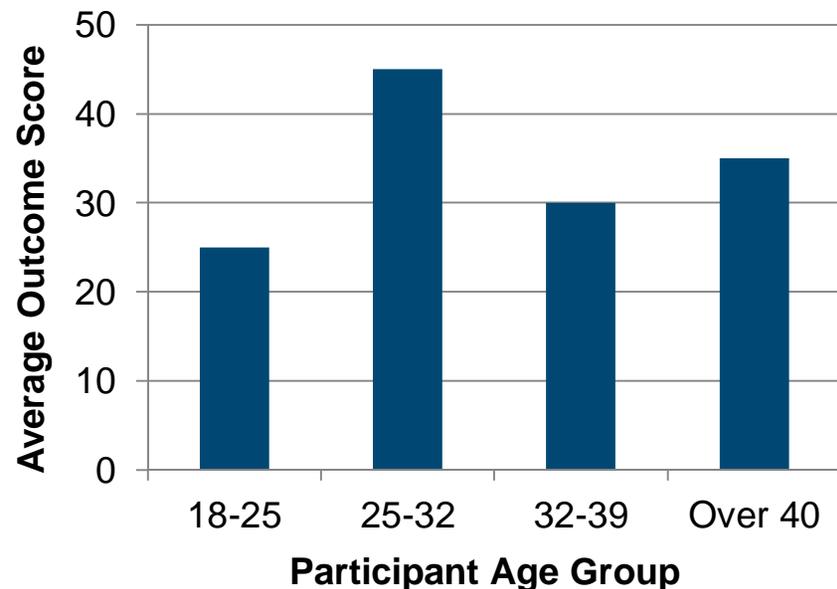
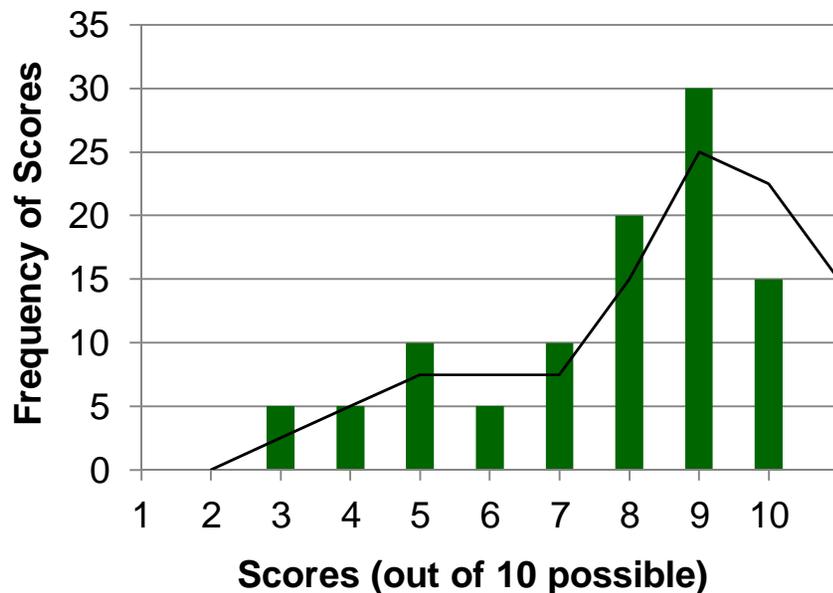
- Did outcomes vary by sub-population or intervention group?
- Did any unexpected positive effects occur as a result of program activities?
- Were there any unintended negative outcomes?



What should be improved or changed in the program?

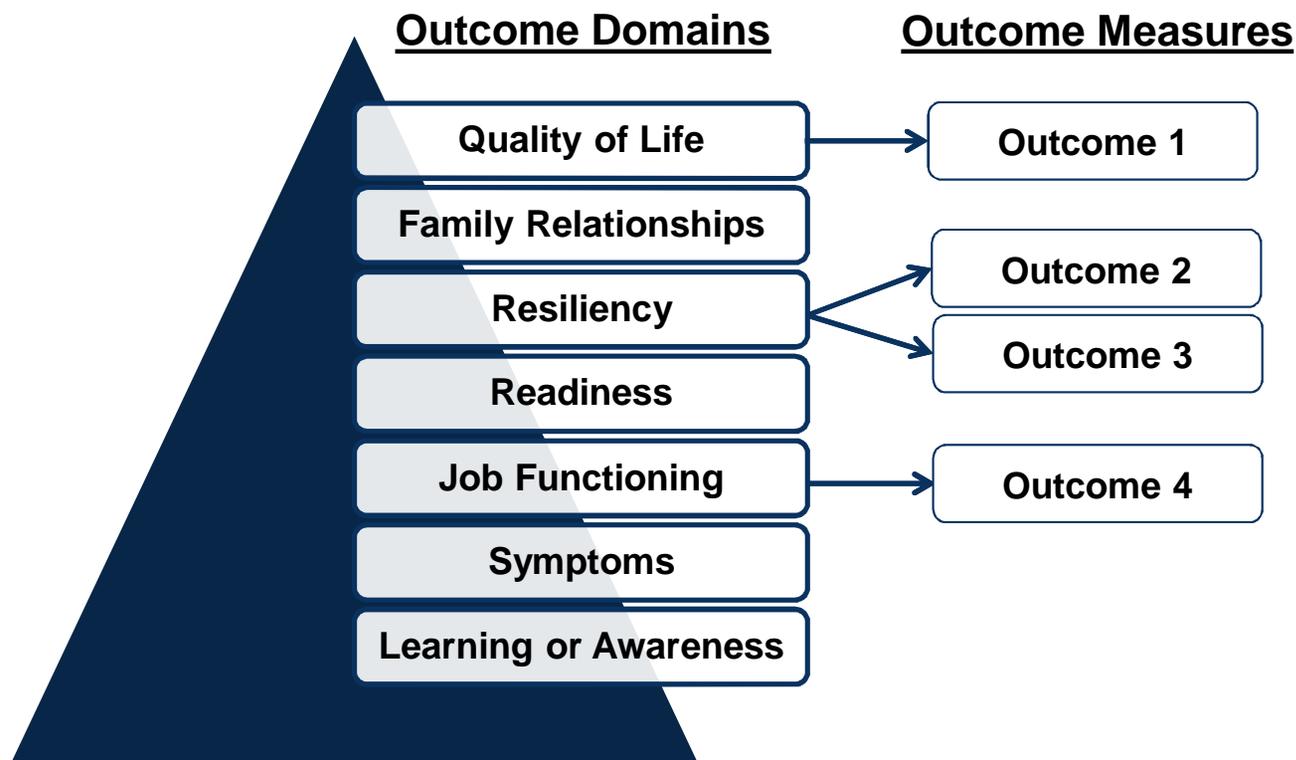
Begin by Describing Outcome Data

Examine descriptive statistics, such as response frequency, group averages and variability to learn about the characteristics of outcome data



Conduct Analyses to Address Key Outcome Evaluation Questions

Core Question for Outcome Evaluations:
Did the program achieve its intended outcomes?



Compare Measured Outcomes to Stated Objectives

To determine whether desired outcomes are achieved, it is necessary to:

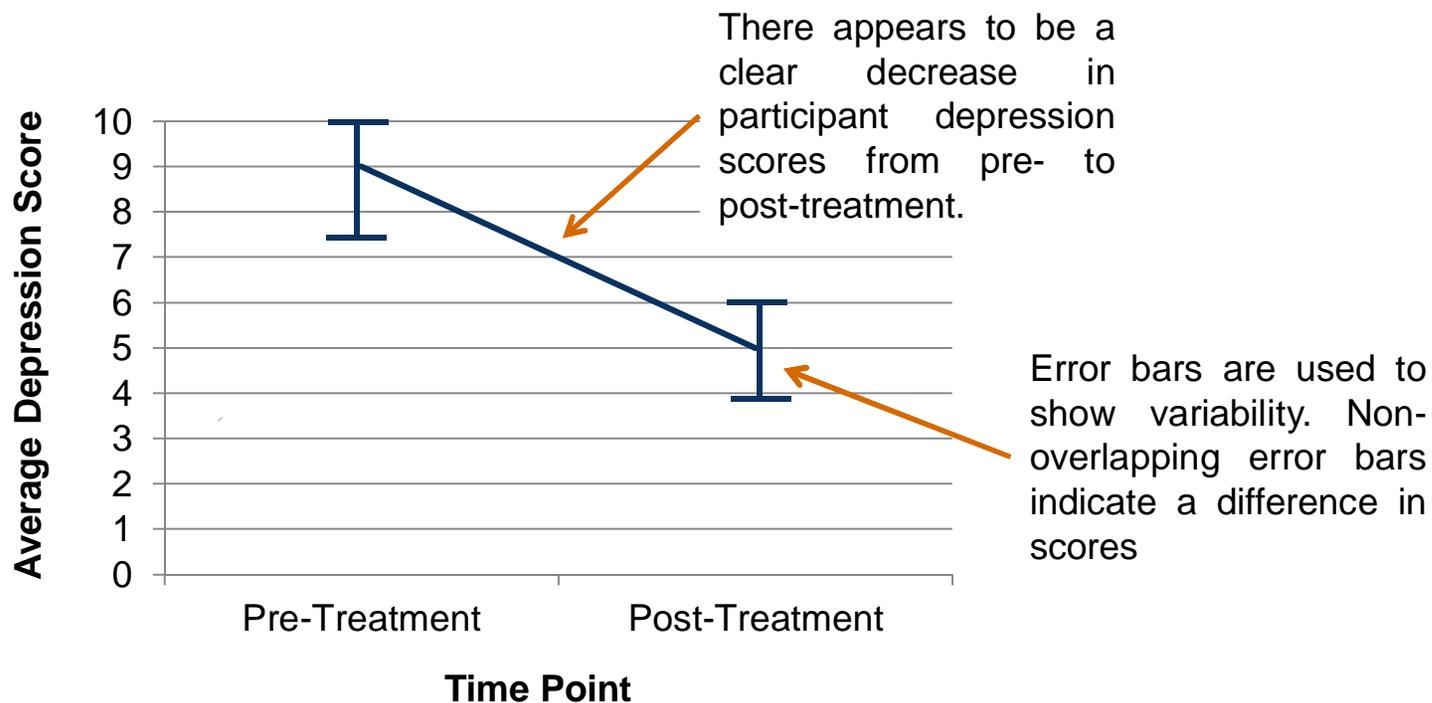
- Start with SMART objectives (Specific, Measurable, Achievable, Relevant, Time-Bound)
- Directly compare measured outcomes to stated objectives

**MEASURED
OUTCOMES = STATED
OBJECTIVES ?**

Compare Measured Outcomes to Stated Objectives: Clinical Example

Objective: Program participants will exhibit reduced depression symptoms from pre- to post-treatment

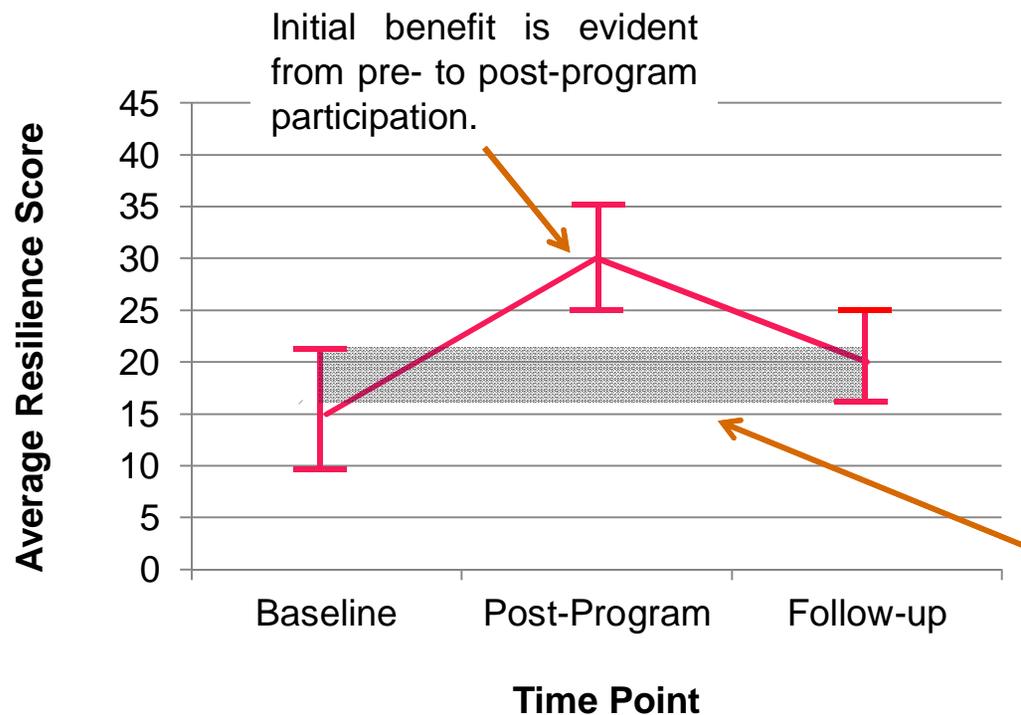
Measured Outcome: On average, depression scores decreased from 9 to 5



Compare Measured Outcomes to Stated Objectives: Non-Clinical Example

Objective: Program participants will demonstrate improved resilience from baseline to post-program and will be maintained at 6-month follow-up

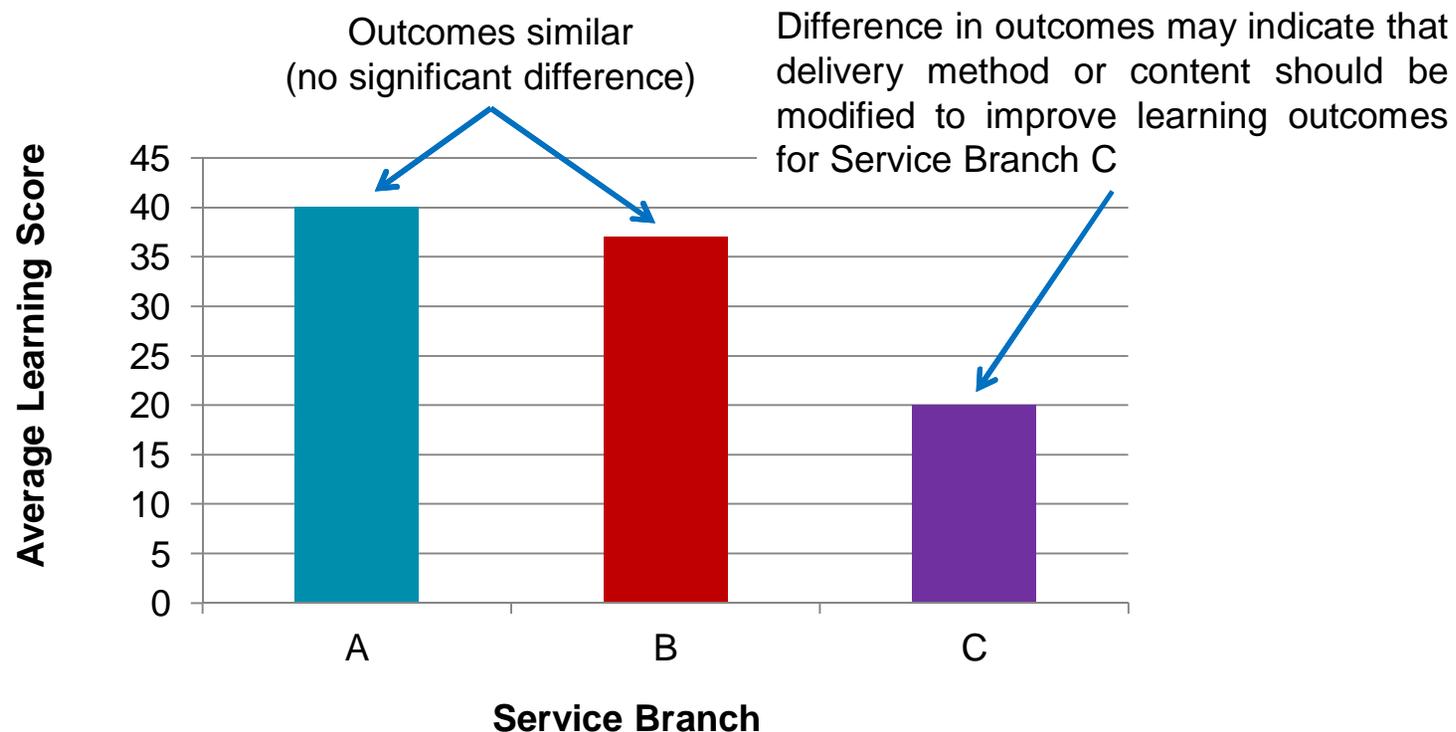
Measured Outcome: On average, resilience ratings increased from 15 to 30, but then declined to 20



Overlap in error bars at baseline and follow-up indicates that benefit is not sustained over time.

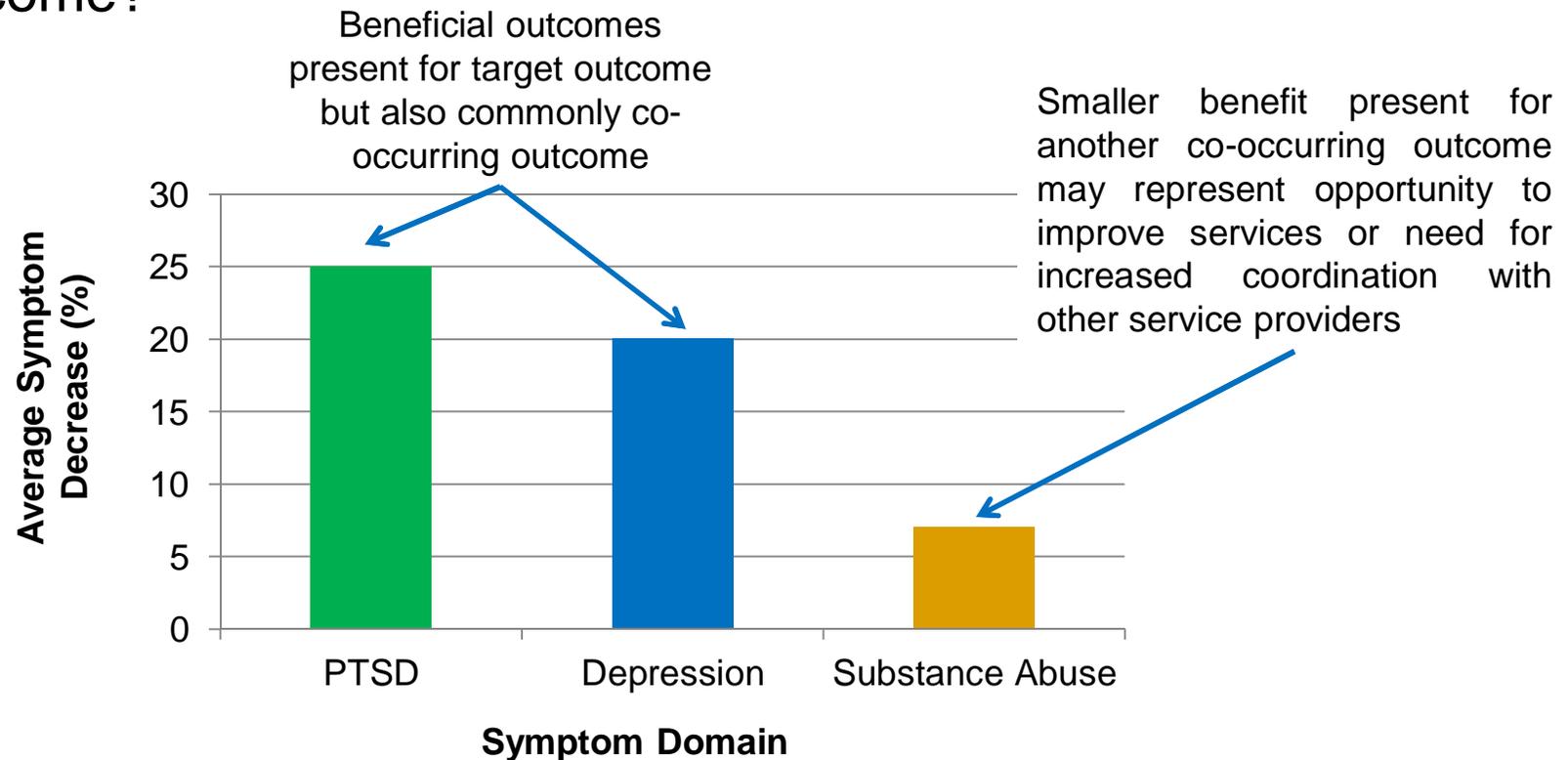
Use Outcome Evaluation Questions to Guide Program Improvements: Non-Clinical Example

Consider a non-clinical program focused on increasing learning among personnel from different service branches. What does it mean if outcomes vary by sub-population?



Use Outcome Evaluation Questions to Guide Program Improvements: Clinical Example

Consider a clinical program focused on decreasing post-traumatic stress disorder (PTSD) symptoms. What does it mean if effects are or are not present for outcomes other than target outcome?



Summarize Outcomes for Stakeholders

An effective summary of outcomes for stakeholders will convey information about:

- Whether intended outcomes were achieved and how program administrators know they were achieved
- Target outcomes as well as other outcomes of interest to stakeholders (e.g., readiness)
- Areas of strength and areas in which improvements could be made
- Planned changes to improve outcomes and program quality in the future

Common Challenges



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Common Challenges FAQ

- How can I assess program fidelity when I have limited information from program initiation?
- How can I conduct process and outcome analyses with limited resources?
- How do I conduct analyses for a program that has many separate but interrelated components?

How Can I Assess Program Fidelity When I Have Limited Information From Program Initiation?

- Some information may be available from historical records, former program personnel or service-level databases
- It may be necessary to re-initiate a program with updated mission, goals and objectives to serve as a baseline for future evaluations
 - Revisit the evidence basis for the program, because more up-to-date information about effective practices may be available
 - Also revisit the need for the program and population served, which are likely to have changed over time

How Can I Conduct Process and Outcome Analyses With Limited Resources?

- Process and outcome analyses are an important investment in a program's future by determining effectiveness and opportunities for improvement
- Descriptive analyses can go a long way toward answering evaluation questions and can be performed using common software applications such as Microsoft® Excel
- Incorporate process and outcome evaluations into standard operations, if possible
- Keep it simple – start with a straightforward evaluation question, such as how many participants did the program provide services to during a specified timeframe

How Do I Conduct Analyses for a Program That Has Many Separate but Interrelated Components?

- It is important to measure processes and outcomes in as much detail and as accurately as possible
- Specific analyses will depend upon the goals of the evaluation process
 - It may be beneficial to examine whether specific components are associated with specific outcomes, based on the program's logic model
 - Likewise, it will be beneficial to examine whether specific program components are implemented with fidelity
- Broader analyses of processes or objectives are often useful in conveying the value of the program as a whole

Conclusion



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Key Takeaways

- ★ Programs can use data analysis strategies to provide evidence of a program's effectiveness
- ★ Data analysis can also be used to establish the degree to which a program's inputs, activities, and outputs contribute to its outcomes
- ★ Analyses of program processes and outcomes can guide program improvements



Photo by: Stewart Leiwakabessy

References and Resources



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

References and Resources

Administration for Children and Families, Office of Planning, Research and Evaluation (2010). *The program manager's guide to evaluation* (2nd ed.). Retrieved from U.S. Department of Health and Human Services website:

<http://www.acf.hhs.gov/programs/opre/resource/the-program-managers-guide-to-evaluation-second-edition>

Centers for Disease Control and Prevention (2011). *Introduction to program evaluation for public health programs: A self-study guide*. Retrieved from: <http://www.cdc.gov/eval/guide/>

Agency for Healthcare Research and Quality: <http://www.qualitymeasures.ahrq.gov>

American Evaluation Association: <http://www.eval.org/>

Centers for Disease Control and Prevention, Program Performance and Evaluation Office: <http://www.cdc.gov/program/>

Center for Quality Assessment and Improvement in Mental Health: <http://www.cqaimh.org/NIMHQM.htm>

DCoE Program Evaluation: http://www.dcoe.mil/About_DCoE/Program_Evaluation/Resources_and_Training.aspx

Defense and Veterans Brain Injury Center: <http://dvbic.dcoe.mil/>

Deployment Health Clinical Center: <http://www.pdhealth.mil/>

Minnesota Department of Health, Quality Improvement Toolbox: <http://www.health.state.mn.us/divs/opi/qi/toolbox/>

National Center for PTSD: <http://www.ptsd.va.gov/professional/assessment/overview/index.asp>

National Institutes of Health Toolbox: <http://www.nihtoolbox.org/>

National Quality Forum: www.qualityforum.org/Measures_Reports_Tools.aspx

References and Resources (continued)

Substance Abuse and Mental Health Services Administration, National Behavioral Health Quality Framework:

<http://www.samhsa.gov/data/national-behavioral-health-quality-framework>

University of Kansas, Community Toolbox: <http://ctb.ku.edu/en>

University of Wisconsin-Extension: www.uwex.edu/ces/pdande

U.S. Army Public Health Command, Behavioral and Social Health Outcomes Program (BSHOP):

<http://phc.amedd.army.mil/topics/healthsurv/bhe/Pages/BehavioralandSocialHealthOutcomesProgram%28BSHOP%29Services.aspx>

U.S. Department of Veterans Affairs, Health Services Research & Development: <http://www.hsrp.research.va.gov/>

References and Recommended Reading

- Bond, G.R. Drake, R.E., McHugo, G.J., & Whitley, R. (2009). Strategies for improving fidelity in the National Evidence-Based Practices Project. *Research on Social Work Practice, 19*, 569-581.
- Carroll, C., Patterson, M., Wood, S., Booth, A., Rick, J., & Balain, J. (2007). A conceptual framework for implementation fidelity. *Implementation Science, 2*, 1-9.
- Cellini, S.R., & Kee, J.E. (2010). Cost-effectiveness and cost-benefit analysis. In J.S. Wholey, H.P. Hatry, & K. E. Newcomer (Eds.), *Handbook of Practical Program Evaluation, 3rd Ed.* (pp. 493-530) San Francisco, CA: Jossey-Bass.
- Gold, M.R., Siegel, J.E., Russel, L.B., & Weinstein, M.C. (Eds). (1996). *Cost-effectiveness in health and medicine.* (1996). Oxford, UK: Oxford University Press.
- Hasson, H. (2010). Systematic evaluation of implementation fidelity of complex interventions in health and social care, *Implementation Science, 5*, 1-9.
- Orwin, R.G. (2000). Assessing program fidelity in substance abuse health services research. *Addiction, 95*, S309-S327.
- U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (2006). *Guide to analyzing the cost-effectiveness of community public health prevention approaches* (Project No. 0208827). Retrieved from <http://aspe.hhs.gov/health/reports/06/cphpa/report.pdf>
- Yates, B. (1999). *Measuring and improving cost, cost-effectiveness, and cost-benefit for substance abuse treatment programs: A manual.* Bethesda, MD: National Institute on Drug Abuse.

Feedback and Question-and-Answer Session



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Feedback and Question-and-Answer Session

- We are now open for a live question-and-answer session. Please submit your questions anonymously via the Question box located in the center of your screen.
- Your feedback is important!
 - After the Q&A, please follow the displayed link to complete the Interactive Customer Evaluation (ICE) card
 - Or, you may immediately access the ICE card via the Chat box
- Additional questions and comments may be directed to

Capt. Armen Thoumaian

armen.h.thoumaian.mil@mail.mil

Save the Date

The next webinar in the DCoE PEI Webinar Series will be on June 16, 2015 from 1–2:00 p.m. ET

Analyzing Program Evaluation Data: Business Case and Cost Analyses

June						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Program Sierra Example

See also: Episodes 2 (Jan. 20, 2015) and 3 (Feb. 17, 2015)
in the FY2015 DCoE PEI Series and

Module 2 of the DCoE Program Evaluation Guide (2nd Ed.)

NOTE: Program Sierra was formerly called Program Echo in Episodes 2 and 3 and in Module 2



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Non-Clinical Program Example

Mission: At Program Sierra, we seek to ensure that service members who are wounded, ill or injured successfully reintegrate into civilian life or return to duty in the military. By performing our mission effectively, we hope to enhance force readiness and improve the quality and efficiency of services across the Defense Department



DoD photo by Pat Cubal

Non-Clinical Program Example (continued)

Goal 1: Program Sierra helps service members transition to civilian life or return to duty with increased functioning and a sustainable, individualized system of support and care to meet ongoing needs

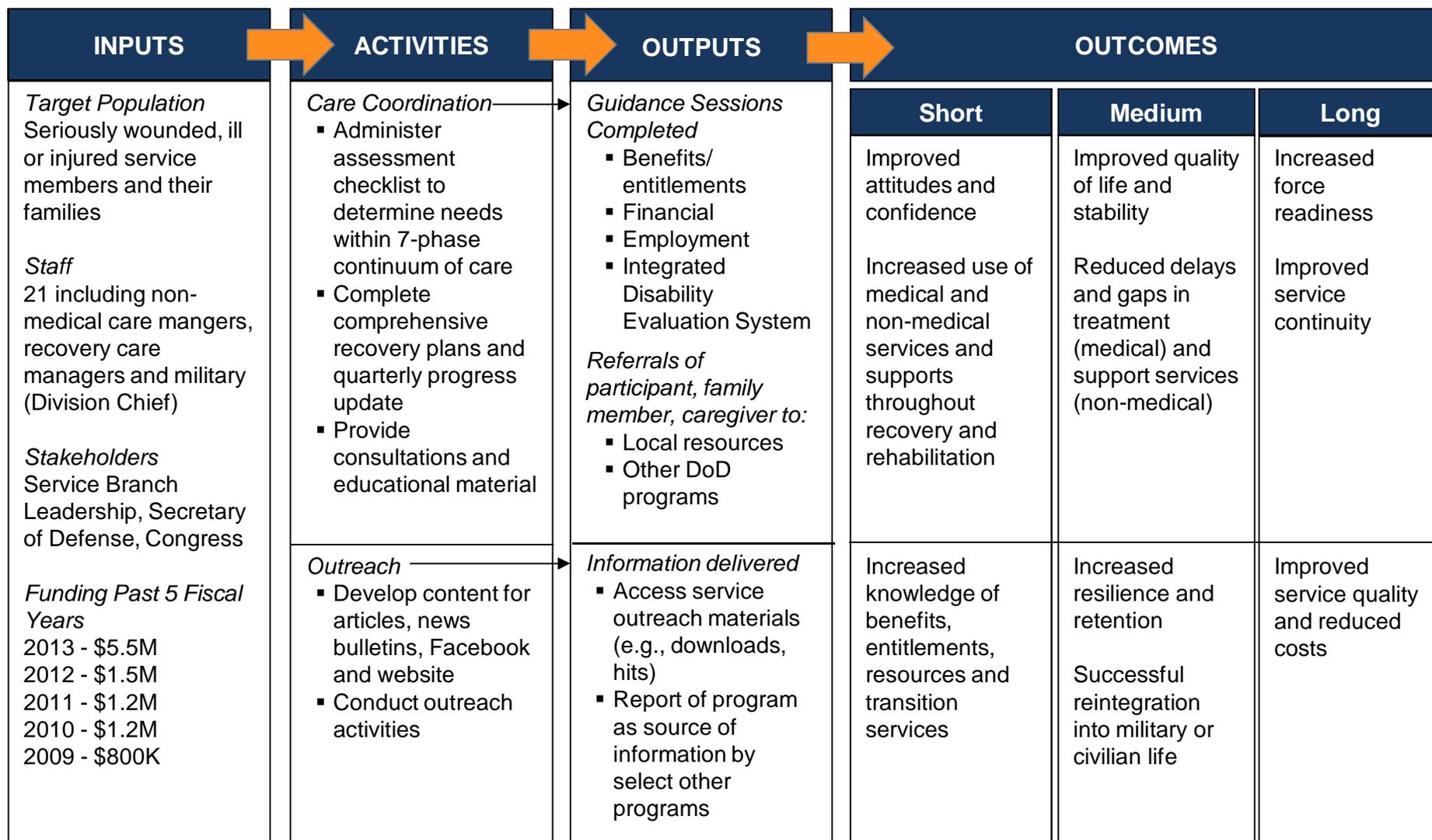
- **Objective 1A:** To assess all service members referred to the program and work with the service member and his or her family or caregiver to determine their needs and develop a plan for reintegration, followed by guidance sessions and service referrals
- **Objective 1B:** To increase use of services and supports for participating service members and enhanced functioning in targeted areas measured on an ongoing basis
- **Objective 1C:** To ensure continuous access to medical and non-medical services from point of illness/injury and for as long as needed to secure resilience and stability

Non-Clinical Program Example (continued)

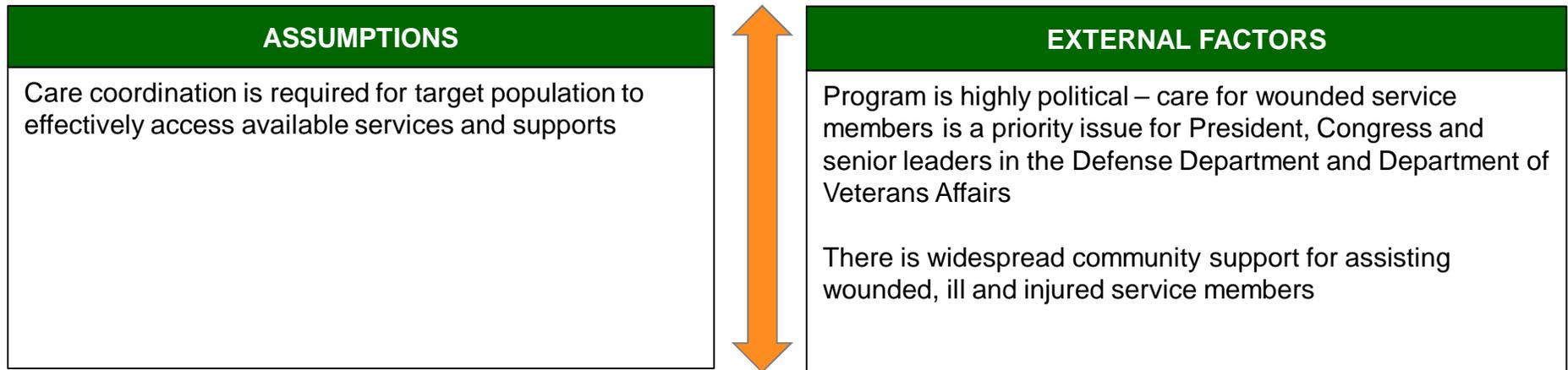
Goal 2: Program Sierra provides media materials and outreach in order to enhance service members' knowledge and awareness of the support and services available to assist them with reintegration

- **Objective 2A:** To produce and deliver media materials to targeted locations in order to increase awareness of services and supports as indicated by reports from other programs regarding source of referral or knowledge
- **Objective 2B:** To increase service use and improve quality by promoting effective support and care services to those who need them

Non-Clinical Program Example (continued)



Non-Clinical Program Example (continued)



An additional example for a clinical program is provided in DCoE's *Program Evaluation Guide* (2nd Edition), Appendix AE