

MEMORANDUM

Contract Number: CNSHQ14A0007-95332A18F-0023
Contract Title: Senior Corps Systematic Evidence Review of Agency Supported Programs
Submitted To: Anthony Nerino
Date: July 31, 2019
Subject: Senior Corps Meta-Analysis Feasibility

Introduction

Meta-analysis can provide important insights about effectiveness across programs and interventions. Usually derived from a systematic review, meta-analysis is a useful tool for assessing whether an evidence base offers quantitative evidence of effect with more power and accuracy than can be obtained from individual studies.¹ JBS systematically reviewed the evidence base of Senior Corps programs to determine the extent to which a meta-analysis is possible. Through this systematic review and feasibility analysis, we found that it would be technically possible to conduct a meta-analysis with a limited number of outcomes (17 outcomes from 6 studies that have the necessary data elements: sample sizes, directionality, and p-values). However, the notable shortage of rigorous evaluation studies indicates that a meta-analysis should not be conducted at this time.

Methods

JBS identified the hallmarks of a quality meta-analysis and defined precisely what would be needed to make a meta-analysis of Senior Corps programs feasible. To complete our assessment, we relied on the results from our systematic review of 27 Senior Corps impact and outcome evaluation studies from 1980-2019. The results of the systematic review are examined in the corresponding report, *A Systematic Review of Senior Corps' Impact of Volunteers and Program Beneficiaries*. The 27 studies selected for inclusion in the systematic review and report met certain criteria for recency and quality (see Figure 1).

The systematic review process extracted key information about study design, program type, participant type, and outcome data, which included statistical significance and directionality. The systematic review considered the quality of the studies and categorized them by study design. Specifically, if rigorous study designs did not address threats to internal validity, they were categorized as non-experimental.

Figure 1. Inclusion Criteria for the Systematic Review

- Conducted between 1980 and the Present
- Evaluation report with findings (no theory, review, or design papers)
- Focused on Senior Corps volunteers or beneficiaries (excluding Experience Corps)
- Relevant to the report's research questions
- An impact or outcome evaluation (no implementation-only reports)

¹ Ahn, E. and Kang, H. *Introduction to Systematic Review and Analysis*. Korean Journal of Anesthesiology, 2018 Apr; 71(2): 103-112.

We compiled 110 outcomes from the 27 studies included in the Senior Corps systematic review and report into one dataset. The information in the dataset as well as additional information from individual evaluation reports, such as exact sample sizes, were used to determine the presence of sufficient data for a meta-analysis. We also assessed the extent to which effect sizes were already provided in evaluation reports and whether certain outcomes have an evidence base more suited to an eventual meta-analysis than others.

Hallmarks of a Quality Meta-Analysis

A quality meta-analysis is derived from a systematic review of studies collected on a particular topic. Typically, the more information across the topic and within individual studies, the more thorough the meta-analysis. Meta-analysis is not usually just one analysis, but a series of meta-analyses examining different groups of outcomes that have similar characteristics (e.g., outcome types, program type, or beneficiary type). Using advanced statistical techniques, meta-analyses provide information, such as average effect size, and identify moderating variables that cause variation in effect sizes across studies. Measures of effect can be calculated and reported by several standard approaches, including Cohen's d , Hedges' g , eta-squared, r , and r -squared. Typically, the effect size is considered very small if it is below 0.20, small between 0.20 and 0.50, medium between 0.50 and 0.80, and large if it is greater than 0.80. A meta-analysis that calculates overall effect sizes using multiple data points is generally a reliable source of information about effectiveness across interventions.²

Since there are multiple ways to conduct meta-analyses, different types of data are required for different meta-analysis approaches. The data used is generally extracted from final evaluation reports, and the type of meta-analysis run is dependent on the amount of data reported. Meta-analyses can be conducted using information such as statistical significance, directionality, sample sizes, variance, and/or standard errors. The meta-analysis technique that requires the data elements most often available in final evaluation reports is the correlation coefficient (r) calculation converted to and back from the Fischer's z scale (the Fischer's z transformation). To undertake this particular meta-analysis, variance is not necessary since Fischer's z score and its variance are used in the analysis.³ Therefore, the necessary data elements include: p -value (statistical significance), directionality, and sample size. Though it can be helpful if reports include their own effect sizes, it is not necessary.⁴ Although standardized effect sizes may not be needed to conduct meta-analyses, when an evaluation report includes effect sizes, it is highly likely to have enough data elements available to use in a meta-analysis.

A useful meta-analysis must be able to rely on the quality of the studies included. The studies must be rigorous, such as a quasi-experimental design (QED) that, ideally, uses a comparison

² Leppink, Jimmie; O'Sullivan, Patricia; and Winston, Kal. *Effect size – large, medium, and small*. Perspectives on Medical Education, 2016 Dec; 5(6): 347–349.

³ Comprehensive Meta-Analysis User's Manual. Source: <https://www.meta-analysis.com/downloads/Meta-analysis%20Effect%20sizes%20based%20on%20correlations.pdf>

⁴ As the evidence base expands, it may be helpful to encourage the inclusion of standardized effect sizes. Evaluations that provide standardized effect sizes help strengthen evidence of effectiveness even without meta-analysis and provide a helpful quick reference of effect.

group or a randomized controlled trial (RCT) and must have addressed any potential bias, threats to internal validity, or methodological issues. The systematic review is a useful tool for identifying the strongest studies with high internal validity, which generally produce more reliable results. The outcomes from these studies can be positive or negative, but statistical significance is an important factor.

Meta-analyses commonly assess results by outcome domain. Meta-analyses can be run using multiple types of groupings, such as by Senior Corps program or Senior Corps overall. But, the information gleaned from outcome analyses within a single Senior Corps program and type of outcome offer the most specific and potentially useful information, such as the effect of FGP programs on pre-K school readiness. Additionally, using the same participant type is important to get an accurate assessment of the evidence base. For example, caregiver outcomes should be separated from volunteer outcomes. Within such specific groups, researchers can also identify moderating variables to determine how another factor of the study, such as study design, effects the evidence. The number of outcomes can be small to run a meta-analysis; in fact, it is possible to run a meta-analysis with only two outcomes, but a larger sample is better. Finally, the outcomes should not all come from the same study as the results would not give an accurate representation of the evidence base.

Findings

Our feasibility assessment takes into consideration the findings from the Senior Corps systematic reviews report, which found that while there is ample positive evidence of the effectiveness of Senior Corps programs, fewer outcomes are associated with rigorous studies or are statistically significant. Nearly two-thirds of the outcomes compiled in the systematic review (65 percent) did not report statistical significance. Overall, the total of 110 outcomes yielded just 17 outcomes from rigorous studies reporting statistical significance.

Outcome Quality

In total, 110 outcomes from 27 studies were reviewed and included in the synthesis report. Of the 110 outcomes, 38 included statistical significance, and 17 of those were based on rigorous designs with internal validity to be considered for inclusion in a meta-analysis (QEDs or RCTs). Regardless of whether they have effect sizes in their reports, these 17 outcomes, from 6 studies, could be included in a meta-analysis. However, more factors must be considered in determining the feasibility of a meta-analysis, including details such as sample sizes, distribution of outcomes across programs and study participants, and concentration of data within outcome types. See Table 1 for an overview of feasibility factors and the elements included.

Table 1: Feasible Outcomes

Study	Author(s)	Study Design	Program	Participant Type	Outcome Type(s)	Sample sizes (treatment and control)	p-value	Directionality	Effect sizes incl*
Longitudinal Study of Foster Grandparent and Senior Companion Programs: Service Delivery Implications and Health Benefits to the Volunteers (2018)	JBS International, Inc.	QED	FGP	Volunteer	Physical health	x	x	x	Yes
			SCP	Volunteer	Physical health	x	x	x	Yes
			FGP	Volunteer	Psycho-social health: depression and mental health	x	x	x	No
			SCP	Volunteer	Psycho-social health: depression and mental health	x	x	x	No
The 2013-2014 Senior Corps Study: Foster Grandparents and Senior Companions (2016)	JBS International, Inc.	QED	FGP	Volunteer	Physical health	x	x	x	No
			SCP	Volunteer	Physical health	x	x	x	No
			FGP	Volunteer	Physical health	x	x	x	No
			SCP	Volunteer	Physical health	x	x	x	No
			FGP	Volunteer	Psycho-social health: life satisfaction	x	x	x	No

Study	Author(s)	Study Design	Program	Participant Type	Outcome Type(s)	Sample sizes (treatment and control)	p-value	Directionality	Effect sizes incl*
			SCP	Volunteer	Psycho-social health: life satisfaction	x	x	x	No
Fostering social ties through a volunteer role Implications for older-adults' psychological health (2003)	Rook, K.S., & Sorkin, D.H.	RCT	FGP	Volunteer	Psycho-social health: social connectedness	x	x	x	Yes
			FGP	Volunteer	Psycho-social health: depression and mental health	x	x	x	No
Senior Companion Program impact evaluation: Final report (1985)	SRA Technologies (for ACTION)	RCT	SCP	Client	Overall functioning	x	x	x	No
				Volunteer	Overall functioning	x	x	x	No
Evaluating the Observable Effects of Foster Grandparents on Hospitalized Children (1982)	Suzanne Ziegler and Johanna King	RCT	FGP	Child	Social, emotional, behavioral development	x	x	x	No
Can Senior Volunteers Deliver Reminiscence and Creative Activity Interventions? Results of the Legacy Intervention Family Enactment Randomized Controlled Trial (2014)	R.S. Allen et al.	RCT	RSVP	Client	Psycho-social health: depression and mental health	x	x	x	Yes

Study	Author(s)	Study Design	Program	Participant Type	Outcome Type(s)	Sample sizes (treatment and control)	p-value	Directionality	Effect sizes incl*
				Caregiver	Psycho-social health: depression and mental health	x	x	x	No

*Optional

Participants

The data in the studies identified in Table 1 include all programs and beneficiaries. A successful meta-analysis would, ideally, be run by group. Each group would contain outcomes with similar data, with separate groups for volunteers, clients, caregivers, and children. While a meta-analysis with Senior Corps data could be run for volunteers and, technically, for clients (since there are two outcomes), it could not be run for the other types of beneficiaries. While it is possible to run the meta-analysis for all beneficiaries together, this analysis could be misleading due to the vast differences between some of the beneficiaries, such as caregivers (who are often also seniors) and children.

Programs

Without taking outcome type and other factors into consideration, there are a sufficient number of outcomes for a meta-analysis for both SCP and FGP, and most are volunteer outcomes, making the data relatively similar. However, while the outcomes are evenly distributed by SCP and FGP, there are only two RSVP outcomes. Again, it is possible to run a meta-analysis on two outcomes, but the outcomes are from the same study, which would be problematic since it does not provide enough information about the larger base, and the outcomes also differ in type and participant.

Outcome Types

The ideal meta-analysis would be run using various groupings, including program and participant, but it would be driven by the smallest groups with the most in common. These groups would include outcomes in the same program, with the same participants, and the same outcome type. With the 17 total outcomes, few such groupings can be formed. The two outcome types with more than one outcome are physical health and several psycho-social outcomes, which include depression and mental health and life satisfaction. With three outcomes in each program (SCP and FGP), physical health may be the best option for meta-analysis; however, physical health outcomes vary widely. Although both depression/mental health and life satisfaction might be better candidates due to specificity, there are not enough outcomes within each program. An analysis within outcome types but across programs is possible, but it would not be ideal.

Conclusion

Overall, we determined that the available Senior Corps data are not sufficient to conduct a meta-analysis. Only a small number of usable outcomes from studies conducted with rigor have the necessary data elements for meta-analysis (e.g., p-values, sample sizes, etc.). To perform a meta-analysis, it would be important to have additional rigorous evaluations distributed more evenly across participants, programs, and outcome types. For example, RSVP lacked a sufficient number of outcomes for an adequate meta-analysis. In fact, the two potentially usable RSVP outcomes were limited to the same study and differed across both participant and outcome type. For these reasons, conducting a meta-analysis at this time would not provide enough useful information about any or all of the Senior Corps evidence base.