Evaluation of the GNE Demonstration Project
Volume I: Implementation and Impact

Centers for Medicare & Medicaid Services

Center for Medicare & Medicaid Innovation

October 2017

IMPAQ INTERNATIONAL LLC

Prepared For:

Pauline Karikari-Martin, PhD, MSN, MPH
Centers for Medicare & Medicaid Services
7500 Security Blvd.
Baltimore, MD 21244

Prepared By:

Leanne Clark-Shirley, PhD
Daniela Zapata, PhD
Brandon Heck, PhD
Sarah Pedersen, MPP
Clancy Bertane, MPP
Bryan Gale, MA
Katherine Harris, PhD
Karen Kauffman, PhD

IMPAQ International
10420 Little Patuxent Parkway
Suite 300
Columbia, MD 21044
(443) 256-5500
www.impaqint.com

Contract No. HHSM-500-2011-00013I
Task Order No. HHSM-500-T0009

Evaluation of the GNE Demonstration Project Volume I: Implementation and Impact

by Leanne Clark-Shirley, PhD, Project Director, IMPAQ International
Daniela Zapata, PhD, IMPAQ International
Brandon Heck, PhD, IMPAQ International
Sarah Pedersen, MPP, IMPAQ International
Clancy Bertane, MPP, IMPAQ International
Bryan Gale, MA, IMPAQ International
Katherine Harris, PhD, IMPAQ International
Karen Kauffman, PhD, Nurse Consultant, Life Passages Care Consultants, Inc.

Federal Contracting Officer's Representative (COR): Pauline Karikari-Martin, PhD, MSN, MPH

This project was funded by the Centers for Medicare & Medicaid Services under contract no. HHSM-500-2011-00013I, Task Order HHSM-500-T0009. The statements contained in this report are solely those of the authors and do not necessarily reflect the views or policies of the Centers for Medicare & Medicaid Services. IMPAQ International assumes responsibility for the accuracy and completeness of the information contained in this report.

Contents

Exhibits

Executive Summary

LEGISLATIVE SUMMARY

The Graduate Nurse Education (GNE) demonstration project was established by section 5509 of the Patient Protection and Affordable Care Act (ACA) of 2010, Pub. L. 111-148, which amended title XVIII of the Social Security Act by adding 42 U.S.C. 1395ww note. Section 5509 appropriated $50 million for each fiscal year 2012 through 2015 without fiscal year limitation. Under this demonstration project, the Centers for Medicare & Medicaid Services (CMS) was authorized to provide payments to eligible hospitals[1] for the reasonable costs they incurred in providing qualified clinical training to advanced practice registered nurse (APRN) students. The statute also required that participating hospitals enter into an agreement with eligible partners[2] for the provision of qualified training. The statute places an emphasis on primary care by requiring that at least half of the clinical training be provided in non-hospital community-based care settings. This requirement may be waived for rural or medically underserved areas.

The statute also requires an evaluation of the GNE demonstration project no later than October 17, 2017, including an analysis of the following: (1) the growth in the number of APRNs with respect to a specific base year as a result of the demonstration; (2) the growth for each of the following specialties—clinical nurse specialist (CNS), nurse practitioner (NP), certified registered nurse anesthetist (CRNA), and certified nurse-midwife (CNM); (3) the costs to the Medicare program under title XVIII of the Social Security Act as a result of the demonstration; and (4) other items the Secretary determines appropriate and relevant.

BACKGROUND

By 2025, the United States will need an additional 23,640 primary care physician provider full time equivalents to meet growing demands associated with expanded access to insurance, and especially with the aging of the population. The proportion of people over age 65 is increasing faster than the general population, and older individuals are likely to have chronic conditions

[1] The term "eligible hospital" means a hospital (as defined in subsection (e) of section 1861 of the Social Security Act (42 U.S. C. 1395x)) or a critical access hospital (as defined in subsection (mm)(1) of such section) that has a written agreement in place with (A) 1 or more applicable schools of nursing; and (B) 2 or more applicable non-hospital community-based care settings.

[2] The term “eligible partner” includes the following (A) an applicable non-hospital community-based care setting; (B) an applicable school of nursing.

and complex care needs.[3,4] A shortage of primary care physicians is expected due to a declining number of medical students who choose primary care as their specialty.[5] These trends pose challenges for the Medicare program, which will continue to be the largest insurer of the growing population of older Americans. Study findings suggest that nurse practitioners can augment and expand physician capacity in many care settings. This may help alleviate the shortage of primary care physicians in 2025.[6,7] APRNs are registered nurses (RNs) who have completed graduate-level education programs in nursing and have passed a national certification examination. The purpose of these education programs is to provide the advanced clinical knowledge and skills needed to deliver safe, competent, high-quality care to patients. Research has shown that APRNs treat patients as effectively as physicians and at a lower cost.[8]

In 2011, the Institute of Medicine (IOM) issued recommendations to promote a greater role for APRNs in primary care and improvements in the education system to enable nurses to more easily obtain advanced education in schools of nursing (SONs).[9] APRN graduations are increasing nationally;[10] however, SONs continue to face significant challenges in increasing enrollments due, in part, to difficulty finding clinical education sites and preceptors to provide one-on-one mentoring and supervision of APRN students. In addition, a limited number of graduate-level faculty are available to mentor clinical preceptors and supervise student clinical experiences.

The Graduate Nurse Education (GNE) demonstration project attempts to mitigate some of these challenges by increasing the number of clinical education sites and preceptors.

[3] U.S. Department of Health and Human Services. (2016). National and Regional Projections of Supply and Demand for Primary Care Practitioners 2013-2025. National Center for Health Workforce Analysis.

[4] Petterson, S. M., Liaw, W. R., Philips, R. L., Rabin, D. L., Meyers, D. S., & Bazemore, A. W. (2012). Projecting U.S. primary care physician workforce needs: 2010-2025. *Annals of Family Medicine*, *10*(6), 503-509.

[5] Association of American Medical Colleges. (2013). *Successful Primary Care Programs: Creating the Workforce We Need.* Subcommittee on Primary Health and Aging, Committee on Health, Education, Labor, and Pensions (HELP).

[6] Rohrer, J. E., K. B. Angstman, G. M. Garrison, J. L. Pecina, J. A. Maxson. 2013. Nurse Practitioners and Physician Assistants Are Complements to Family Medicine Physicians. Population Health Management 16(4):242-45,

[7] Horrocks, S., E. Anderson, and C. Salisbury. 2002. "Systematic Review of Whether Nurse Practitioners Working in Primary Care Can Provide Equivalent Care to Doctors." *British Medical Journal 324*:819-823 [accessed 5/11/2016]. Available from: http://www.bmj.com/content/324/7341/819

[8] American Nurses Association. (2011). 2011 ANA Health and Safety Survey. Silver Spring, MD.

[9] Institute of Medicine. (2011). The Future of Nursing: Leading Change, Advancing Health. Washington, DC: National Academies Press.

[10] Fang, D., Li, Y., Arietti, R., & Bednash, G. D. (2014). 2013-2014 Enrollment and Graduations in Baccalaureate and Graduate Programs in Nursing. Washington, D.C.: American Association of Colleges of Nursing.

THE GNE DEMONSTRATION PROJECT

Per statute, under the GNE demonstration project, CMS provided payment to five eligible hospital awardees for the reasonable costs attributable to providing qualified clinical training to APRN students enrolled as a result of the demonstration. Reasonable costs include only those clinical training costs that are not covered by other revenue sources. Costs associated with didactic training, certification, and licensure are not eligible for payment under the demonstration.

The hospitals participating in the demonstration were required to partner with accredited schools of nursing and non-hospital community-based care settings (CCSs), but they also partnered with other hospitals in an effort to expand the number of APRN students receiving qualified clinical training. The need for primary care access is especially critical in medically underserved areas of the country. As such, CMS not only aimed to increase the overall number of primary care providers, but also to expand primary care access to underserved areas of the country. Therefore, consistent with the statutory requirement, CMS required hospitals participating in the demonstration to ensure that students completed at least half of their qualified clinical education in such settings. These settings included Federally Qualified Health Centers (FQHCs) and rural health clinics (RHCs).

Payments to the participating hospitals are linked directly to the number of "incremental," or additional, APRN students that the hospitals and their partnering entities educate as a result of their participation in the demonstration. The payment is calculated on a per incremental student basis, by comparing enrollment levels in the APRN programs during the baseline period, January 2006–December 2010,[11] to increased enrollment under the demonstration. Participating hospitals reimburse their partners for the reasonable cost of providing qualified clinical training to APRN students based on their established agreements.

The participating hospitals receive monthly interim payments derived from their projected budget estimates based on the expected number of incremental students, divided by 12 months, for allowable and reasonable costs incurred for the provision of incremental APRN students' clinical education. These payments are calculated using the allowable costs derived from the updated budget estimates and enrollment information that the hospitals provide to CMS. The following year an independent audit is completed during which any reconciliations are made. Any interim payments that exceed the actual reasonable GNE costs are paid back to CMS. Conversely, CMS pays the hospital a one-time lump sum in the event that the GNE interim payments are less than the actual reasonable GNE costs, with the stipulation that the

[11] The legislatively established baseline period is January 2006–December 2010.

demonstration expenditures not exceed the amount of funds appropriated under the authorizing statute. Table 1 provides the total payment each awardee received over the first four-year demonstration period.

In a competitive selection process, CMS made awards to five hospitals to participate in the GNE demonstration project:

- Duke University Hospital (DUH), Durham, North Carolina
- Hospital of the University of Pennsylvania (HUP), Philadelphia, Pennsylvania
- Memorial Hermann-Texas Medical Center (MH), Houston, Texas
- Rush University Medical Center (RUMC), Chicago, Illinois
- HonorHealth Scottsdale Osborn Medical Center (SHC-O), Scottsdale, Arizona

A summary of the characteristics of the GNE networks is shown in Table 1.

Table 1. Summary of the Characteristics of the GNE Demonstration Networks

	Duke University Hospital (DUH)	Hospital of the University of Pennsylvania (HUP)	Memorial Hermann-Texas Medical Center (MH)	Rush University Medical Center (RUMC)	Scottsdale Healthcare Osborn Medical Center (SHC-O)
Partner Hospitals	5	8	2	3	4
Partner Schools of Nursing	1	9	4	1	4
Partner Community-Based Care Settings (CCSs)	More than 150 CCSs: affiliated practice primary care network, community clinics, free clinic, other CCSs	More than 150 hospital- and non-hospital-affiliated CCSs, stand-alone nurse-managed primary care clinics, FQHCs	More than 150 CCSs: clinics surrounding SONs, FQHCs, physician group primary-care practices, hospice, home health	25 CCSs in Greater Chicago area and adjoining rural counties; initially 5 large community organizations	More than 1,000 CCSs: FQHCs, rural health clinics, primary care practices, nurse-managed clinics, home health, long-term care
Geographic Area	Regional, generally within approximately a 60-mile radius	Greater Philadelphia area with regional reach; 44 northern and central counties served by 1 partner	Southeastern Texas, near the Gulf Coast	Greater Chicago area and adjoining counties in Illinois	Large geographic region across Arizona, other Southwestern bordering states, and parts of Mexico

	Duke University Hospital (DUH)	Hospital of the University of Pennsylvania (HUP)	Memorial Hermann-Texas Medical Center (MH)	Rush University Medical Center (RUMC)	Scottsdale Healthcare Osborn Medical Center (SHC-O)
APRN Specialty	NP CNS CRNA	NP CNS CRNA CNM	NP CRNA	NP CNS CRNA	NP CNS
Total Payment	$10,696,200	$42,942,600	$35,750,600	$9,243,400	$21,841,700

The GNE demonstration project was initially implemented in July 2012 for a four-year period. Because appropriations were available at the end of that period, and the statute permits the use of these funds without fiscal year limitation, CMS extended the demonstration project for an additional two years, through July 2018, to allow sufficient time for (1) the incremental APRN students enrolled under the demonstration project to complete their required clinical education, and (2) more accurate measurement of APRN graduation rates under the demonstration.

EVALUATION OF THE GNE DEMONSTRATION PROJECT

CMS contracted initially with Optimal Solutions, and then with IMPAQ International, to conduct an independent evaluation of the project as required by the statute. In addition to determining whether payments to participating hospitals for clinical training resulted in overall growth in APRN student enrollment and graduations across the four named clinical specialties relative to the specific base year period, the evaluation also examined the costs to the Medicare program by determining the overall cost of implementing the GNE demonstration as well as the cost to CMS for supporting an incremental APRN student to graduate. In addition, the evaluation assessed the structure and characteristics of the networks, the implementation processes, the successes and challenges, and the spillover effects.

The overarching research questions that the evaluation addressed were the following:

1. **How was the GNE demonstration project implemented and operated?**
    a. What are the networks' characteristics and demonstration operation processes?
    b. How does the demonstration influence precepted clinical education placements and the placement processes?
    c. What notable successes and challenges do networks experience?
    d. What are the networks' plans for sustainability?

2. **How effective was the GNE demonstration project in increasing growth in the APRN workforce?**
    a. What is the effect on APRN growth (i.e., student enrollment and graduation) overall?
    b. What is the effect on APRN enrollment and graduation by specialty?
    c. Is the demonstration associated with spillover effects to non-participating SONs?

3. **What is the total cost of the demonstration project overall?**

This report addresses the first two sets of questions for the first four years of the demonstration period, (demonstration year (DY) 2012–DY 2015). A companion document prepared by IMPAQ, *Evaluation of the GNE Demonstration Project, Volume II: Demonstration Costs,* presents the results for the third research question.

DATA AND METHODS

The evaluation used a mixed-methods approach that combined data from primary and secondary sources. The team collected primary data from in-depth interviews and focus groups with a wide variety of participants involved in APRN education. The team analyzed quantitative administrative data to describe (1) the implementation and operation of the demonstration project; (2) strategies for sustaining support for expanded precepted educational opportunities for APRNs after the end of the demonstration project; and (3) trends in enrollments, precepted training hours, and graduations. The design of the demonstration project limited the team's ability to monitor APRN growth in non-GNE SONs. For this reason, the team used quasi-experimental models to estimate the impact of the demonstration project on APRN enrollment and graduations overall and by specialty, and to determine whether the demonstration project had spillover effects on non-demonstration SONs operating in geographic proximity to SONs participating in the GNE demonstration project.

The team used secondary survey data from the American Association of Colleges of Nursing (AACN) to compare APRN enrollment and graduations from GNE SONs during the first four years of the demonstration project to the enrollment and graduations in a comparison group of non-GNE SONs for the same period. The team implemented two alternative models, entropy weighting and propensity score weighting, to balance covariates and create the weights used to construct the comparison group. A difference-in-differences (DID) regression analysis was used to estimate the effect of the demonstration project.

There are some potential concerns with this approach. First, the magnitude and the statistical significance of the impact estimates are sensitive to the method and covariates used to

construct the comparison group. Second, the DID analysis does not control for time-varying unobservable characteristics. Finally, a common concern with any weighting approach is that the estimates can be unstable when very small or very large weights are used. To address this concern, the team confirmed that the models did not produce extreme weights, by re-estimating the impact results after removing the comparison SONs that had relatively high weights.

KEY EVALUATION FINDINGS

Key findings to date suggest that the GNE demonstration project had a positive impact on APRN student growth and helped transform clinical education in participating GNE SONs. The evaluation findings related to the networks' implementation and operation, and the effect on APRN student enrollment and graduations as a result of the demonstration are described below.

How was the GNE Demonstration Project Implemented and Operated?

Network Characteristics

There was wide variability among the five GNE networks in the size and composition of the networks' partnerships, types of community-based care settings, and geographic areas. The number of hospital partners ranged from 2 to 8, and the number of SON partners from 1 to 9. The CCSs included free clinics, nurse-managed health centers, FQHCs, rural health clinics, Indian Health Service centers, as well as hospital-affiliated CCSs. The geographic areas included rural coverage areas and coverage areas including both rural and urban areas.

Demonstration Operation Processes

The GNE demonstration project strengthened SONs' relationships with existing clinical education sites in ways that made the sites more willing to precept students and that increased the SONs' ability to recruit new sites and also sites that were previously unwilling to participate. All networks reported difficulties in the implementation of the demonstration project, due to limited staff time and financial resources available for program development. However, over the course of the implementation period, networks established regular meetings to launch and sustain demonstration project activities. Consistent with the objectives of the demonstration project, participants from all networks reported partnering with new CCSs whose staff had not precepted their students previously, and expanding and diversifying precepted training opportunities.

All five demonstration networks and their SON partners used GNE funds to create or expand administrative resources devoted to managing and overseeing the clinical

education placement process. Some SONs used these funds to hire dedicated clinical placement coordinators and/or clinical site recruiters. Others reported using the funds to develop a database system to track clinical placements, site/preceptor contact information, and the type of site. None reported using funds to recruit preceptors directly. Instead, the SON representatives explained to the site staff that there was a possibility they would receive precepting payments.

Clinical Education Placements and Processes

The networks used GNE demonstration funds to develop and implement several innovative clinical education models. Several networks have established interprofessional education models, in which APRN students complete their clinical education alongside medical, pharmacy, and psychology students. Students and network administrators reported that this clinical education helped enrich students' experience by enhancing their medical, teamwork, and communication skills. Networks also invested in clinical education sites that serve medically underserved populations, including securing placements in rural health centers and establishing a start-up preceptor program which places an affiliated preceptor at a clinical site that was previously unable or unwilling to provide precepted clinical education to APRN students.

The methods for determining which preceptors or training sites received GNE precepting payments varied across networks. If the network designated a clinical education site as a "GNE site," then that site received GNE precepting payments for any student who was placed at that location. If the network designated students at a site as "GNE students," then any clinical education site at which a GNE student was placed received GNE precepting payments. The oversight teams of each GNE network determined whether sites or students would be designated as "GNE" and allocated the number of GNE sites or students each semester. Each network created its own precepting payment methodology as part of program implementation, based on the number of student clinical hours, preceptors' lost productivity time, or Medicare fee schedules.

There was a lack of consensus among network demonstration oversight teams about the impact of GNE precepting payments on providers' willingness to precept students. Some demonstration administrators believed that the precepting payments did not motivate preceptors who had precepted APRN students in the past. Instead, they thought that individual preceptors viewed their role as a way to give back, to teach the future generation of APRNs, and to continue their own education. In contrast, stakeholders perceived that clinical education *sites* were driven by payments, because the sites ultimately decide if and how many of their providers will precept each semester. The precepting payments help compensate sites for the preceptors' time spent with students and allow sites to take on more students without affecting the quality of

care they provide or their financial bottom line. Interestingly, many stakeholders across the networks observed an increase in the number of physicians willing to accept APRN students, and they attributed the increase to GNE precepting payments because physicians are accustomed to reimbursement for precepting medical students.

The number of clinical education hours completed by incremental APRN students in CCSs increased substantially, with more than half of the clinical education hours occurring at CCSs. This trend is consistent with the demonstration project's objective of expanding clinical education in community settings.

Successes and Challenges

Networks reported that the demonstration project created new and diverse precepted clinical education opportunities. Stakeholders described enhanced coordination between partners as well as across the networks, and improvements to placement processes within and across SONs. The demonstration project also afforded the SONs time to focus on improving other aspects of APRN training, such as aligning curricula and admissions criteria. In addition, many interviewees stated that the demonstration project created dialogue, and encouraged greater awareness throughout the medical community, about the role and value of APRNs in providing care.

At the same time, some networks found the design of the demonstration project challenging to navigate. All networks reported having minimal start-up time at the beginning of the project, which obliged networks to simultaneously plan, design, and implement the demonstration. Due to the short time period between award and implementation, stakeholders across all networks reported "playing catch-up" for most of the first year. In addition, significant increases in enrollment applied pressure on faculty and university resources. Since the GNE demonstration payments did not cover didactic education, the SONs attempted to balance the goal of increasing the number of APRN graduates with the reality of limited resources.

Sustainability Plans

Network administrators expressed concerns about whether the positive outcomes of the project could be sustained after the demonstration ends. Many interviewees expressed optimism that the relationships formed and the increased communication across SONs and other network members will be sustained. Others, however, had mixed views about the ability of the SONs to maintain the increased number of APRN enrollments after GNE demonstration payments end. SON administrators and network leaders were exploring potential strategies to maintain the investments and processes developed through the GNE demonstration project. Though not perceived as ideal, many SONs have considered increasing student enrollment in

order to maintain the support staff that oversees the clinical placement process. A few stakeholders discussed plans to pursue other funding opportunities and engage local and state government officials as a way to sustain GNE activities.

In addition to exploring funding sources, the SONs were developing strategies to sustain current levels of clinical education sites and preceptors beyond the demonstration period. Such strategies include new resources, trainings, and tokens of appreciation that the networks hope will motivate preceptors to continue engaging with their students. The demonstration project oversight teams and the SON administrators reported that they will continue to discuss how to further solidify relationships and maintain key demonstration-facilitated investments over the next academic year.

How Effective was the GNE Demonstration Project in Increasing Growth in the APRN Workforce?

APRN Student Growth

The results of the evaluation suggest that the GNE demonstration project increased the number of enrollments and graduations of APRN students. The analysis of descriptive data from independently-audited annual reports shows that enrollments and graduations from SONs participating in the GNE demonstration project increased steadily between 2012 and 2015. A quasi-experimental DID analysis suggests that the demonstration project contributed to these increases. Specifically, the DID results showed that the demonstration project increased annual APRN student enrollment in GNE SONs by about 87 students per SON, and increased annual graduations by about 27 students per SON relative to an entropy weighted comparison group of non-GNE SONs. This increase was statistically significant. While overall results suggested a positive effect of the demonstration project on enrollments and graduations, the magnitude and statistical significance of the results were sensitive to the methodology used to construct the comparison group.

Many demonstration participants perceived a direct relationship between enhanced financial support for clinical placement processes and increased enrollment. Some participants were not willing to attribute increased enrollment solely to the demonstration project and reported that increases were due to the upward trajectory of the health care field in general. Nonetheless, stakeholders reported unequivocally that without GNE demonstration payments, sustaining increased enrollment would not be possible in their networks.

The results suggest that the positive effects of the GNE demonstration project were concentrated among students in nurse practitioner (NP) training programs and those seeking master's degrees. The demonstration project resulted in a statistically significant

increase in annual NP enrollments of about 84 students per SON and an increase in annual NP graduations by about 27 students per SON, relative to a comparison group of non-GNE SONs. Other specialties, including certified registered nurse anesthetist (CNRA), certified nurse midwife (CNM), and clinical nurse specialist (CNS), did not experience enrollment and graduation increases of a meaningful magnitude, nor were these differences statistically significant. The average number of masters' degree graduates among the GNE SONs was about 25 more than among the non-GNE comparison SONs. This increase was found to be statistically significant. Increases of a much smaller magnitude were observed for post-master's and doctor of nursing practice (DNP) program enrollment and graduations, which also did not differ significantly from trends in the comparison SONs.

Spillover Effects to Non-GNE SONs

Contrary to expectations, the evaluation found no evidence of negative spillover effects on non-GNE SONs located in the same geographic area as the GNE SONs. The team examined whether the demonstration project impacted APRN student enrollment or graduations among non-GNE SONs located in the same state as GNE SONs. The analyses show a reduction in enrollment and graduations in same-state non-GNE SONs of 16 and 6 students, respectively, but this reduction was not statistically significant. There is therefore no evidence to suggest unintended consequences of the demonstration project for nearby non-GNE SONs.

LIMITATIONS OF THE GNE DEMONSTRATION EVALUATION

The findings of this study should be assessed in the context of several limitations of the demonstration project and the evaluation design. Some design features of the GNE demonstration project placed limitations on estimating the impact of the project and generalizing findings to other SONs. For example, only 19 SONs participated in the demonstration project out of the more than 420 SONs that offer master's-level or DNP APRN programs. Implementation of the demonstration project across a larger number, or a more diverse set, of SONs might have yielded different results. In addition, all participating network partners were affiliated with a large academic institution, so it is uncertain whether the findings reported here could be achieved by smaller, non-affiliated SONs.

Under the terms and conditions of the GNE demonstration project, SONs who enrolled individuals who were already licensed to practice as APRNs were not eligible for payment for clinical education training under the GNE project. However, the AACN data do not distinguish between individuals who already have an APRN license or certification and those who do not. To address this, the team used a proxy estimation of prior APRN certification. The results suggest that including existing APRNs in the analysis did not pose a major threat to the interpretation of the findings.

Another limitation is that the demonstration payments to networks were based on the number of incremental full-time equivalent (FTE) APRN students, whereas the impact evaluation examined the total number of APRN students enrolled regardless of whether they were part-time or full-time students. Ideally, the impact calculations would use the same FTE measure that is used to calculate payments to the networks, but AACN does not include in its annual survey the number of credit hours for which students register, which is needed to calculate the FTE measure. The average increase in APRN enrollment by 87 students per SON was due to an increase of 51 part-time students and 36 full-time students. This suggests that if an FTE measure had been used for the evaluation, the size of the increase in APRN FTE enrollment due to the demonstration would have been smaller.

CONCLUSION

Five diverse networks that varied in composition and implementation processes implemented the GNE demonstration project. This report focused on the networks' implementation experiences, trends in clinical precepted education, the project's successes, and challenges, and estimates of the impact of the demonstration project on APRN student growth as measured by SON enrollment and graduations. The networks reported that the demonstration project facilitated more streamlined clinical education processes and an expanded pool of clinical education sites and preceptors. Findings of the quantitative impact evaluation reported here suggest that the demonstration project may be associated with an overall increase in APRN student enrollment and graduations. The results show that, relative to a comparison group of non-GNE SONs, the APRN student enrollment and graduations increased across the GNE SONs, particularly in NP programs and at the master's degree level. Even though the results indicate that the GNE SONs and the APRN students will continue to benefit after the demonstration project ends from the partner collaborations formed during the project and from streamlined clinical placement processes, network administrators expressed concern about sustaining increased student enrollments, because they will no longer be able to reimburse the clinical sites and preceptors. The GNE demonstration project is an innovative approach to furthering the clinical education of APRN students.

A final evaluation report including findings for the complete six-year demonstration project experience will be available in the fall of 2019.

Chapter 1: Introduction

The Graduate Nurse Education (GNE) demonstration project was established by section 5509 of the Patient Protection and Affordable Care Act (ACA) of 2010, Pub. L. 111-148, which amended title XVIII of the Social Security Act by adding 42 U.S.C. 1395ww note. Section 5509 appropriated $50 million for the project for each fiscal year, 2012 through 2015, without fiscal year limitation.

Under this demonstration, the Centers for Medicare & Medicaid Services (CMS) was authorized to provide payments to eligible hospitals[12] for the reasonable costs they incurred in providing qualified clinical training to advanced practice registered nurse (APRN) students enrolled as a result of the demonstration. The statute also required that the participating hospitals enter into an agreement with eligible partners[13] for the provision of qualified training. The statute places an emphasis on primary care by requiring that at least half of the clinical training be provided in non-hospital community-based care settings. This requirement may be waived for rural or medically underserved areas.

The statute also required an evaluation of the GNE demonstration project, no later than October 17, 2017, including an analysis of the following: (1) the growth in the number of APRNs with respect to a specific base year as a result of the demonstration; (2) the growth for each of the following specialties—clinical nurse specialist (CNS), nurse practitioner (NP), certified registered nurse anesthetist (CRNA), and certified nurse-midwife (CNM); (3) the costs to the Medicare program under title XVIII of the Social Security Act as a result of the demonstration; and (4) other items the Secretary determines appropriate and relevant.

This report provides background on the demonstration project, describes how it was implemented, and presents the evaluation findings for the first four years of the demonstration project (e.g., DY 2012 – DY 2015).

[12] An eligible hospital means a hospital (as defined in subsection (e) of section 1861 of the Social Security Act (42 U.S.C. 1395x)) or critical access hospital (as defined in subsection (mm) (1) of such section) that has a written agreement in place with (a) 1 or more applicable schools of nursing; and (b) 2 or more applicable non-hospital community-based care settings.

[13] The term “eligible partner” includes the following: (a) an applicable non-hospital community-based care setting; (b) an applicable school of nursing.

PRIMARY CARE AND THE ROLE OF APRNS

Primary Care Provider Shortage

By 2025, the United States will need an additional 23,640 primary care physician provider full time equivalents (or FTEs) to meet growing demands associated with expanded access to insurance, and especially with the aging of the population.[14] The proportion of people over age 65 is increasing faster than the general population, and older individuals are likely to have chronic conditions and complex care needs.[15] A shortage of primary care physicians is expected due to a declining number of medical students who choose primary care as their specialty.[16] These trends pose challenges for the Medicare program, which will continue to be the largest insurer of the growing population of older Americans.

The Role of APRNs in Addressing the Provider Shortage

Study findings suggest that NPs can augment and expand physician capacity in many care settings. This may help alleviate the shortage of primary care physicians in 2025.[17,18] APRNs, which include NPs, are registered nurses (RNs) who have at least a master's degree in nursing, are certified by professional or specialty nursing organizations, and are licensed to deliver care consistent with their areas of expertise and the laws that govern the nursing scope of practice in each state. Like a physician or physician assistant (PA), APRNs are prepared by education and certification to assess, diagnose, and manage patient problems, order and conduct diagnostic tests and lab work, perform in-office procedures, and prescribe medications.[19]

The primary difference between an APRN and a physician is the training involved. Medical education emphasizes the pathology, leading to a disease-centered model, whereas nursing school emphasizes the patient, promoting a patient-centered model. APRNs have the advanced clinical knowledge and skills needed to deliver safe, competent, high-quality care to patients.

---

[14] U.S. Department of Health and Human Services. (2016). National and Regional Projections of Supply and Demand for Primary Care Practitioners 2013-2025. National Center for Health Workforce Analysis.

[15] Petterson, S. M., Liaw, W. R., Philips, R. L., Rabin, D. L., Meyers, D. S., & Bazemore, A. W. (2012). Projecting U.S. primary care physician workforce needs: 2010-2025. *Annals of Family Medicine*, *10*(6), 503-509.

[16] Association of American Medical Colleges. (2013). *Successful Primary Care Programs: Creating the Workforce We Need.* Subcommittee on Primary Health and Aging, Committee on Health, Education, Labor, and Pensions (HELP).

[17] Rohrer, J. E., K. B. Angstman, G. M. Garrison, J. L. Pecina, J. A. Maxson. 2013. Nurse Practitioners and Physician Assistants Are Complements to Family Medicine Physicians. Population Health Management 16(4):242-45.

[18] Horrocks, S., E. Anderson, and C. Salisbury. 2002. "Systematic Review of Whether Nurse Practitioners Working in Primary Care Can Provide Equivalent Care to Doctors." British Medical Journal 324:819-823 [accessed 5/11/2016]. Available from: http://www.bmj.com/content/324/7341/819

[19] APRN Definition: http://www.graduatenursingedu.org/aprn-definition/

Research shows that APRNs treat individuals and families as effectively as physicians, at a lower cost,[20] and in some cases provide more effective care on selected measures than that provided by physicians.[21]

The APRN Education Process

Growth in the supply of APRNs relies on the ability of schools of nursing (SONs) to attract and train APRN students. Students may pursue APRN credentials through multiple pathways, including a master's degree, post-master's certificate, and doctorate of nursing practice (DNP). Although most APRNs are currently prepared at the master's level, advocates including the American Association of Colleges of Nursing (AACN) support a shift from master's-level to DNP education.[22] This response was based on recommendations from the Institute of Medicine (IOM) for APRNs to practice to the full extent of their education and training as primary care providers and, particularly, that "nurses should achieve higher levels of education and training through an improved education system that promotes seamless academic progression."[23] In addition to their clinical skills, DNP-prepared APRNs are skilled in quality and process improvements within health systems.

SONs offer APRN degrees in a number of specialties, including nurse practitioner (NP), clinical nurse specialist (CNS), certified nurse-midwife (CNM), and certified registered nurse anesthetist (CRNA). Students can select from a number of population foci, including adult-gerontology, family, pediatric, neonatal, psychiatric-mental health, and acute care. The vast majority of APRN students enroll in NP programs.[24] The length of time spent in a specific APRN program depends on the degree type offered (from one and a half years to five years), and whether a student enrolls as a full- or part-time student. Exhibit 1-1 provides a description of each APRN specialty.

[20] American Nurses Association. (2011). 2011 ANA Health and Safety Survey. Silver Spring, MD.

[21] Naylor M. D., & Kurtzman, E. T. (2010). The role of nurse practitioners in reinventing primary care. *Health Affairs*, 29(5), 893-899.

[22] American Association of Colleges of Nursing. (2014). Annual Report 2014: Building a Framework for the Future. Washington, D.C.

[23] Institute of Medicine. (2011). The Future of Nursing: Leading Change, Advancing Health. Washington, DC: National Academies Press.

[24] Fang, D., Li, Y., Arietti, R., & Bednash, G. D. (2014). 2013–2014 Enrollment and Graduations in Baccalaureate and Graduate Programs in Nursing. Washington, D.C.: American Association of Colleges of Nursing.

Exhibit 1-1. APRN Degree Types and Roles

Type of APRN	Role
Nurse Practitioner (NP)	NPs typically work under the indirect supervision of physicians and use their expertise to consult on patient care. They are engaged in all aspects of care, including assessing, diagnosing, and managing acute episodes, ordering and conducting diagnostic tests and lab work, performing in-office procedures, making medical treatment referrals, and prescribing medications.
Clinical Nurse Specialist (CNS)	The CNS is typically in charge of a department of nursing, either at a private practice or a hospital. CNSs are experts in diagnosing and treating illness in their area of expertise. They are responsible and accountable for the diagnosis and treatment of health/illness states, disease management, health promotion, and prevention of illness and risk behaviors among individuals, families, groups, and communities.
Certified Nurse Midwife (CNM)	CNMs provide a full range of primary health care services to women throughout the lifespan. These include gynecologic care, family planning, preconception care, prenatal and postpartum care, childbirth, and newborn care. CNM care is provided in diverse settings, which may include hospitals, birth centers, homes, and a variety of ambulatory care settings.
Certified Registered Nurse Anesthetist (CRNA)	CRNAs provide the full spectrum of patients' anesthesia care. They provide anesthesia in a variety of settings in collaboration with surgeons, anesthesiologists, dentists, podiatrists, and other qualified health care professionals. When anesthesia is administered by a CRNA, it is recognized as the practice of nursing; when administered by an anesthesiologist, it is recognized as the practice of medicine. Regardless of the educational background, however, all anesthesia professionals administer anesthesia the same way.

Education Requirements

APRN education includes graduate-level core courses, including advanced physiology/ pathophysiology, health assessment, and pharmacology. Recommendations for the ratio of didactic faculty to students vary across APRN educational programs. For example, the National Task Force on Quality Nurse Practitioner Education recommends that SONs maintain an NP didactic faculty to NP student ratio of 1:6, while the National Association of Clinical Nurse Specialists recommends a ratio of 1:8. SONs are required to adhere to these ratios to maintain accreditation.

Accredited SONs require APRN students to receive precepted clinical education. Precepted clinical education entails the placement of APRN students in acute care or community-based clinical sites, where they gain clinical competencies, skills, and knowledge from experienced health care providers. All APRN programs of study require a minimum number of credit hours in precepted clinical experiences as stipulated by their accrediting body. Clinical preceptors, such as APRNs, medical doctors, doctors of osteopathic medicine, and physician assistants, are licensed and board-certified health care providers, who supervise APRN students in a preceptor: student ratio of 1:1 or 1:2. The required number of clinical hours varies by specialty program:

- NP and CNS programs require a minimum of 500 precepted clinical hours, which are distributed to develop competencies reflecting the needs of the relevant population.
- CRNA programs require a minimum of 600 precepted clinical cases rather than a fixed number of hours.
- Other specialized programs of study, such as family nurse practitioner (FNP), adult-gerontology nurse practitioner (AGNP), and psychiatric-mental health nurse (PMHN), typically require more precepted clinical hours to develop the required competencies.
- CNM programs are based on meeting competencies; therefore, no specific number of clinical hours or experiences is required for accreditation.

Barriers to the Growth of the APRN Workforce

The APRN workforce has grown in recent years. By academic year 2013-2014, the number of APRN programs had increased by 17 percent over a five-year span in the 420 SONs across the country. Among the APRN students enrolled, 81 percent were in NP programs.[25,26] Many factors may explain this trend, including increased public recognition of the need for and the value of APRNs, and advocacy for APRN practice authority. For example, the research literature suggests that the economic downturn in 2008 motivated more students to enroll in graduate nursing programs.[27] In addition, based on a 2008 initiative of the Robert Wood Johnson Foundation, the IOM, in 2011, issued the report *The Future of Nursing: Leading Change, Advancing Health.* The report recommended that nurses should (a) practice to the full extent of their education and training; (b) achieve higher levels of education and training through an improved education system that promotes seamless academic progression; and (c) be full

[25] Fang, D., Tracy, C., & Bednash, G. D. (2010). 2009-2010 Enrollment and Graduation in Baccalaureate and Graduation Programs in Nursing. Washington, D.C.: American. American Association of Colleges of Nursing.

[26] Fang, D., Li, Y., Arietti, R., & Bednash, G. D. (2014). 2013-2014 Enrollment and Graduations in Baccalaureate and Graduate Programs in Nursing. Washington, D.C.: American Association of Colleges of Nursing.

[27] Terry, A. J., & Whitman, M. V. (2011). Impact of the economic downturn on nursing schools. *Nursing Economics, 29*(5)*,* 252-256, 264.

partners with physicians and other health care professionals in redesigning health care in the United States. The accessibility and affordability of graduate nurse education may play a role as well. Less time is needed to complete graduate nurse education in comparison with medical education.

State and federal initiatives targeting APRN education may also play a role in APRN workforce growth. In addition to authorizing the GNE demonstration project, the Affordable Care Act encouraged APRN growth through funding for nurse-managed health clinics and the establishment of the Advanced Nursing Education (ANE) grant program.[28] In addition, some states permit community colleges to award baccalaureate nursing degrees.[29] Other state initiatives to encourage APRN precepting, such as Maryland's tax credit for NP preceptors,[30] may continue to increase opportunities for growth in the number of APRN students.

Despite the growing demand for APRN education, SONs continue to face significant challenges in increasing enrollments. These challenges stem, in part, from difficulty finding clinical education sites and preceptors to provide individual mentoring and supervision of APRN students. SONs face increasing competition for funding and student placements with medical schools and physician assistant programs. Unlike medical schools, SONs are unable to provide payments to preceptors. Moreover, SONs compete for the limited number of clinical training sites. A national shortage of qualified nursing faculty and a lack of funds for increasing the number of faculty available to educate students amplify this challenge.[31] Faculty shortages within SONs and competition for clinical education sites have limited the number of APRN students that SONs can enroll each year. This has contributed to a highly competitive environment for applicants to APRN education programs.

The GNE demonstration project aims to mitigate some of these challenges by increasing the number of clinical training sites and preceptors.

[28] Administered by the Health Resources & Services Administration (HRSA), the ANE supports innovative academic-practice partnerships to improve education for APRN students in rural and underserved areas. https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/advanced-nursing-education-highlights.pdf

[29] American Association of Colleges of Nursing. (2015). Community Colleges Operating Baccalaureate Nursing Programs. Policy Brief. http://www.aacn.nche.edu/government-affairs/Community-College-BSN.pdf

[30] Maryland Board of Nursing. Tax Benefit for Nurse Practitioner Preceptors. http://mbon.maryland.gov/Pages/advanced-practice-tax-benefit-np-preceptors.aspx

[31] American Association of Colleges of Nursing. (2014). Annual Report 2014: Building a Framework for the Future. Washington, D.C.

THE GNE DEMONSTRATION PROJECT

As required by statute, under the GNE demonstration project, CMS provided payment to five eligible hospital awardees for the reasonable costs attributable to providing qualified clinical training to APRN students enrolled as a result of the demonstration. Reasonable costs include only those clinical training costs that are not covered by other revenue sources, such as:

- Salaries for staff in lead hospitals to administer the GNE demonstration project;
- Costs incurred by SONs for materials, salaries for non-didactic faculty, and coordination of clinical preceptorships for incremental APRN students;
- Costs associated with executing CCS partnership agreements; and
- Precepting payments for the clinical education of incremental APRN students.

Costs associated with didactic training as well as costs for certification and licensure are *not* eligible for reimbursement under the demonstration. Importantly, the demonstration provides reimbursements only for costs incurred for students seeking graduate nurse education for the purpose of being employed in a new capacity, that is, one in which they could not have been employed without completing the additional training program. Training that only enhances nurse competencies is not eligible for reimbursement. Individuals who have already been licensed to practice as APRNs are therefore not eligible for further training under the demonstration.

The hospitals participating in the demonstration were required to partner with accredited schools of nursing, with non-hospital care providers in community-based care settings (CCSs), and with other hospitals in an effort to expand the number of APRN students receiving qualified clinical training. Because the need for primary care access is especially acute in underserved areas, CMS aimed not only to increase the overall number of primary care providers, but also to expand primary care access to medically underserved areas of the country. Therefore, consistent with the statutory requirement, CMS required hospitals participating in the demonstration project to ensure that students completed at least half of their qualified clinical education in medically underserved areas. These settings included Federally Qualified Health Centers (FQHC) and rural health clinics.

Payments to the participating hospitals are linked directly to the number of "incremental," or additional, APRN students that the hospitals and their partnering entities educate as a result of their participation in the demonstration. Thus, payment is calculated by comparing enrollment levels in the APRN programs during the baseline period (i.e., January 2006–December 2010)[32] to increased enrollment under the demonstration. Participating hospitals reimburse their

[32] This is the legislatively established baseline period.

partners for the reasonable cost of providing qualified clinical training to APRN students based on their established agreements.

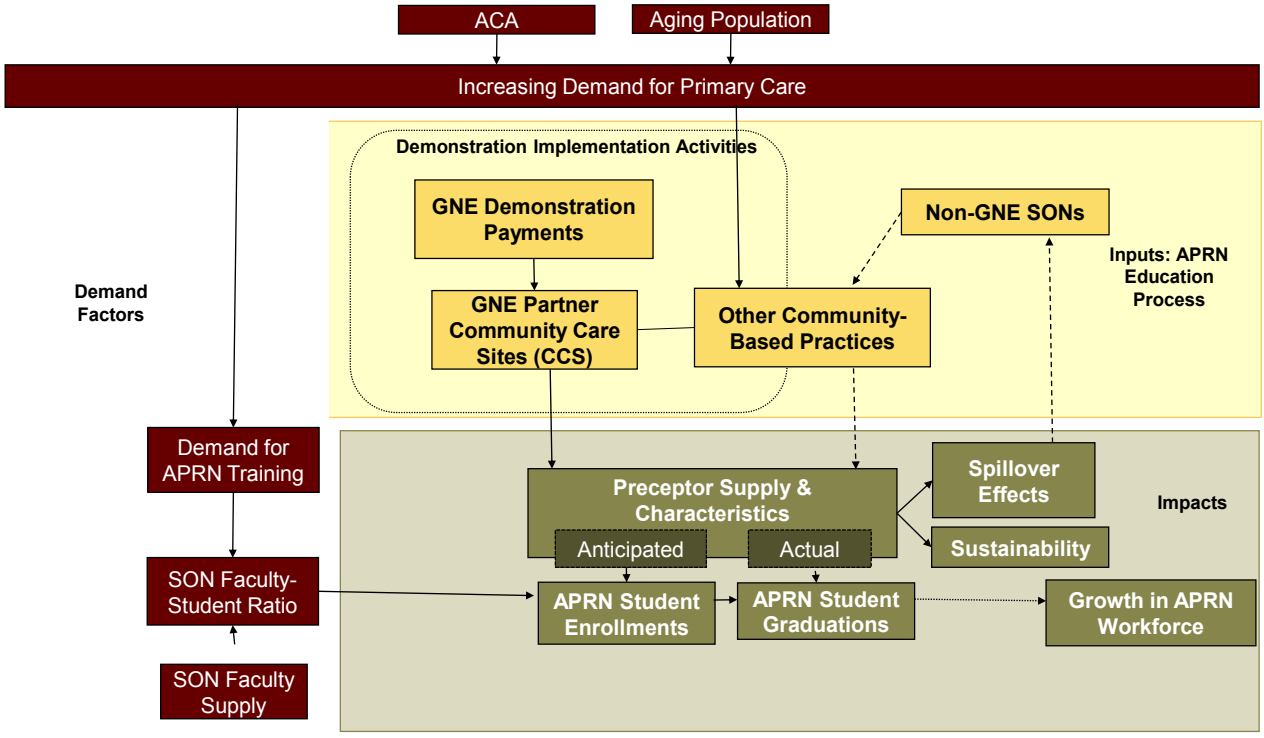
The participating hospitals receive monthly interim payments derived from their projected budget estimates based on the expected number of incremental students, divided by 12 months, for allowable and reasonable costs incurred for the provision of incremental APRN students' qualified clinical education. These payments are calculated using the allowable costs derived from the updated budget estimates and the enrollment information that the hospitals provide to CMS. The following year an independent audit is completed, during which any reconciliations are made. Any interim payments that exceed the actual reasonable GNE costs are paid back to CMS. Conversely, CMS pays the hospital a one-time lump sum in the event that the GNE interim payments are less than the actual reasonable GNE costs, with the stipulation that the demonstration expenditures not exceed the amount of funds appropriated under the authorizing statute. Exhibit 1-3 provides the total payment each awardee received over the first four-year demonstration period.

Logic Model of the Intended Effects of the GNE Demonstration Project on the APRN Workforce

Exhibit 1-2 depicts a logic model of the key pathways through which the GNE demonstration project may affect growth in the APRN workforce and shows the contextual factors that may influence the success of the demonstration.

The exhibit depicts the dynamic relationships through which growing demand for primary health care results in increased demand for APRN providers, which in turn increases the demand for precepted clinical education. The GNE demonstration project supports the formation of collaborative networks that recruit, coordinate, and pay clinical education sites to expand the number of opportunities for clinical precepted training. This design in which precepting payments are offered to clinical sites aims to address the difficulty the SONs experience in finding and building relationships with clinical sites and preceptors who will provide one-on-one mentoring and clinical training of APRN students. Financial support for precepted training is intended to enable SONs to enroll and graduate more APRN students and ensure that the students graduate on time. By compensating clinical sites for staff time educating students, the demonstration project aims to ensure that sufficient clinical preceptorships are available to permit the enrollment and facilitate the graduation of additional APRN students.

Exhibit 1-2. Logic Model of the GNE Demonstration Project



Overview of the GNE Demonstration Project Awardees

In a competitive selection process, CMS awarded the following five hospitals the opportunity to participate in the GNE demonstration project:

- Duke University Hospital, Durham, North Carolina
- Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania
- Memorial Hermann-Texas Medical Center, Houston, Texas
- Rush University Medical Center, Chicago, Illinois
- HonorHealth Scottsdale Osborn Medical Center, Scottsdale, Arizona

Each hospital participant formed a network partnership composed of other hospitals, SONs, and CCSs, which together developed network-specific processes and priorities for implementing the demonstration project. Each network established a GNE strategic planning and oversight team, and engaged SON administrators, clinical administrators, clinical placement coordinators, and preceptors to implement the demonstration project.

Each GNE network appointed a designated GNE oversight team and SON administrators to establish network- and SON-level clinical placement processes, hire the necessary program support staff and faculty, and invest in innovative models of care and training. The GNE

oversight teams, formed at the beginning of the project period, typically consisted of hospital leadership including chief financial officers, SON administrators, and other high-level hospital affiliates designated to manage the demonstration project. Each of the five hospital-led networks is further described below.

Duke University Hospital

Duke University Hospital (DUH), the participant hospital for the Duke GNE demonstration network, is a large academic health and medical center located in Durham, North Carolina. It is the flagship hospital of Duke University Health Systems (DUHS), a nonprofit corporation that includes DUH, Duke Regional Hospital, Duke Raleigh Hospital, ambulatory care services, home health care, hospice, and other services.[33] The DUH demonstration network is made up of DUH, Duke Regional Hospital, Duke Raleigh Hospital, three rural, small/medium-sized hospitals, Duke University School of Nursing (DUSON), and many CCSs, including specialty and primary care private practices, community clinics, and health departments. The DUH network is one of two networks in the demonstration project with only a single school of nursing.

Hospital of the University of Pennsylvania

The Hospital of the University of Pennsylvania (HUP), located in Philadelphia, Pennsylvania, is the participant hospital for the Greater Philadelphia GNE demonstration network. The network consists of HUP, nine SONs, and eight other hospitals and community umbrella organizations representing free-standing ambulatory care clinics. The nine SONs partnering in the demonstration network are the University of Pennsylvania, Gwynedd Mercy College, LaSalle University, Drexel University, Neumann University, Temple University, Thomas Jefferson University, Villanova University, and Widener University.

Memorial Hermann-Texas Medical Center

Memorial Hermann-Texas Medical Center (MH) in Houston, Texas, is the hospital participant for the Memorial-Hermann (MH) GNE demonstration network. The network consists of 11 hospitals in the Memorial Hermann Health System (including MH), two additional hospitals, four SONs, four hospital-based physician partners, and many community-based partners. The network covers the Gulf Coast Region of Texas, which includes an area with a rapidly growing population and some of the highest rates of uninsured people in the country.[34] The following SONs are part of the network: University of Texas Health Science Center at Houston, Texas Woman's University, Prairie View A&M University, and University of Texas Medical Branch at Galveston. Memorial Hermann Health System has a history of partnering with these schools to

[33] Optimal Solutions Group. (2014). Phase I Evaluation Report.

[34] Memorial-Hermann (MH) Demonstration Application, MH Implementation Plan.

place students for clinical education, and all the schools are part of a pre-existing Gulf Coast Committee, which promotes health care workforce solutions for Gulf Coast communities.[35]

Rush University Medical Center

Rush University Medical Center (RUMC), located in Chicago, Illinois is the hospital participant for the RUMC GNE demonstration network. The network includes three other hospitals, Rush University College of Nursing (CON), and over 20 clinical and community-based care training sites. The training sites are located throughout the Chicago area and rural Illinois and include health networks, FQHCs, and charity clinics. Rush CON, which is structurally affiliated with RUMC, acts as the coordinator of the RUMC demonstration network and is the sole SON in the network.

HonorHealth Scottsdale Osborn Medical Center[36]

HonorHealth Scottsdale Osborn Medical Center, previously known as Scottsdale Healthcare Osborn Medical Center (SHC-O), is the hospital participant for the SHC-O GNE demonstration network. It is a newly formed nonprofit health system in Scottsdale and Phoenix, Arizona, that consists of a merger between the Scottsdale Healthcare and the John C. Lincoln Health Network. The HonorHealth system has five acute care hospitals, which are located around the Scottsdale and Phoenix area. Four SONS (Arizona State University, Grand Canyon University, Northern Arizona University, and the University of Arizona) are partners on the demonstration project. Five other hospitals - Banner Health System, Mayo Clinic Hospital, Phoenix Children's Hospital, Maricopa Integrated Health System, and the University of Arizona Medical Center together with over 1,000 CCSs based in urban and rural areas participate in the GNE demonstration project.

A summary of the five GNE networks is presented in Exhibit 1-3.

[35] MH Demonstration Application.

[36] In March 2015, Scottsdale Healthcare Osborn Medical Center (SHC-O) became HonorHealth Scottsdale Osborn Medical Center. In this report, it is still referred to as SHC-O.

Exhibit 1-3. Summary of Characteristics of the GNE Demonstration Networks

	Duke University Hospital (DUH)	Hospital of the University of Pennsylvania (HUP)	Memorial Hermann-Texas Medical Center (MH)	Rush University Medical Center (RUMC)	Scottsdale Healthcare Osborn Medical Center (SHC-O)
Partner Hospitals	5	8	2	3	4
Partner Schools of Nursing	1	9	4	1	4
Partner Community-Based Care Settings (CCSs)	More than 150 CCSs: affiliated practice primary care network, community clinics, free clinic, other CCSs[37]	More than 150 hospital- and non-hospital-affiliated CCSs, stand-alone nurse-managed primary care clinics, FQHCs[38]	More than 150 CCSs: clinics surrounding SONs, FQHCs, physician group primary-care practices, hospice, home health[39]	25 CCSs in Greater Chicago area and adjoining rural counties; initially 5 large community organizations[40]	More than 1,000 CCSs: FQHCs, rural health clinics, primary care practices, nurse-managed clinics, home health, long-term care[41]
Geographic Area	Regional, generally within approximately a 60-mile radius	Greater Philadelphia area with regional reach; 44 northern and central counties served by 1 partner	Southeastern Texas, near the Gulf Coast	Greater Chicago area and adjoining counties in Illinois	Large geographic region across Arizona, other Southwestern bordering states, and parts of Mexico
APRN Specialty	NP CNS CRNA	NP CNS CRNA CNM	NP CRNA	NP CNS CRNA	NP CNS
Total Payment	$10,696,200	$42,942,600	$35,750,600	$9,243,400	$21,841,700

GNE Demonstration Project Timeline

The GNE demonstration project was initially implemented in July 2012 and designed to operate for a four-year period (e.g., demonstration years (DY) 2012 – 2015). Because there were

[37] Duke University Hospital (DUH), 2015 GNE semi-annual report.

[38] Hospital of the University of Pennsylvania (HUP), 2015 GNE semi-annual report.

[39] Memorial Hermann-Texas Medical Center (MH), 2015 semi-annual report.

[40] Rush University Medical Center (RUMC), 2015 semi-annual report.

[41] HonorHealth Scottsdale Osborn Medical Center (SHC-O), 2015 semi-annual report.

appropriations available at the end of that period, and the statute permits the use of these funds without fiscal year limitation, CMS extended the demonstration for an additional two years, through July 2018 (e.g., DY 2016 – 2017). The extension (1) allowed additional time for the incremental APRN students enrolled under the demonstration project to complete their required clinical education, and (2) made measurement of APRN graduation rates under the demonstration project more accurate. However, no payments for qualified clinical education were to be made for incremental APRN student enrollments during the extension period.

The demonstration project operates on an academic calendar. The academic year runs from the fall of a given calendar year through the summer of the subsequent year. Exhibit 1-4 relates academic years (AYs) to demonstration years (DYs).

Exhibit 1-4. GNE Demonstration Project Timeline

Academic Calendar Year (AY)	Demonstration Period					
	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Demonstration Year (DY)	DY 2012	DY 2013	DY 2014	DY 2015	DY 2016	DY 2017
	DY 1	DY 2	DY 3	DY 4	DY 5	DY 6

EVALUATION OF THE GNE DEMONSTRATION PROJECT

Section 5509 required an independent evaluation of the GNE demonstration project, to determine whether payments to participating hospitals for qualified clinical training resulted in overall growth in APRN students in the four named clinical specialties relative to the specific base year. The evaluation also examined the costs to the Medicare program by determining the overall cost for implementing the GNE demonstration as well as the cost to CMS for supporting an incremental APRN student to graduate. In addition, the evaluation assessed the structure and characteristics of the networks, the implementation processes, successes and challenges, and spillover effects.

CMS awarded an initial 2-year contract to Optimal Solutions Group, LLC, during the original evaluation design phase (Phase 1). A second contract, for five years, was awarded to IMPAQ International, LLC, to complete the independent evaluation of the GNE demonstration project (Phase II).

Research Questions

The overarching research questions that the evaluation addresses are:

1. **How was the GNE Demonstration project implemented and operated?**
    a. What are the networks' characteristics and demonstration operation processes?
    b. How does the demonstration influence precepted clinical education placements and the placement processes?
    c. What notable challenges and successes do networks experience?
    d. What are the networks' plans for sustainability?
2. **How effective was the GNE Demonstration project in increasing growth in the APRN workforce?**
    a. What is the effect on APRN growth (i.e., enrollment and graduations) overall?
    b. What is the effect on APRN enrollment and graduations by specialty?
    c. Is the demonstration associated with spillover effects to non-demonstration SONs?
3. **What is the total cost of the demonstration project overall?**

This report addresses the first and second set of research questions for the first four years of the demonstration project period. The third research question is addressed in a separate report titled *Evaluation of the GNE Demonstration Project Volume II: Demonstration Costs.*

Evaluation Design

The evaluation team used a mixed-methods approach to evaluate the GNE demonstration project.[42] The team integrated data from a number of sources: qualitative interviews with a wide variety of participants involved in APRN education; administrative data reported to CMS by the demonstration networks; GNE summary reports submitted by an independent auditor under contract with CMS; and annual institutional survey results published by the American Association of Colleges of Nursing (AACN). The team used these data to describe:

- Processes used by the networks to implement and operate the demonstration project;
- Strategies for sustaining support for expanded precepted clinical educational opportunities for APRNs after the end of the demonstration; and

[42] Optimal Solutions, LLC, developed the original evaluation design and methodology in 2012 and independently carried out the evaluation of the first two demonstration years (Phase I). IMPAQ International, LLC built on that methodology.

- Trends in enrollments, precepted training hours, and graduations.

The team also used a quasi-experimental, difference-in-differences (DID) model to estimate the impact of the demonstration project on APRN growth in APRN student enrollment and graduations, overall and by specialty, relative to a defined baseline period. In addition, the team used the DID model to determine whether the demonstration project had spillover effects on non-GNE SONs operating in geographic proximity to GNE SONs participating.

Evaluation Timeline

The evaluation of the GNE demonstration project began in September 2012 and will end in September 2019. The evaluation team defined the baseline period as academic years (AY) 2006-2007 through 2009-2010 to approximate the legislatively established baseline period of calendar years January 2006–December 2010.[43]

This report provides findings for the initial four years of the demonstration period. A final evaluation report that will provide findings for the complete six-year demonstration experience will be available in the fall of 2019.

Organization of This Report

This report describes the methods and cumulative findings from the mixed-methods evaluation of the GNE demonstration project conducted by the evaluation team. Chapter 2 describes the data sources, evaluation methodology, and quality assurance procedures for the qualitative and quantitative data collection and analyses, and explains how the qualitative and quantitative findings were integrated. Chapter 3 discusses the findings to date regarding the implementation and operations of the project. Chapter 4 examines the quantitative impacts of the demonstration on APRN student enrollment and graduations, as well as spillover effects on non-GNE SONs. Finally, Chapter 5 summarizes the findings to date, discusses the limitations of the data and the methods used to conduct the evaluation, and draws conclusions about the impact of the demonstration on APRN student growth.

[43] AACN data used for the evaluation were available by academic year and not calendar year. As such, the legislatively mandated baseline period January 2006 –December 2010 was defined as academic years 2006-2007 through 2009-2010 for the evaluation. Academic years 2005-2006 and 2010-2011 were not considered part of the baseline period because calendar years 2005 and 2011 were not included in the legislatively defined baseline.

Chapter 2: Evaluation Methodology

This chapter describes the data sources, evaluation methodology, and quality assurance procedures for the qualitative and quantitative data collection and analyses, and explains how the qualitative and quantitative findings were integrated.

DATA SOURCES

The sections below describe the primary and secondary sources of data used by the evaluation team to implement the qualitative and quantitative components of the evaluation.

Qualitative Data Describing Demonstration Project Implementation and Operations

The evaluation team collected qualitative data during annual site visits, which consisted of stakeholder interviews and focus groups, and annual check-in calls. The team conducted eight rounds of qualitative data collection over the four-year period between AY 2012-2013 (DY 2012) and AY 2015-2016 (DY 2015). The team conducted site visits each fall, followed by check-in calls each spring.

Stakeholders who participated in the qualitative data collection represented hospital and SON leaders who oversee the demonstration; administrative staff and faculty involved in implementing demonstration activities (including clinical placement coordinators); preceptors who provide clinical education to APRNs; and APRN students enrolled during the demonstration period. Exhibit 2-1 describes each stakeholder group. The team used semi-structured interview guides to lead in-person and telephone discussions during the site visits and in later check-in telephone calls. The purpose of the interviews was to describe and monitor major demonstration project activities and experiences over time. These included clinical placement processes, changes in partnerships, innovative uses of GNE demonstration project and precepting payments, stakeholders' perspectives on successes and challenges, and plans for sustaining APRN growth after the demonstration project ends.

Exhibit 2-1. Stakeholder Descriptions and Frequency of Data Collection

Stakeholder Description	Data Collected DY 2012–DY 2015	
	Annual Site Visit	Annual Check-in Call
GNE oversight teams vary by network based on the network's structure, but generally include leadership from the primary participant hospital and participating SONs (e.g., hospital chief financial officers, SON administrators). The oversight team directs and oversees all high-level programmatic aspects of the demonstration, supports participating SONs, works with financial leadership to manage the overall GNE demonstration budget, and coordinates communication with CMS.	X	X
The chief financial officers and other financial staff oversee all financial aspects of the demonstration in consultation with the oversight team. They define financial-related policies and procedures and ensure that the network complies with these and with CMS policies.	X	
SON administrators include the dean, assistant deans, and other administrative staff who oversee implementation of the GNE demonstration, including programmatic policies, demonstration budgets, and promotion of the demonstration to university leadership and other external stakeholders.	X	X
Clinical placement coordinators coordinate all aspects of the clinical placement process. Coordinators were hired by the SONs at the start of the GNE demonstration, generally with demonstration payments, to improve and develop internal processes and relationships with preceptors and preceptor sites.	X	
Preceptors include APRNs, physicians, and other health care professionals from hospitals and CCSs who precept one or more students from a participating SON at sites that receive precepting payments through the GNE demonstration project.	X	
APRN students include those who have been mentored and supervised by a preceptor at a site that receives precepting payments through the demonstration project or those who are "GNE-designated" (depending on how the network defines "GNE" for precepting payment purposes).	X	
Clinical faculty oversee clinical placements for students, including students who are GNE-designated or who have been precepted at a site that receives precepting payments (depending on how the network defines "GNE" for payment purposes).	X	

Exhibit 2-2 shows the total number of respondents who participated in individual and group interviews during each demonstration year.

Exhibit 2-2. Number of Interviewees by Type and Demonstration Year

DY	In-Person Interview Participants							Check-in Call Participants
	GNE Strategic Planning Team	SON Admin	Clinical Placement Coordinator	Preceptors	Financial Staff	APRN Students	Clinical Faculty	
2012	15	29	9	14	2	37	32	9†
2013	18	21	12	19	4	33	20	30
2014	25	26	11	20	12	42	42	35
2015	22	30	8	21	8	21	27	53
TOTAL	**80**	**106**	**40**	**74**	**26**	**133**	**121**	**118**

* Strategic Planning Team and SON administrators.
† Maximum number of persons who could be interviewed prior to receiving Office of Management and Budget (OMB) clearance.

Secondary Data Describing SON Characteristics and Demonstration Outcomes

The evaluation team used secondary data to describe the characteristics of the GNE SONs and to measure the evaluation outcomes. Data came from several sources: GNE participants' applications, the American Association of Colleges of Nursing, the Integrated Postsecondary Education Data System, US News & World Report, and the GNE Demonstration Audit Reports. A description of each data source and how it was used in the evaluation follow.

Baseline Network Features and Planned Implementation Activities

The evaluation team extracted data contained in the GNE demonstration project applications submitted in 2012 by the lead hospitals. These data provided the team with baseline information about the structure and organizational features of the networks, which informed the team's development of the qualitative interview guides, the selection of participants for stakeholder interviews, and the analysis of primary qualitative data obtained during the interviews. Each application included the following information:

- A description of the network and its partners;
- The network's stated purpose and the need for the demonstration at the local, state, and regional levels;
- The network's goals and its strategies for achieving them;
- The perceived potential impact of the demonstration on the network;
- The plan for implementing the demonstration, including recruiting, coordinating, and monitoring clinical placements; and
- Budget and financial information.

SON-level APRN Enrollment and Graduation Data

In the fall of each year, the American Association of Colleges of Nursing (AACN) administers an annual institutional survey to accredited SONs operating in the United States**.** The evaluation team used various data elements to compare and track APRN enrollments and graduations for SONs participating in the GNE demonstration project. The team used the data to:

- Describe trends in APRN enrollment and graduations by degree program and clinical specialty, specifically, NP, CNS, CNM, CRNA;
- Determine full-time/part-time status;
- Construct comparison groups of SONs; and
- Measure the impact of the demonstration on APRN student growth.

Affiliation and Locational Characteristics of SONs

The Integrated Postsecondary Education Data System (IPEDS) contains detailed survey data collected annually by the National Institute of Education Sciences from every college, university, and technical and vocational institution that participates in federal student financial aid programs.[44] The evaluation team selected fields that were likely to be correlated with GNE demonstration project participation and APRN student enrollment and graduations. The variables include:

- Whether the SON is part of a public institution, and
- Whether the SON location is a city, suburb, town, or rural area.

The team combined the 2008 IPEDS survey responses with the AACN enrollment and graduation data to inform the selection of the non-GNE SONs. The non-GNE SONs served as the comparison group for the impact and spillover analyses.

Quality of APRN Training Programs

In addition, the team used information from the "Best Nursing Schools of 2011," published by US News & World Report, as a proxy for the quality of the program.[45] These rankings are based on the results of surveys sent to deans, other administrators, and faculty at accredited degree programs or schools in each discipline. Respondents rate the academic quality of programs on a scale of 1 (marginal) to 5 (outstanding). Only fully accredited programs in good standing during the survey period are ranked. The team used the information for 2011 because the data

[44] http://datainventory.ed.gov/Search?seriesID=189&searchTerm=Integrated Postsecondary Education Data System&searchType=Exact

[45] Data retrieved on January 10, 2015.

for 2008 were not publicly available. However, school rankings are generally stable over short periods of time.[46] The team used these rankings inform the selection of the comparison SONs.

Audited Report Summaries

Each year an independent audit of the GNE demonstration project is completed on behalf of CMS. The audit includes a review and certification of financial data for each demonstration network based on the student enrollment, credit hours, graduations, and completed clinical education hours by clinical site, for each degree program, at each GNE SON. The audited data were used to describe trends in precepted clinical education hours overall and by specialty.

DATA COLLECTION AND ANALYSIS

The sections below describe the methods the evaluation team used to collect and analyze qualitative and quantitative data to answer the research questions regarding the characteristics of the demonstration networks and their implementation, operation, and sustainability.

Qualitative Data

The purpose of the qualitative component of the evaluation is to analyze the structural features of the demonstration networks, their implementation and operational processes, perceived outcomes, and sustainability strategies. The analysis of qualitative data provides insight into the meanings, motives, reasoning, and perceptions of respondents that cannot usually be obtained from analyses of quantitative data.[47] The qualitative findings also provide context for framing and interpreting the quantitative results and were used for the process and effectiveness domains of the evaluation.

Review of GNE Semi-Annual Reports

The team conducted a systematic review of the GNE semi-annual reports submitted to CMS by the demonstration networks. These documents contained descriptions of network characteristics and implementation plans, which informed the development and routine updating of the structured interview and focus group guides, and were also used to explore changes to program implementation over the course of the demonstration.

The team systematically reviewed the reports across each network, recorded the data using a standardized template, summarized key points, and documented areas for follow-up and

[46] Tancredi, D. J., Bertakis, K. D., & Jerant, A. (2013). Short-term stability and spread of the U.S. News & World Report primary care medical school rankings. *Academic Medicine, 88*(8), 1107-15.

[47] Miles, M. B., & Huberman, A. M. (1994). Introduction. In *Qualitative Data Analysis*, 2nd edition. Thousand Oaks, CA: Sage Publications.

probing to be used during the site visit interviews and check-in calls. The review was performed annually, prior to conducting the qualitative interviews and focus groups.

Stakeholder Interviews and Focus Groups

Data Collection. The evaluation team collected primary qualitative data through stakeholder interviews and focus groups conducted during the site visits and through check-in telephone calls conducted twice a year between AY 2012-2013 and AY 2015-2016. The team conducted interviews with GNE strategic planning teams, SON administrators, clinical placement coordinators, chief financial officers/financial staff, and preceptors, and led focus groups with APRN students and clinical faculty. The interviews were conducted individually or in groups of two or three people.

The team designed and employed distinct guides for each type of interviewee (SON administrator, clinical faculty, etc.). Each guide was structured to cover only the areas in which the interviewee or group had direct knowledge and was best suited to respond. These semi-structured interview guides were intended to standardize the core qualitative data collected from each network. However, the interviewees' responses to the core interview questions, and the different network structures, shaped the follow-up questions asked of the respondents. In addition, information gleaned from the document reviews was used to identify specific lines of inquiry that interviewers pursued (discussed in more detail below). This tailoring provided flexibility to discuss the issues most relevant to each GNE network and to customize probing questions to address each network's unique features. Exhibit 2-3 lists the topics covered by each interview guide.

Exhibit 2-3. Interview Discussion Topics by Interviewee Type

Interviewee Type	Topics
GNE Oversight Team	▪ Changes since the GNE demonstration project began ▪ Outcomes, barriers, and facilitators ▪ Perceived return on investment and sustainability plans ▪ Effects of the demonstration on enrollment and graduations ▪ Positive and negative outcomes of the demonstration
SON Administrator	▪ Changes since the GNE demonstration project began ▪ Outcomes, barriers, and facilitators ▪ Perceived return on investment and sustainability plans ▪ Effects of the demonstration on enrollment and graduations ▪ Positive and negative outcomes of the demonstration

Interviewee Type	Topics
Chief Financial Officer	▪ Investments related to the GNE demonstration project ▪ Perceived return on investment and sustainability plans ▪ Positive and negative outcomes of the demonstration
Clinical Placement Coordinator	▪ Changes since the GNE demonstration project began ▪ Outcomes, barriers, and facilitators ▪ Perspectives on sustainability ▪ Positive and negative outcomes of the demonstration
Preceptor	▪ Preceptor's professional history ▪ Preceptor's experiences ▪ Positive and negative outcomes of the demonstration.
Director of Nursing/Clinical Director	▪ Changes since the GNE demonstration project began ▪ Outcomes, barriers, and facilitators ▪ Perceived return on investment and sustainability plans ▪ Effects of the demonstration on enrollment and graduations ▪ Positive and negative outcomes of the demonstration
Clinical Faculty	▪ Changes since the GNE demonstration project began ▪ Outcomes, barriers, and facilitators ▪ Perceived return on investment and sustainability plans ▪ Changes made to preceptor hours to meet student needs
APRN Student	▪ Placement in clinical rotations ▪ Clinical training experiences ▪ Education and career goals ▪ Recent clinical placement experiences

The evaluation team coordinated with the participant hospitals' GNE demonstration project coordinators and directors to prepare a schedule and create agendas for each site visit. An assigned evaluation team member served as the point of contact or site liaison and worked with the project coordinators to identify and recruit preceptors, students, and faculty to participate in the interviews and focus groups. The availability and scheduling of participants informed the agenda for each site. The liaison sent Institutional Review Board-approved consent forms to all participants in advance of the interviews and focus groups, and the site visit team confirmed consent at each interview and focus group session.

Two evaluation staff members with professional training and extensive experience conducting interviews with student populations and health care professionals led the annual site visits. These interviewers received additional training, ongoing support, debriefings, and analysis input

from the evaluation team's doctorally prepared consultant, who is also a certified gerontological nurse practitioner. With the participants' consent, the team audio-recorded the sessions to support the written record and to clarify any discrepancies.

Each interview lasted approximately 60 minutes (with the exception of the interviews with the chief financial officer/financial leader, which lasted 30 minutes). The focus groups with APRN students and clinical faculty lasted 90 minutes.

Approximately six months following the site visits, the site liaison contacted each GNE demonstration project coordinator to schedule check-in calls with oversight team members and SON administrators in the network. The purpose of these 30-minute calls was to collect information about changes or updates to the demonstration since the last site visit. In addition, these calls served as an opportunity to confirm or clarify information gathered during the site visits. When feasible, the same two team members who conducted the site visit also conducted the check-in calls.

Analysis. The evaluation team followed the analysis framework developed by Miles and Huberman to analyze the primary qualitative data and draw conclusions.[48] This framework consists of three steps: data reduction, data display, and conclusion-drawing and verification. First, the team used a combination of deductive and inductive coding. The highest-level codes were used as the starting point for coding (a deductive approach), and additional codes, subcodes, and code categories were created based on information obtained from the interviews, focus groups, and telephone calls (an inductive approach). The team transcribed the interview and focus group recordings and notes into text format and entered them into NVivo version 10 (NVivo), a qualitative data analysis software used to apply codes and identify key themes.

Prior to coding the qualitative data, all interview notes were reviewed by the note takers, using the audio files as a reference. Any typographical errors, erroneous text, or omissions were corrected at this stage. The team then met as a group to brainstorm additions, changes, and exclusions to the coding framework.

Using a sample of notes from discussions with the interviewees and focus group participants, the team applied the coding scheme and looked for any instances where codes were not used or where new codes were needed. The team mapped the new codes onto the coding scheme

[48] Miles, M. B. & Huberman, A. M. (1994). *Qualitative Data Analysis* (2nd ed.). Thousand Oaks, CA: Sage Publications. The team's qualitative methodology and analysis approach was adapted from the methodology of the Phase I evaluator.

and then tested the revised coding scheme on another sample of notes to evaluate its applicability and to test inter-rater reliability.

In the test of inter-rater reliability, all coders applied codes to a subset of interviews (including interviews from sites they had not visited). Across these interviews, the agreement scores (Cohen's Kappa) averaged a Kappa value of 0.7 and 0.8 across codes.[49] For the check-in calls, the team revisited the independent coding and found that the team-based approach produced good independent inter-rater reliability (an average Kappa of 0.7 or better). The check-in calls were coded independently by the team members who had conducted the site visit.

The team then reviewed each transcript and assigned specific codes to sections of text that were of interest or related to associated subcodes. For each network, the team integrated new themes with the themes generated in Phase I of the evaluation, noting changes or updates to the network structure and partnerships that had occurred in the past year. Data across all networks were then analyzed together, using a cross-case process. This process allowed the team to identify emergent themes and draw conclusions about the structure, characteristics, and processes of the demonstration project.

Quantitative Data

The quantitative component of the evaluation sought to provide information regarding the implementation and operation of the GNE demonstration project and its influence on the demonstration outcomes. To achieve this objective, the evaluation team collected and analyzed descriptive data from the summary audit reports to describe demonstration-level trends in enrollment and graduations and hours of precepted clinical education from DY 2012 through DY 2015 (AY 2012-2013 through AY 2015-2016). The use of AACN data to estimate the impact of the demonstration project on enrollment and graduations is described in detail in the next section.

IMPACT OF THE GNE DEMONSTRATION PROJECT ON APRN STUDENT GROWTH

A critical goal of the evaluation is to understand whether the GNE demonstration project was effective in increasing APRN student growth. To accomplish this, the evaluation team estimated the impact of the GNE demonstration on APRN student enrollments and graduations across the

[49] For open-ended interviews with complex coding schemes, a Kappa agreement score of 0.6 to 0.8 is considered "substantial" agreement. For further details, see: Hruschka, D. J. et al. (2004). Reliability in coding open-ended data: lessons learned from HIV behavioral research. *Field Methods, 16*(3), 307-331.

GNE SONs relative to the non-GNE SONs comparison group. The team also tested whether the demonstration project resulted in spillover effects on enrollment and graduations in non-GNE SONs located in the same state as a GNE SON. To complement the impact analysis, the team collected the perspectives of network stakeholders about the impact of the demonstration project on APRN student growth. This section discusses the methodology used to estimate the impact of the demonstration project on APRN student growth in the demonstration and comparison group SONs.[50]

The following sections describe the impact evaluation approach, including the criteria the evaluation team used to select the comparison group, the selection of the spillover group, the construction of the spillover comparison group, and the weighted difference-in-differences methodology used to measure the direct and indirect effects of the demonstration project.

Impact Evaluation Approach

The team used a weighted difference-in-differences (DID) regression approach combined with rigorously selected comparison groups to measure the direct and indirect effects of the GNE demonstration project on APRN enrollment and graduations.

The direct effect of the demonstration project was measured using weighted DID regressions that compared the average difference between pre- and post-demonstration outcomes for the 19 SONs that participated in the demonstration project (i.e., GNE SONs) with corresponding outcome differences for the non-GNE SONs (i.e. a comparison group of SONs that did not participate in the GNE demonstration and are not located in states with GNE SONs).

The indirect effects of the demonstration project, or spillover effects, were also measured using a weighted DID approach. In this case, the outcome differences for the *spillover group* were compared to the outcome differences of the *spillover comparison group.* The spillover group is composed of SONs that did not participate in the demonstration, but have observable characteristics similar to those of the GNE SONs and are located in the same states as the GNE SONs.

[50]The Phase I evaluation used a non-GNE SON comparison group that was different from the one used to generate the findings presented in this report. The Phase I comparison group had several limitations: (1) it was selected using data from 2012, the first demonstration year, meaning that the comparison group may already have been affected by the demonstration; (2) the baseline enrollment trends of the GNE and comparison groups were not parallel; and (3) the GNE and comparison group SONs were substantially different in some observable characteristics. The evaluation team for Phase II revised the evaluation methodology to address concerns expressed by the GNE SONs regarding the small number of comparison SONS. The methodology for Phase II uses larger comparison groups, resulting in greater statistical power to detect the effects of the demonstration.

Criteria to Select the Comparison Group

Calculation of the unbiased estimate of the demonstration relies on selecting an appropriate comparison group. The evaluation team selected a comparison group that satisfies two main requirements. *First, the GNE group and the comparison group should have parallel outcome trends during the baseline period.* The reason is that the identifying assumption of the DID approach (also known as the parallel trends assumption) states that, conditional on observable covariates, changes in APRN enrollment and graduations would have been the same for the GNE SONs and the comparison groups if the demonstration had not occurred. It is not possible to directly test this assumption because we cannot observe the counterfactual (i.e., we cannot observe what would have happened to the GNE SONs group in the absence of the demonstration). However, we can indirectly assess the validity of this assumption by visually examining the outcome trends for the GNE SONs group and the comparison group during the baseline period and by estimating a model that interacts the treatment variables with the full set of year fixed effects. The tests for differential pre-treatment trends (i.e., falsification tests) evaluate whether the coefficients of the "treatment" variables in the baseline period are equal to zero. All the comparison groups described in this report passed this formal test, as is described in more detail below.

Second, the GNE group and the comparison group should be similar based on observable characteristics. Selecting a comparison group with similar observable characteristics increases confidence that the groups are similar and therefore increases the likelihood that the comparison group will serve as a reasonable counterfactual for the GNE SONs group. Typically, differences in observable characteristics between the treatment and comparison groups (i.e., balance of covariates) are stated in terms of standardized bias. Researchers have offered rules of thumb for evaluating the magnitude of dissimilarities between the treatment and comparison groups. For example, Rosenbaum and Rubin[51] suggest a 10 percent threshold (in absolute value) for the standardized difference after adjustment. The calculation of standardized bias is defined by the formula:

$$\text{Bias} = \frac{\bar{X}_D - \bar{X}_C}{\left(\frac{(\sigma_D^2 + \sigma_C^2)}{2}\right)^{1/2}}, \quad (1)$$

where $\bar{X}_D$ and $\bar{X}_C$ represent the sample means in the matched demonstration and comparison groups, respectively, for a given covariate, and σ_D^2 and σ_C^2 represent the variances in the full demonstration group and the full comparison group, respectively. Note that because the

[51] Rosenbaum, P., & Rubin, D. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *American Statistician*, *39*, 33-38.

differences are standardized using the demonstration and comparison group variances (in the denominator), it is possible to observe large biases even when the sample means of the demonstration and comparison groups (in the numerator) are very similar. In particular, the more uniform each of these two groups is, that is, the lower the variance of the demonstration(σ_D^2) and the comparison(σ_C^2) groups, the larger the bias.

Comparison Group Selection

The evaluation team selected a comparison group of non-GNE SONs similar to the GNE SONs from the universe of SONs that completed the 2008 AACN Annual Institutional Survey and had an APRN program (N=353). The year 2008 was selected because it is the first baseline year in which the SONs reported data to AACN for DNP programs. We narrowed down this universe based on some essential features of the demonstration project.

First, we excluded potential comparison non-GNE SONs that did not offer master's degree or post-master's certificate NP programs, because all GNE SONs had these two programs in 2008. Eliminating these non-GNE SONs reduces the risk of using comparison SONs that might be different from the GNE SONs in unobservable ways.

Second, we excluded SONs that were not located in one of the 50 states or the District of Columbia, because the 19 GNE SONs are located in one of the 50 states. SONs located in U.S. territories (rather than states) may have a very different APRN curriculum from those in the rest of the United States. This reduced the pool of potential comparison SONs to 272.

Third, we excluded SONs located in the same state as the GNE SONs, because of the potential presence of spillover effects that may bias the estimates of the effect of the demonstration on enrollment and graduations. If these SONs were included and spillover effects existed, we would have a comparison group that also was affected by the demonstration project. After applying these exclusions, the pool of potential comparison SONs consisted of 218 SONs.

We evaluated the impact of the demonstration project on APRN student enrollment using three alternative comparison groups: (1) a propensity score weighted comparison group, (2) an entropy weighted comparison group using entropy balancing inclusive of quadratic and cubic terms for continuous variables, and (3) an entropy weighted comparison group using entropy balancing inclusive of quadratic terms for continuous variables (but not cubic terms).

We included in the propensity score and entropy balancing models those observable characteristics likely to affect both the probability to participate in the GNE demonstration project and APRN student enrollment and graduations. Notably, we included the baseline level of graduations because if the GNE SONs and the comparison SONs have similar levels of

baseline outcomes, this increases the likelihood that they have similar unobservable characteristics.

The observable characteristics that were included in the selection of comparison groups 1 and 2 are as follows:[52]

AACN variables from the 2008 Annual Institutional Survey:

- Indicator variables if the SON offers a specific program (NP, CNS, CNM, CRNA) and degree (master's degree or DNP)
- Number of APRN applications received
  - Linear and quadratic terms
- Number of qualified APRN applicants not offered admission (by program and total)
- Total number of faculty
  - Linear, quadratic, and cubic terms
- An indicator variable if the school has an associated health center
- Number of APRN graduates
  - Linear and quadratic terms

IPEDS variables from the 2008 data set:

- Indicator variable if the university/college has an affiliated hospital
- Indicator variables if the:
  - University/college is located in a city
  - University/college is located in a suburb
  - University/college is located in a town
  - University/college is located in a rural area
- Indicator variable if the university/college is a public institution

[52] As is explained in more detail below, the only difference between comparison group 3 and comparison group 2 is that comparison group 2 excludes cubic continuous terms from the entropy balancing algorithm. Note also that not every cubic continuous variable was included as a covariate. In particular, the cubic of the number of APRN applications received and the number of APRN graduates were not included, because the entropy balancing algorithm was not able to achieve balance in those covariates.

Other variables:

- Indicator variables if the SON is located in a state with a regional interstate compact for higher education. The indicator variables equal one if the SON is located in a state that belongs to:
  - Midwestern Higher Education Compact (MHEC)
  - New England Board of Higher Education (NEBHE)
  - Southern Regional Education Board (SREB)
  - Western Interstate Commission for Higher Education (WICHE)
  - None of the above compacts
- SON's ranking according to US News & World Report, "Best Nursing Schools of 2011"
  - Linear, quadratic, and cubic terms

Each comparison group is described in detail below, including its advantages and disadvantages. For each comparison group, we examined the standardized bias coefficients for each variable listed above and the baseline outcome trends. We selected comparison group 2 for our main analysis; for this reason, we present standardized biases and baseline outcome trends for comparison group 2 in this section; similar graphs and tables for comparison groups 1 and 3 are shown in Appendix A.

Comparison Group 1. Propensity Score Weighting Methodology

The first comparison group was specified using a propensity score (PS) weighting methodology.[53] First, we estimated a propensity score model (PSM) and obtained the propensity score[54] for each potential comparison non-GNE SON. In a subsequent step, we estimated a DID regression in which GNE and comparison SON observations were weighted by the propensity score.[55] As shown in Exhibits A-1 and A-2 in Appendix A, baseline enrollment and graduation trends for the GNE SONs and the propensity score weighted comparison non-GNE group (comparison group 1) are close to parallel. However, as shown in *Exhibit A-3*, several covariates have standardized biases exceeding the 10 percent threshold recommended in the literature.[56] For these reasons, we explored alternative methods to define comparison groups

[53] This weighting scheme is also known as inverse probability of treatment weighting using the propensity score.

[54] A probit regression was used to estimate propensity scores.

[55] Specifically, the regression model is weighted by a function of the propensity score. To estimate the average treatment effect on the treated, GNE SONs were given a weight of 1 and comparison non-GNE SONs were given a weight of $p(x)/1 - p(x)$, where $p(x)$ is the estimated propensity score.

[56] See Rosenbaum, P., & Rubin, D. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *American Statistician*, *39*, 33-38.

with similarly parallel baseline outcome trends to achieve covariate balance statistics below the 10 percent threshold for all covariates.

Comparison Group 2. Entropy Weighting Methodology

The second comparison group was defined using an entropy balancing method[57] with cubic and quadratic terms. The entropy balancing algorithm produces a weight for each non-GNE SON that fulfills two criteria. First, the weights must be such that the GNE group and the reweighted comparison group have perfect balance for the specified moments (e.g., mean, variance, skewness) of the covariates. Second, the weights are chosen to be as close as possible to the weights of the GNE SONs. This approach achieves nearly perfect balance in observable characteristics between the GNE SONs and the non-GNE SONs. We then estimated DID regressions in which the observations of the non-GNE SONs were weighted using the weights found using entropy balancing.

The resulting comparison group included all eligible non-GNE SONs (n=218), each with an associated weight based on relative similarity to the GNE SON covariates. Exhibit 2-4 shows that after applying entropy balancing with quadratic and cubic terms, the means of almost every covariate are nearly identical between the two groups, and the standardized biases are far below the preferred threshold of 10 percent for most of the covariates.

Exhibit 2-4. Covariate Balance Statistics After Entropy Balancing

Variable	Mean for the GNE Group	Mean for the Weighted Comparison Group	Standardized Bias (%)
Indicator for master's NP program	1.000	1.000	0.000
Indicator for master's CNS program	0.526	0.527	-0.094
Indicator for master's CNM program	0.053	0.053	-0.020
Indicator for master's CRNA program	0.421	0.421	0.114
Indicator for DNP NP program	0.263	0.263	0.060
Indicator for DNP CNS program	0.053	0.053	-0.007
Indicator for DNP CNM program	0.053	0.053	0.046
Indicator for DNP CRNA program	0.053	0.053	0.032
Total number of applications	151.632	151.543	0.007

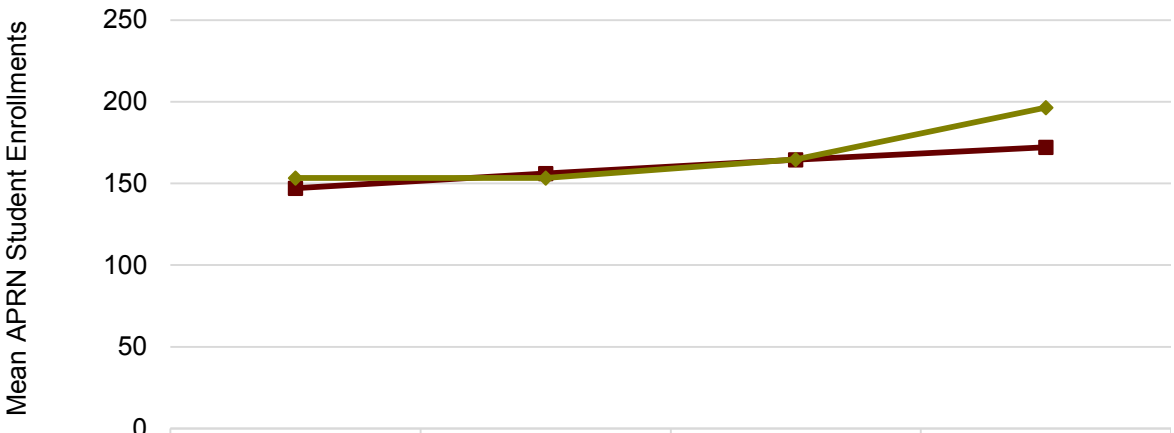
[57] Hainmueller, J. (2012). Entropy balancing for causal effects: a multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis*, *20*(1), 25-46.

Variable	Mean for the GNE Group	Mean for the Weighted Comparison Group	Standardized Bias (%)
Total number of qualified applicants not admitted	15.474	15.456	0.043
Total APRN graduates in 2008	52.316	52.287	0.073
SON US News ranking in 2011	142.895	142.890	0.003
Total number of faculty	44.684	44.683	0.006
Indicator for health center	0.474	0.473	0.042
Indicator for public institution	0.421	0.421	-0.037
Indicator for affiliated hospital	1.632	1.632	-0.009
Indicator for university/college is located in a city	0.737	0.737	0.060
Indicator for university/college is located in a suburb	0.210	0.211	-0.060
Indicator for MHEC compact	0.053	0.053	-0.003
Indicator for SREB compact	0.263	0.263	-0.000
SON belongs to no regional compact	0.474	0.473	0.113
(SON US News ranking in 2011)^2	37,067	37,059	0.014
(SON US News ranking in 2011)^3	1,373,978,051	1,373,978,051	0.023
(Total number of faculty) ^2	2,516	2,516	-0.007
(Total number of faculty) ^3	164,803	164,868	-0.013
(Total number of applications)^2	41,335	41,2978	0.046
(Total APRN graduates in 2008)^2	4,422	4,417	0.069

Notes: Baseline comparison group: weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.
The demonstration group consisted of 19 SONs; the comparison group, 218 SONs.

The descriptive graphs in Exhibit 2-5 and Exhibit 2-6 show that the GNE group and the entropy weighted comparison group have trends that are close to parallel for both enrollment and graduations. A regression analysis (Exhibit A-12 in Appendix A) shows that the baseline trends in total enrollment and graduations are not statistically different for the demonstration and comparison groups in any baseline year, providing additional evidence that the parallel trends assumption is likely satisfied.

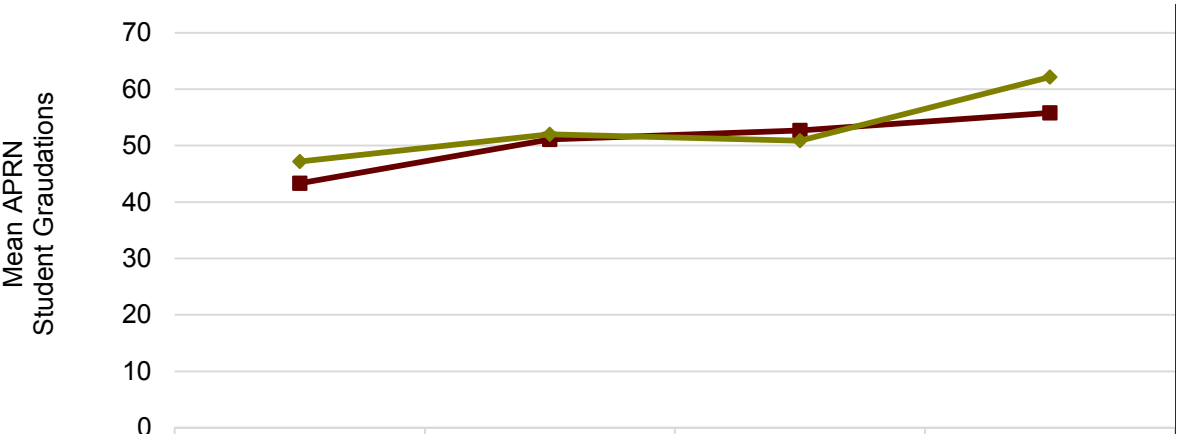
Exhibit 2-5. Mean APRN Student Enrollments per SON, GNE Group vs. Entropy Weighted Comparison Group



	1	2	3	4
Series1	147	156	164	172
Series2	153	153	165	196

Notes: BY = baseline year. Baseline comparison group: weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.

Exhibit 2-6. Mean APRN Student Graduations per SON, GNE Group vs. Entropy Weighted Comparison Group



	BY 2006	BY 2007	BY 2008	BY 2009
Comparison	43	51	53	56
GNE	47	52	51	62

Notes: BY = baseline year. Information for APRN graduations is reported with a one-year lag (the AACN 2015 Annual Institutional Survey reports graduation data for AY August 1, 2014 through July 31, 2015). Baseline comparison group: weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.

Comparison group 2 satisfies the two main criteria for an appropriate comparison group: small covariate balance and parallel baseline trends. However, a characteristic of this comparison

group is that about 60 percent of the SONs have weights relatively close to zero.[58] A potential concern was that not all the SONs would provide meaningful information to the regression analysis, and thus the analysis might not have enough power to detect statistically significant effects.

Comparison Group 3. Entropy Weighting Methodology Excluding Cubic Continuous Terms

The third alternative method used to define the comparison group was an entropy balancing method with quadratic terms only. A feature of the entropy balancing algorithm is that there is a trade-off between achieving more balance (by including higher order terms) and the number of control group observations that are assigned meaningful weights. To assess how the covariate specification affects the size and composition of the comparison group, we removed the cubic terms from the entropy balancing algorithm. That is, comparison group 3 employs weights estimated using the entropy balancing algorithm, including the covariates described above with the exception of cubic terms for several continuous variables.

This alternative group has a larger number of comparison units relative to comparison group 2, with weights meaningfully larger than zero. Comparison group 3 also has standardized biases lower than the 10 percent threshold (see Appendix A, Exhibit A-6), and parallel baseline trends (see Appendix A, Exhibit A-4 and Exhibit A-5).

Of the three comparison groups, comparison group 2 was selected because it has lower standardized biases than comparison group 1 and because it balances in several cubic continuous terms, which comparison group 3 does not. This last point is important because, as researchers have noted,[59,60] the exact treatment selection process is unknown, so the inclusion of additional interactions and higher order polynomial terms increases the probability of capturing the true treatment selection process and therefore the comparison group that is the most similar on both observable and unobservable characteristics.

The weighted DID results for APRN enrollment and graduations are shown in Chapter 4 using each of these comparison groups so readers can assess the sensitivity of the estimates to the use of alternative comparison groups. However, the estimates of the effect of the demonstration

[58] The evaluation team defined any weight above 0.0001 as a meaningful weight. This threshold is arbitrary, but comparison SONs with weights below this threshold have virtually no effect on the impact estimates.

[59] Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, *25*(1), 1–21.

[60] Austin, P. C. (2011). An introduction to propensity score methods for reducing the effects of confounding in observational studies. *Multivariate Behavioral Research 46*(3), 399-424.

project on APRN enrollment and graduations by degree level (master's, post-master's, and DNP) and specialty (NP, CNS, CNM, CRNA) are shown only for comparison group 2.

Spillover Comparison Group

This evaluation also estimated the indirect effects of the demonstration project, or spillover effects. Spillover effects are unintended consequences that are likely to affect APRN enrollment and graduations in non-GNE SONs. Spillover effects can be positive or negative. An example of a positive spillover would be additional training opportunities for students enrolled in non-GNE SONs located in the same geographic area as the GNE SONs. This might be the result of more individuals becoming interested in precepting given the federal government's renewed interest in this activity. An example of a negative spillover would be a reduction in the number of preceptorships available to students at SONs in the spillover group. For instance, as a result of the precepting payments under the demonstration project, preceptors from the non-GNE SONs might elect to precept only APRN students at GNE SONs. Eventually these spillover effects might have an impact on APRN enrollment and graduations at those schools.

We measured spillover effects using a two-step process. First, we used Mahalanobis matching with replacement to identify the subset of non-GNE SONs more likely to be affected by the demonstration project.[61] In this approach, we selected the non-GNE SONs that were more similar, in terms of observable characteristics, to those in the GNE group from among all the schools located in the same states as the GNE SONs. That is, we selected the spillover group from among all the schools that could potentially be affected by spillover effects. This is the group more likely to be direct competitors of the GNE SONs and therefore more likely to be affected by potential spillover effects of the demonstration project. We chose the state as the relevant geographic area because all schools in the same state are affected by the same regulatory and policy environment, and, as such, are likely to be influenced by the presence of the demonstration project.

Second, to capture the effects of the demonstration project on the spillover SONs, we used entropy balancing to construct a spillover comparison group that has parallel outcome trends in the baseline period and is nearly identical on every covariate. The spillover comparison group consists of the same SONs as those in the comparison group for the GNE SONs (SONs in non-demonstration states), but they are weighted so that they are balanced with the spillover group rather than the GNE group.

[61] Mahalanobis matching, a nonregression-based approach, is more appropriate in cases where there is a small sample from which to select the comparison group: Stuart, E. A. (2010). Matching methods for causal inference: a review and a look forward. *Statistical Science*, *25*(1), 1–21.

Each SON in the spillover group receives a weight of 1, and the comparison group SONs receive the weight from the entropy balancing algorithm. The covariates used in entropy balancing are the same as the covariates described above for comparison groups 1 and 2 except that the indicator for being in a DNP CNM program and the quadratic and cubic terms are not included.[62] Exhibit 2-7 shows that after balancing the spillover SONs and the pool of potential comparison SONs, the means of every covariate are nearly identical.

Exhibit 2-7. Covariate Balance Statistics after Entropy Balancing—Spillover Group

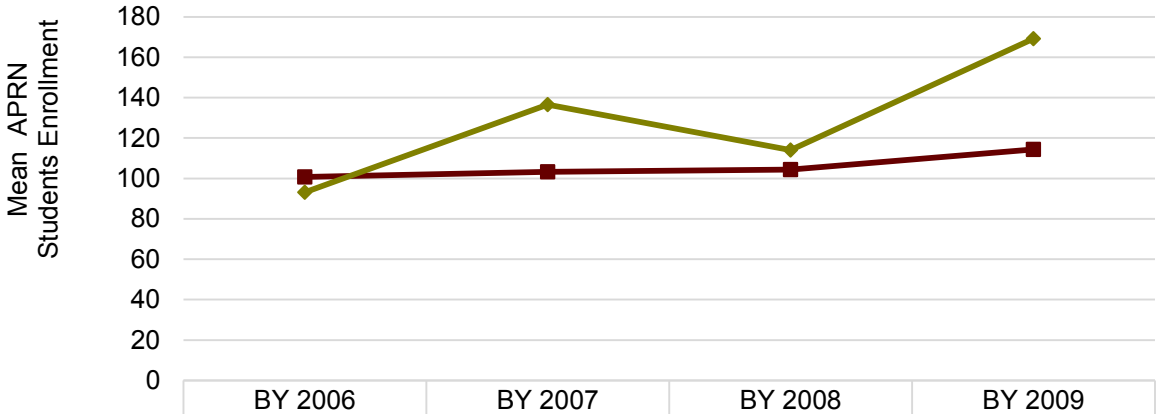
Variable	Mean for the Spillover Group	Mean for the Comparison Group	Standardized Bias (%)
Indicator for master's NP program	1	1	0
Indicator for master's CNS program	0.546	0.545	-0.010
Indicator for master's CNM program	0	0	-0.030
Indicator for master's CRNA program	0.273	0.273	-0.015
Indicator for DNP NP program	0.091	0.091	0
Indicator for DNP CNS program	0	0	-0.018
Indicator for DNP CRNA program	0	0	-0.017
Total number of applications	91.687	91.636	-0.048
Total number of qualified applicants not admitted	8.187	8.182	-0.014
Total APRN graduates in 2008	34.570	34.545	-0.082
SON US News Ranking in 2011	176.873	176.909	0.028
Total number of faculty	37.198	37.182	-0.071
Indicator for health center	0.273	0.273	0.005
Indicator for public institution	0.636	0.636	0.019
Indicator for affiliated hospital	1.818	1.818	0.003
Indicator for university/college is located in a city	0.727	0.727	0.006
Indicator for university/college is located in a suburb	0.182	0.182	0.017
Indicator for MHEC compact	0	0	-0.040
Indicator for SREB compact	0.636	0.636	0.011
SON belongs to no regional compact	0	0	-0.016

Notes: The comparison group is weighted to be balanced with the spillover group, with weights found using entropy balancing. The spillover group consists of 11 SONs; the comparison group, 218 SONs.

[62] The entropy balancing algorithm did not converge with the full set of covariates, but did converge with this reduced set of covariates.

Exhibit 2-8 and Exhibit 2-9 show that there is large year-to-year variation in total APRN enrollment and graduations in the spillover group, which makes it difficult to assess the parallel trends assumption. Given the small sample size and the high variance of the outcomes of the spillover group, these results should be interpreted with caution.

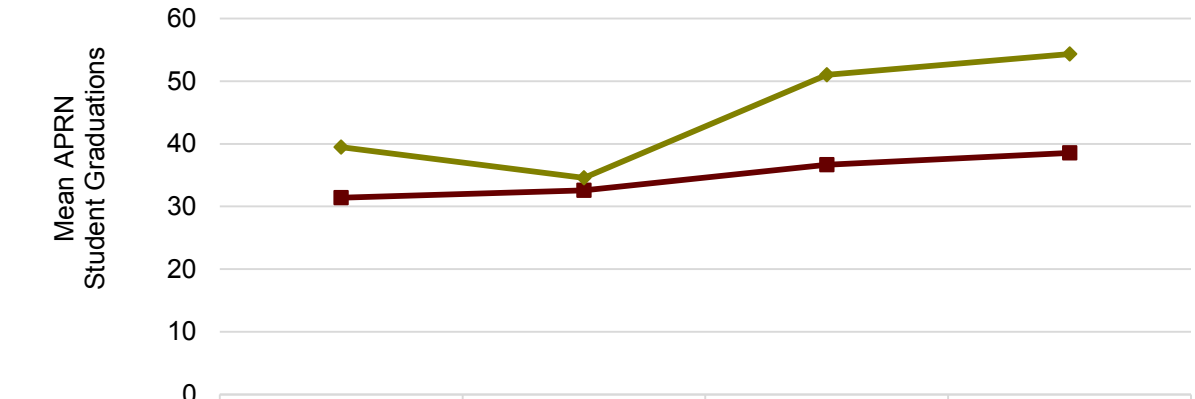
Exhibit 2-8. Mean APRN Students Enrolled per SON, Spillover vs. Entropy Weighted Comparison Group



	BY 2006	BY 2007	BY 2008	BY 2009
Compairson	101	103	104	114
Spillover	93	137	114	169

Notes: BY = baseline year, DY = demonstration year. The comparison group is weighted to be balanced with the spillover group, with weights found using entropy balancing.

Exhibit 2-9. Mean APRN Student Graduations per SON, Spillover vs. Entropy Weighted Comparison Group



	BY 2006	BY 2007	BY 2008	BY 2009
Comparison	31	33	37	39
Spillover	39	35	51	54

Notes: BY = baseline year. Information for APRN graduations is reported with a one-year lag (the AACN 2015 Annual Institutional Survey reports graduation data for AY August 1, 2014 through July 31, 2015). The comparison group is weighted to be balanced with the spillover group, with weights found using entropy balancing.

Weighted Difference-in-Difference (DID) Analysis

We estimated the effect of the demonstration project on APRN student enrollment and graduations using a difference-in-differences (DID) approach. The DID method uses the change in outcomes in the comparison group between the pre- and post-periods as an estimate of the trend that would have occurred for the GNE group in the absence of the demonstration project. Subtracting the average change in outcomes between the pre- and post-periods in the comparison group from the change in the GNE group removes the confounding effect of the trend in outcomes that is common to both groups. Thus, the DID method estimates only the change in APRN enrollment and graduations that occurred as a result of the demonstration project. The DID model is described by the following equation:

$$Y_{st} = \alpha + \gamma_t + \beta\, GNE_s + \delta_1 \mathrm{GNE}_s * \mathrm{After}_t + \theta X_{st} + \epsilon_{st} \quad (1)$$

The dependent variable Y_{st} is the outcome of interest (APRN enrollment or graduations) for SON *s* during year *t.*

On the right-hand side of the equation, the variables are as follows:

- A constant term α

- Year fixed effects, γ_t, that control for unobservable time shocks in year *t*. Year fixed effects are constant across SONs.
- A dummy variable GNE that indicates whether the SON is a GNE SON. This dummy variable captures unobservable differences between GNE SONs and comparison SONs that are constant over time.
- A parameter vector θ that captures the effect of relevant observable characteristics X_{st} at the SON level. Observable characteristics include:
  - An indicator variable equal to one if the SON has an associated health center
  - An indicator variable equal to one if the SON is a public university
  - An indicator variable equal to one if the SON is located in a city
  - An indicator variable if the university/college has an affiliated hospital
  - The total number of faculty as of 2008
  - The US News & World Report ranking of the SON as of 2011[63]
  - A set of dummy variables that indicates the regional interstate compacts for higher education to which the state where the SON is located belongs.

The DID estimate is captured by the parameter δ_1. The variable GNE_s is an indicator variable for the GNE SONs, and the variable $After_t$ is an indicator variable for the period after the GNE demonstration project was implemented. This parameter measures the change in outcome Y (holding year effects and observable characteristics constant) for the GNE group between the baseline and demonstration periods minus the change in outcome Y (holding year effects and observable characteristics constant) for the comparison group between the baseline and demonstration periods.

Equation (1) is estimated using the three comparison groups described above: (a) a propensity score weighted comparison group, (b) a weighted comparison group using entropy balancing inclusive of quadratic and cubic terms, and (c) a weighted comparison group using entropy balancing inclusive of quadratic terms.

Spillover effects are estimated using a slightly modified version of equation (1):

$$Y_{st} = \alpha + \gamma_t + \rho Spillover_s + \delta_2 Spillover_s * \text{After}_t + \theta X_{st} + \epsilon_{st} \quad (2)$$

[63] The 2011 *US News & World Report* rankings were used as a proxy for the 2008 rankings, which were only available for purchase.

where Y_{st}, After_t, X_{st}, and γ_t are defined as in equation (1). The variable $Spillover_s$ is an indicator variable for spillover SONs. The estimated spillover effect of the GNE demonstration is captured by the parameter δ_2.

Equation (2) is estimated using the spillover group and the spillover comparison group described above. Following best practices, the standard errors are clustered at the SON level to correct for possible autocorrelation of the error term for both equation (1) and equation (2).[64]

[64] Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics*, *119* (1), 249-275.

Chapter 3: How was the GNE Demonstration Project Implemented and Operated?

This chapter describes the implementation and operation of the GNE demonstration networks, including the strategies that networks have used thus far to provide and expand clinical training opportunities for APRN students; the successes and challenges of implementing the demonstration project as perceived by stakeholders; and the networks' plans for sustaining the project when the demonstration project ends.

NETWORK CHARACTERISTICS

There was wide variability among the five networks in the size and composition of their partnerships, the types of CCSs, and the geographic areas they covered. The number of hospital partners ranged from 2 to 8, and the number of SON partners, from 1 to 9. The CCSs included free clinics, nurse-managed health centers, FQHCs, rural health clinics, Indian Health Service centers, as well as hospital-affiliated CCSs. The geographic areas included rural coverage areas and coverage areas including both rural and urban areas.

DEMONSTRATION OPERATION PROCESSES

Implementation Experiences

Prior to the start of the GNE demonstration project, all five hospitals that would eventually lead the demonstration networks had few, if any, formal partnerships with other local hospitals, SONs, or CCSs. The GNE hospital participants also had very little interaction with the SONs in their surrounding areas prior to the demonstration project. Moreover, the data submitted by the networks indicated that prior to the demonstration project only one-fifth of the CCSs had partnered in any capacity with the hospital participants, and just over one-half had precepted students from the SONs included in the demonstration networks.

SON administrators reported in interviews that prior to the demonstration project competition between the GNE SONs and nearby medical schools for clinical training opportunities was common and sometimes contentious. One SON administrator explained:

"If I were to think about the challenges to [clinical] placements, I was thinking there is so much competition for the scarce resource. So how do we get our foot in, to get [clinical sites] to be loyal to us? [Clinical sites] say, 'We cater to this school,' or "We're affiliated with this school, so we only take these students'… A number of sites have existing relationships with taking [medical] residency students so they have difficulty with placing NP students."

The interviews also revealed that prior to the demonstration project, clinical placement processes varied widely across the GNE SONs. Some had well-structured clinical placement processes, with designated staff who assisted in recruiting and coordinating clinical placements. Others had more informal placement processes and relied heavily on faculty and students to recruit and coordinate clinical placements.

Reflecting the flexibility of CMS's requirements, as reported in the early rounds of interviews with network stakeholders, the five networks varied widely in their programmatic structures, ranging from highly centralized to decentralized models. They also varied in how they spent demonstration payments. Interview participants mentioned making investments in administrative support staff and in systems for tracking and managing clinical preceptorships. The most commonly reported expenditures were for additional staff to support clinical education site recruitment, student placement, and clinical education databases, as well as additional clinical faculty to support a larger student body.

Duke University Hospital (DUH) and Rush University Medical Center (RUMC) operate centralized networks, each composed of only one partner SON, with which the lead hospital had already established relationships. Interview participants perceived that having established collaborations allowed their respective networks to "hit the ground running." The Memorial Hermann-Texas Medical Center (MH) network developed a semi-centralized demonstration program, in which the oversight team facilitates communication among the four partner SONs and manages the demonstration project budget and the precepting payments. The GNE SONs, however, oversee the clinical placement processes and work together with a third-party vendor (Gateway to Care) to recruit and coordinate clinical education sites, particularly CCSs.

Like the other networks, the Hospital of the University of Pennsylvania (HUP) and HonorHealth Scottsdale Osborn Medical Center (SHC-O) networks used CMS payments to invest in key staff at the GNE oversight team level. In contrast to the three centralized networks, the HUP and SHC-O SONs worked independently to place students in preceptorships. The resulting clinical placement and education processes were therefore more varied and complex than those implemented by MH, DUH, and RUMC.

All the networks reported a variety of challenges during the initial implementation of the demonstration project due to the short timeframe allocated by CMS for program development. According to network leadership, the following program aspects were the most difficult to implement:

- Developing GNE clinical precepting payment policies and procedures;
- Hiring qualified support staff and faculty within a limited timeframe; and
- Establishing uniform data collection activities.

KEY FINDINGS

All networks faced difficulties during initial implementation of the GNE demonstration project due to limited start-up time and financial resources available for program implementation.

To assist with the implementation, each network oversight team worked to foster communication and collaboration among its network partners. The oversight teams were particularly important for larger networks with multiple SONs, such as HUP and SHC-O, because they helped streamline communication within the network and facilitated partnerships and information sharing across the SONs. Early in the implementation period, all network-level strategic oversight teams coordinated biweekly or monthly meetings to establish demonstration project policies and processes. In addition to members of the strategic oversight team, these meetings generally included project support staff and representatives from each of the SONs, if applicable, and from other key partners.

A key goal of the demonstration project is to increase the number and availability of clinical preceptors in CCSs that focus on primary and preventive care and are located in underserved areas, such as rural settings.[65] Interview participants reported that preceptors in rural areas were the most difficult to recruit. At the same time, students were sometimes reluctant to accept preceptorships in rural areas that would require them to have a vehicle and travel up to two hours each way. For example, one CCS in the HUP network is a four-hour drive from the GNE SON in Philadelphia. Interview participants also noted that rural CCSs were being purchased by large medical networks located in urban areas, and based on the criteria of the demonstration project these CCSs were no longer classified as rural.

Once established, all network oversight teams held bimonthly or quarterly meetings during which attendees discussed best practices and lessons learned, and dealt with questions and concerns. Now, in the fifth year of the demonstration project, these meetings are focusing on sustainability and project closeout procedures and processes. Interview participants

[65] Although increasing the opportunities for clinical precepted education in rural settings is a goal of the demonstration, the demonstration project does not specify the percentage of clinical education sites to be located in rural areas.

representing the strategic oversight teams and SON administrators all reported that the meetings have been very helpful in establishing new and lasting partnerships. These respondents stated that the demonstration project not only encouraged many different partners to come together, but also forged a path for partners to reexamine and improve their clinical recruitment and placement processes.

Key Investments to Support and Enhance the GNE Demonstration Project

All five demonstration networks and partnering SONs used CMS payments to create or expand administrative resources devoted to managing and overseeing the clinical placement process. The analysis of the in-depth interviews suggests that the networks used these payments to recruit or strengthen clinical placement coordinators and clinical site recruiters.

INVESTMENTS MADE BY GNE NETWORKS

- Hired staff to oversee the clinical placement process and site/preceptor recruitment
- Developed a clinical education database system
- Used payments to hire clinical faculty and non-Medicare funds to hire didactic faculty

Clinical placement coordinators[66] oversee all aspects of the clinical placement process. Their activities include communicating with clinical education sites and preceptors, matching students and sites, and ensuring that all paperwork associated with student clinical placements is up to date and accurate. *Clinical site recruiters* assist the SONs in building and sustaining relationships and partnerships with clinical education sites that had discontinued precepting students or had never done so. In some SONs, the clinical placement coordinator oversees the clinical site recruiters.

Both positions (or roles, in some cases) allow SON faculty, many of whom were closely involved in the clinical placement process prior to the demonstration, to refocus their time and energy on teaching and practice, creating a potentially positive effect. As one faculty member commented:

> *"Historically we [faculty] were responsible for everything when it came to coordinating the clinical sites. Now, the placement coordinator does a lot of that work, like follow-up communications after initial contact and writing thank you notes."*

Many interview participants reported using demonstration payments to develop a database system to monitor clinical placements, site/preceptor contact information, and the type of site (CCS, hospital, or FQHC). For example, the RUMC network tasked its newly hired clinical

[66] Also referred to as "clinical placement officers."

placement coordinator to develop a Microsoft Access database system that would house clinical site, preceptor, and student information to aid in monitoring information vital to the placement process. The information can be accessed by SON staff and faculty. The DUH network also developed a clinical placement system that tracks placement needs, catalogs partnerships with placement sites and preceptors, captures clinical hour logs, and manages contracts with placement sites. The databases in both networks allow for efficient communication between the sites, preceptors, faculty advisors, and students, so that they don't "step on each other's toes." Because of staff turnover at clinical sites and the ever-changing roster of preceptors interested in working with students, both systems are continuously evolving. One oversight team member commented:

> *"We always find ways to improve it [the database], seeing an opportunity to add another function. It's starting to work for us, and we're seeing where it can be helpful."*

None of the interview participants reported using precepting payments as a tool for recruiting preceptors. Network representatives said that they chose not to use these payments to recruit sites because they could not guarantee the payments and were uncertain about the availability of precepting payments after the demonstration project ended. Rather, stakeholders involved in clinical site and preceptor recruitment explained to the sites that there was a possibility they would receive precepting payments. One SON administrator explained:

> *"[I] never used funds as a recruitment tool, so [preceptors and sites] don't feel they are getting [cheated] in any way."*

Furthermore, interview participants reported using precepting payments to develop and implement several innovative clinical education models. Three of the five networks have established inter-professional education models. In these models, APRN students complete their clinical education alongside medical, pharmacy, and psychology students. Many stakeholders reported that this type of clinical education enriched students' experience by enhancing their medical, teamwork, and communication skills. According to one preceptor:

> *"The quality of education is wonderful, too. The students are working with PA [physician assistant] students so there is an interdisciplinary co-education thing happening. It's so beneficial because we work as a team, and it shows students that there isn't a competition between NPs and PAs."*

RUMC and SHC-O also allocate payments to investment in innovative clinical education sites, including those that serve medically underserved populations. For example, RUMC developed an innovative Start-up Preceptor Program, which places RUMC preceptors at clinical sites that

were previously unable, or unwilling, to provide clinical education to APRN students. These clinical sites are generally volunteer-based clinics that serve low-income patients.[67] The SHC-O network built a relationship with the Adelante Healthcare system, which has nine health centers in Phoenix and the surrounding rural areas. Prior to the demonstration project, Adelante Healthcare only precepted medical students; however, in January 2016 the system began to accept APRN students.

CLINICAL EDUCATION PLACEMENTS AND PROCESSES

Organization and Management Processes

Interview participants described wide variation in the clinical placement process across the demonstration networks and within each network. Because the DUH and RUMC networks have only one SON each, their clinical placement processes were the most centralized compared to the other three networks. In both networks, the clinical placement coordinator/officer asks each student to provide information on his/her clinical education needs and personal preferences, including location preferences and access to a vehicle. The student's clinical education needs and preferences are then matched with available clinical sites and preceptors. Improved clinical placement database systems also contributed greatly to the creation of a centralized and structured clinical placement process in both networks.

The MH network includes four SONs. Similar to the RUMC and DUH networks, it has a centralized clinical placement process, which is facilitated by the MH network oversight team. As a result of the demonstration payments, each of the four SONs hired a clinical placement coordinator who is located at the SON and is responsible for placing students in both hospital and CCS settings. While each SON remains responsible for recruiting and coordinating hospital-based sites, the MH network relies on a third party vendor, Gateway to Care (GTC),[68] to recruit CCSs. The hiring of clinical placement coordinators and the SONs' collaboration with GTC are a result of the demonstration project. The placement coordinators from each MH-affiliated SON meet monthly with GTC staff to coordinate CCS placements, discuss challenges, exchange best practices, and confirm that all SONs are on schedule with their clinical placement activities. One SON faculty member explained:

[67] Volunteer-based clinics are staffed by providers and support staff who donate their time and services.

[68] GTC is a non-profit organization that operates as a collaborative of over 190 members and affiliates in the Texas Gulf Coast Region, coordinating and streamlining resources and health care delivery.

"[The clinical placement process] has gotten better. At first it was shaky because they didn't know who did what—but then they got a clinical placements coordinator who funnels all the requests and made the process more organized."

By contrast, the SHC-O and HUP networks, which also contain multiple SONs, do not have a centralized clinical placement process across their networks. Instead, each SON oversees its own placement activities, and the process therefore varies substantially. In both networks, some SONs oversee the entire clinical placement process, while others rely on assistance from their students to identify and recruit their own placements. In addition, some SONs have used demonstration payments to hire clinical placement coordinators or recruiters, while others have expanded the roles of current staff and faculty. All the SONs affiliated with SHC-O and HUP, however, reported being able to enhance and streamline their clinical placement process as a result of the demonstration payments.

Expansion of Clinical Placement Sites and Preceptors

Before the demonstration project was implemented, competition for preceptors and a lack of standardized placement processes impeded the enrollment and timely graduation of APRN students. The demonstration project attempts to facilitate APRN student growth by expanding opportunities for precepted education, particularly in community settings. To achieve this goal, there must be a sufficient number of preceptors and clinical training sites to place all APRN enrolled students who require clinical education hours.

To expand opportunities for clinical education, demonstration payments were made to reimburse allowable costs, which included streamlining clinical education placement processes and compensating training sites for the time spent precepting APRN students.

Consistent with the objectives of the demonstration project, SON participants from all networks reported partnering with CCSs whose staff had not previously precepted their students, and expanding and diversifying clinical training opportunities. Many attributed the expansion of clinical education to the ability to use GNE demonstration payments to invest in additional staff and key infrastructure, such as staff to oversee the clinical placement process, and in databases that enabled administrators to more effectively recruit clinical training sites and manage preceptors' assignments.

Interview participants also reported that the demonstration project gave them dedicated time and resources to strengthen existing relationships with clinical education sites. As a result, existing sites have become more willing to precept students each semester, and new sites have come on board that were previously unwilling to participate. The participants indicated that the

precepting payments were particularly helpful in promoting their ability to recruit and retain preceptors at CCSs that were more dispersed geographically.

Distribution of Clinical Precepting Payments

KEY FINDINGS

- Clinical precepting payments are generally made to the clinical education site.
- Networks that designated students (not sites) reported challenges dispersing preceptor payments.
- Networks generally did not promise precepting payments when recruiting clinical education sites and preceptors.

Findings from the interviews with GNE stakeholders, the data extracted from participant applications, and the GNE Audit Reports indicate that the method for determining which preceptors received precepting payments varied across networks. Decisions were based on (1) designating specific clinical education sites as "GNE sites" or (2) designating APRN students enrolled during the demonstration as "GNE students." If the network designated a clinical education site, then that site received precepting payments for *any student* who was placed at that location. If the network designated students, then *any clinical education site* at which a GNE student was placed received precepting payments. The oversight teams for each GNE network determined whether sites or students would be designated, and they allocated the number of GNE sites or GNE students to the SONs in their network each semester. Exhibit 3-1 outlines the GNE designation across networks.

Exhibit 3-1. GNE Designation Method by Network

Network	GNE Designation
DUH	Clinical Sites
HUP	APRN Students
MH	DY 2012: APRN Students
	DY 2013–2015: Clinical Sites
RUMC	Clinical Sites and Start-up Preceptors
SHC-O	APRN Students

Because DUH, MH, and RUMC established a centralized clinical placement process, the networks' oversight teams oversee all GNE designations. Although the oversight teams for HUP and SHC-O allocate the total number of students the SON can designate as GNE, they allow the SONs to strategically place those students.

All networks reported targeting precepting payments to clinical sites and preceptors that:

- Serve medically underserved populations
- Provide inter-professional or other innovative models of clinical education, for example, the Preceptor Start-up Program at RUMC
- Had been difficult to partner with in the past, such as OB/GYN or pediatric sites.

To disburse precepting payments, each network's oversight team created its own methodology as part of its program implementation. HUP, RUMC, and SHC-O base the precepting payments on the number of student clinical hours. MH, however, bases the payments on the preceptor's lost productivity time. DUH uses the Medicare Fee Schedule to determine precepting payments to physicians and other providers, based on provider type and location.

The networks' strategic planning teams distribute the precepting payments, the vast majority of which are made to the clinical education site, not to the preceptor. The sites then decide how to disburse or use those payments. Many sites use the payments as a collective fund to continue staff education through training and to award bonuses. Some sites give all or a portion of the precepting payment directly to the preceptor as a bonus. In a few instances, preceptors who worked at CCSs declined the payments and asked that they be used to support patient care. The payments, however, may be made directly to a preceptor who has a contract with the GNE network, as is the case in RUMC's Start-Up Preceptor Program.

The majority of precepting payments are made within the state in which the GNE hospital participant is located; however, there are a few exceptions. For example, one of the HUP network's nine SONs places a few GNE-designated students at out-of-state clinical education sites. DUH makes precepting payments to several out-of-state sites where students from the DUH online program are placed. As a DUH strategic planning team stakeholder noted:

> *"We saw we were not using all the money, so we decided to ramp-up paying out-of-state sites. Out of state it is mostly health departments. The main driver of paying out-of-state sites was getting a good placement site for out-of-state students since we don't have the in-person presence."*

In addition, two of the four SONs in the SHC-O network place GNE-designated students at out-of-state sites. To ensure that the majority of precepting payments go to in-state sites, the strategic planning team at SHC-O makes the following request of the SONs:

> *"We ask [our SONs] to place GNE-designated students in the following order: students in Arizona, students in border states, and all other students."*

HUP and SHC-O respondents noted initial challenges in clearly communicating the GNE designations and the disbursement process to all SONs and clinical education sites. As one SON respondent noted:

> *"The incremental student idea has been confusing to the providers [sites]. [The sites] are not able to understand what revenues are coming in. That has been really difficult."*

To alleviate these communication issues, the HUP and SHC-O networks have worked to set expectations and clearly explain their GNE designation and disbursement methodology. Many stakeholders from those networks also asked that all students be designated as GNE students:

> *"The whole payment of GNE and non-GNE students is odd. The best thing to do is to make a payment per student instead of the convoluted way things are going on this project."*

Perceived Impact of Clinical Precepting Payments on Preceptors

As discussed above, the GNE demonstration project attempts to expand the pool of available preceptors and community-based preceptorships by compensating clinical education sites for preceptors' time in providing clinical education. In the interviews, stakeholders disagreed about the impact of precepting payments on providers' willingness to accept students. Generally, stakeholders believed that the payments did not motivate preceptors who had mentored APRN students in the past. For example, when these providers were asked if the availability of payment would affect their willingness to provide clinical education, many reported that they were not motivated by payments. Instead, the providers viewed precepting as a way to give back, to teach the future generation of APRNs, and to continue their own education.

In contrast, stakeholders agreed that the *clinical education sites* were driven by precepting payments. The reason is that the sites ultimately decide if and how many of their providers precept students each semester. The payments help compensate sites for the preceptors' time with students and allow the sites to take on more students without affecting the quality of care or their financial bottom line. As one APRN student noted:

> *"It's no secret that providers are really taxed with patients and patient data entry. I would just feel bad if they weren't compensated for their time, because I make them slower."*

Furthermore, stakeholders from all networks explained that a key strategy to expanding the preceptor pool is to partner with clinical education sites that offer multiple preceptors each semester, rather than develop ad hoc relationships with individual preceptors. As such, these stakeholders believed that the precepting payments were important for engaging new sites and

expanding existing sites because the SONs could offer a financial incentive in return for multiple preceptors.

Interestingly, many stakeholders across the networks observed an increase in the number of physicians willing to accept APRN students. Some felt this change was directly related to the precepting payments, since physicians are accustomed to reimbursement for precepting medical students. For example, prior to the demonstration, physicians in RUMC precepted very few APRN students. According to SON administrators, the reason was that physicians "are being paid for residents, but not for NP students." However, as a result of the precepting payments, the number of physician preceptors at RUMC has increased to about 10 to 15. Other networks also cited an increase in the number of physician preceptors.

Although there was no consensus about the impact of precepting payments on preceptors, interview participants from the five sites reported that the demonstration project allowed them to build new partnerships with clinical education sites that had not previously accepted APRN students. These stakeholders also noted that the demonstration project had strengthened relationships with sites that had only occasionally precepted students in the past. One SON faculty member commented:

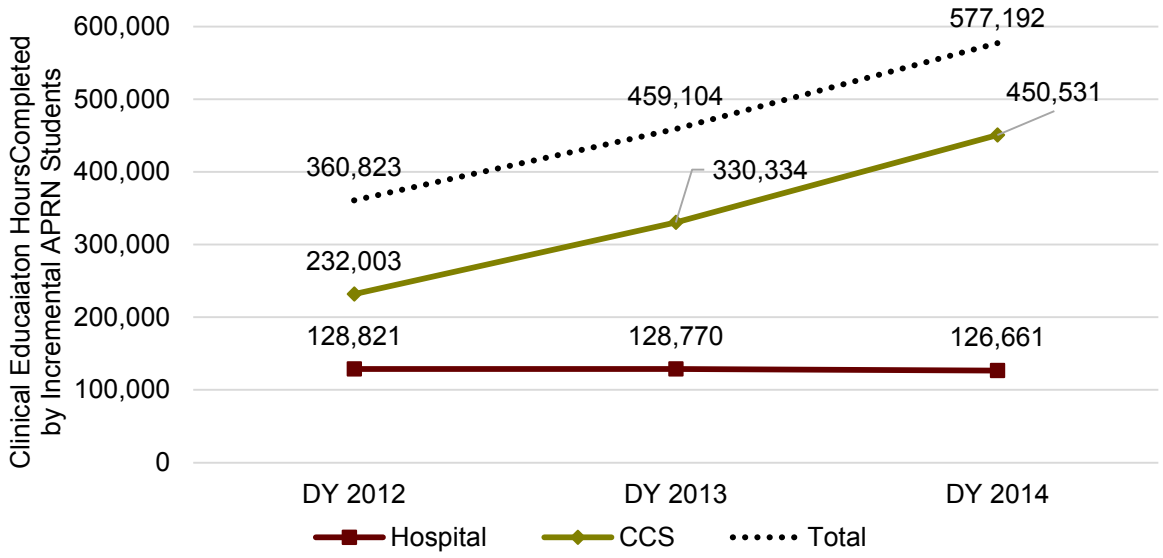
> *"Because of the clinical coordinator position, we have been able to expand our search for sites to areas that we've not looked at before—branching into Delaware and Jersey."*

Clinical Education Hours

During the first two years' implementation of the GNE demonstration project, the number of precepted clinical education hours completed by incremental APRN students increased by 60 percent, from 360,823 hours in DY 2012, to 577,192 hours in DY 2014 (Exhibit 3-2).[69] Exhibit 3-2 also shows that, across all years, incremental students completed more clinical education hours in CCSs than in hospitals. For example, in 2012, 64 percent of completed clinical education hours occurred in CCSs; this increased to 78 percent in DY 2014. This finding is in line with the demonstration's requirement that over half of all clinical precepted education hours must occur in community-based settings.

[69] Incremental students are defined by CMS as "the number of enrolled APRN students relative to the baseline mean of graduating nurses from each participating SON."

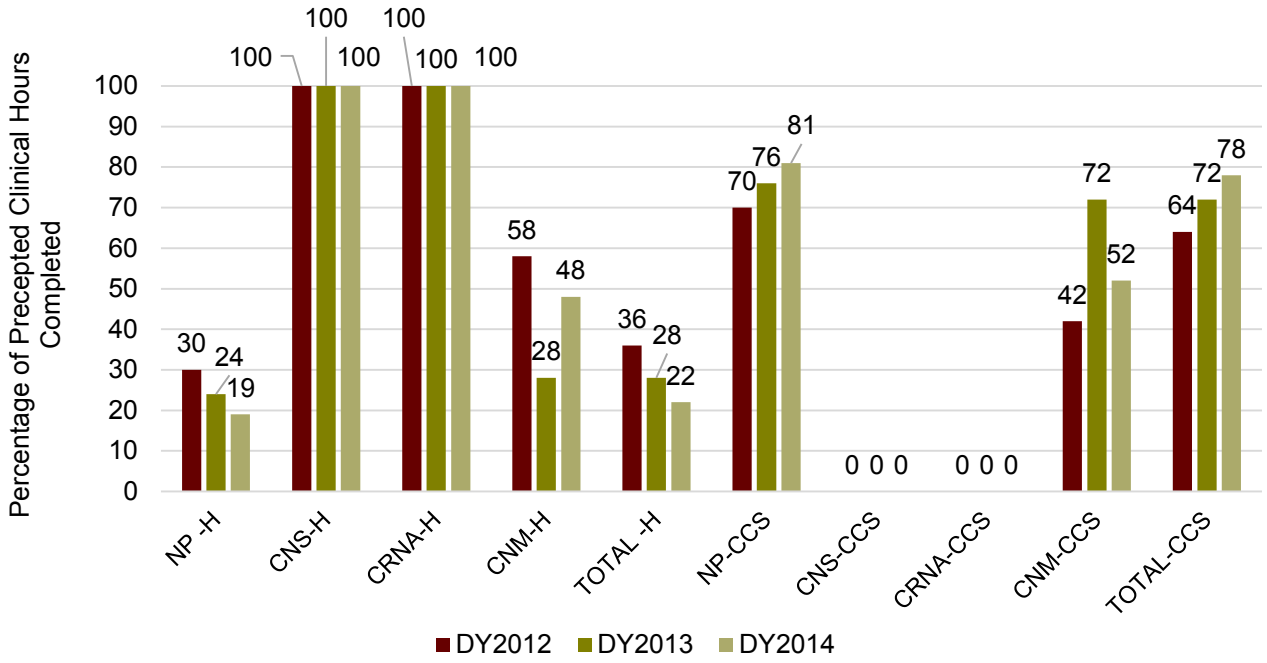
Exhibit 3-2. Clinical Education Hours Completed by Incremental APRN Students, DY 2012–DY 2014, Overall and by Setting



Notes: DY = demonstration year; Data Source: GNE Audit Reports for 2012, 2013, and 2014.

Exhibit 3-3 also shows the percentage of clinical hours completed by incremental APRN students in demonstration-affiliated CCS settings and in hospitals, by specialty, between DY 2012 and 2014. Across all specialties, the percentage of hours completed in CCSs increased from 2012 to 2014 and decreased in hospitals over the same time period. NP students had the largest percentage of hours completed in CCSs, followed by CNM students. Incremental CRNA and CNS students completed all their clinical hours in hospital settings, consistent with the nature of practice within these specialties.

Exhibit 3-3. Percentage of Precepted Clinical Hours Completed at Hospital (H) and CCS Settings by Incremental Students Enrolled in GNE SONs, by APRN Specialty and Year



Source: GNE Audit Reports for 2012, 2013, and 2014.

SUCCESSES AND CHALLENGES

GNE Successes

Interview participants from all five networks identified positive accomplishments of the GNE demonstration project, including enhanced coordination between network partners. Stakeholders noted that the demonstration had facilitated the centralization of clinical placement processes and policies within and across SONs in the MH, HUP, and SHC-O networks.

Participation in the demonstration project afforded SON administrators and faculty time to focus on improving other aspects of APRN training, such as aligning curricula or admissions criteria. In addition, the demonstration project opened doors for the development of new and diverse precepted clinical

KEY SUCCESSES

- Enhanced coordination and collaboration among network partners
- Centralized clinical placement processes and policies within and across SONs
- Alignment of curricula and/or admission criteria
- New and diverse clinical education opportunities

education opportunities. Another result of the demonstration payments was the creation of new resources to support the expanded pool of preceptors, such as standardized manuals, workshops, and conferences for preceptors.

Oversight team members and SON administrators across all five networks expressed optimism about the overall impact on APRN education. Although they noted areas for improvement (see below), participants from all networks highlighted the demonstration's ability to bring "everyone to the table." The demonstration project not only encouraged many different partners to come together, but it also forged a path for partners to reexamine and improve their processes.

GNE Challenges

Stakeholders also described the challenges inherent in the demonstration project's design. Due to the short time period between demonstration project award and implementation, all networks had to simultaneously plan, design, and implement the project. As a result, stakeholders across all networks reported "playing catch-up" for most of the first demonstration year. This iterative process of implementation required more time and resources than network stakeholders had allocated.

Stakeholders also reported confusion, especially in the early stages of the demonstration project, regarding the methodology of the GNE precepting payments. This was particularly an issue for networks such as HUP and SHC-O that had multiple SONs and lacked a centralized clinical placement procedure overseen by the network. Much of the problem was the result of miscommunication within the network and of changing processes and procedures during initial program implementation. The confusion lessened as the demonstration project progressed, and network stakeholders worked to ensure that all SONs and partners were aware of the project's policies and practices. Many stakeholders also cited monthly network meetings as an important tool that helped clarify issues surrounding implementation.

Data collection issues were also a challenge across the networks. During the initial implementation of the demonstration project, the networks spent significant time and resources to ensure that all data forms required by CMS were uniform and captured the required information. When the data requirements changed during the demonstration period, the networks had to update all their data collection forms and tracking documents. Large networks that contained multiple SONs reported that this was a particularly difficult issue.

Further, a significant increase in enrollment placed pressure on faculty and university resources. Since the demonstration payments did not cover didactic education, the SONs attempted to balance the goal of increasing the number of APRN enrollment and graduates with the reality of

limited resources. Some GNE SONs hired faculty, using sources other than demonstration payments, to teach in didactic settings, advise students, and supervise master's papers and projects; but for other GNE SONs, hiring faculty for these purposes was not financially feasible.

SUSTAINABILITY

Perceived Effect of the End of the GNE Demonstration Project

The question of whether growth in student enrollment or graduations, or the changes in the provision of clinical training for APRN students, could be sustained after the end of the program was important to the GNE networks. Interview participants were not in agreement, however, about which aspects of the GNE project could be sustained when the demonstration ends.

PERCEIVED EFFECT OF THE END OF THE PROJECT

- Decline in the number of clinical education sites and preceptors due to lack of resources
- Inability of GNE SONs to maintain enrollment increases due to limited clinical education opportunities
- Reduced collaboration among some network partners

The interview participants had mixed views regarding the ability of the GNE SONs to maintain the increased number of APRN enrollments and graduations following the end of the demonstration project. Participants from two networks considered the increase in the number of APRN students to be unsustainable and reported that their SONs had begun to limit new APRN student enrollments starting in DY 2015. Other participants stated that they were more confident that they could maintain the increased enrollments after the demonstration project ends, but were not certain how they would do this.

Many SON administrators considered the key obstacle to maintaining APRN enrollment to be the expected decrease in clinical education sites and preceptors. These stakeholders expressed concern that administrators at clinical education sites had "gotten used to the system" and would not be willing to take on students if their providers were not compensated for precepting time and effort. One stakeholder estimated that the network would "lose around half of the new sites." Another SON administrator stated:

> *"My concern is, and I think it's one that others share, we have preceptors that have received payment for their decreased productivity for four years…. [Will] they continue to precept for us when they do not receive compensation? We don't have any hard numbers to share about the potential impact, but it's what we and [the network] are hearing from preceptors."*

A SON administrator in a different network expressed a similar opinion:

> *"We are concerned that sites will drop after the GNE money is gone. We have a group of clinics that it took a lot of effort to get them to take students, and funding was part of that agreement. I suspect that they will not continue."*

However, other stakeholders perceived that most APRN preceptors are not motivated by compensation; these participants were therefore optimistic that the preceptor partnerships would continue beyond the demonstration project.

As noted above, the networks used demonstration payments to hire dedicated placement coordinators, placement recruiters, clinical faculty, and other administrative staff. When these payments are no longer available, some SONs reported that they may have to eliminate such structural investments. Many stakeholders stated that this will negatively affect their ability to maintain increased enrollment. Some network leaders discussed plans to mitigate the erosion of the progress afforded by the demonstration project, noting that they are exploring ways to retain key staff through a variety of funding streams, such as student fees and tuition, and by seeking other funding opportunities.

Many stakeholders were hopeful, however, that the relationships and increased communication across SONs and other network members would persist. One participant who served as a member of a strategic planning team commented:

> *"The collaboration will sustain post-demonstration, but what that collaboration will look like is to be determined."*

Strategies to Sustain GNE Demonstration Project Investments

In the fall of 2015, GNE project administrators began discussing internally, and with their partnering SONs, possible funding sources and strategies to maintain the investments and processes developed through the GNE demonstration project. Though not an ideal option, many SONs considered increasing student enrollment in order to maintain the support staff that oversees the clinical placement process. A few stakeholders discussed pursuing other funding opportunities and engaging local and state government officials.

Meanwhile, the SONs are also developing strategies to continue to recruit and sustain current clinical education site and preceptor levels. Some examples include:

- Developing preceptor guides and training to encourage and support APRNs who are new to precepting.

- Scheduling in-person meetings with stakeholders from clinical sites to establish stronger, more targeted, and goal-oriented relationships.
- Expressing appreciation to all clinical education sites and preceptors for their time and effort through thank you notes and other tokens of appreciation.
- Allowing clinical education sites and preceptors to access the SON's library.
- Providing training on the newest medical guidelines.

One GNE SON surveyed both GNE- and non-GNE-supported clinical preceptors to gauge preceptor engagement and elicit suggestions about maintaining preceptor relationships. The survey was fielded in the fall of 2014 and 2015. The preliminary results showed that the preceptors were interested in non-monetary incentives, such as opportunities to work with faculty on papers, earn continuing education credits, and receive SON-hosted training/informational sessions on new medical practices in their areas of interest.

Interview participants said that over the next year they expected to continue discussing how to further solidify partner relationships and maintain key GNE investments.

Chapter 4: How Effective was the GNE Demonstration Project in Increasing Growth in the APRN Workforce?

The evaluation team examined APRN student growth over time in the GNE SONs and assessed the impact of the GNE demonstration project on the growth of APRN students. The team assessed whether the demonstration project was effective in increasing APRN student enrollment and graduations overall, by specialty, and by degree type. To provide context to the quantitative findings, the team collected qualitative data from stakeholders in the GNE networks, to capture their perceptions of how the demonstration project facilitated growth in APRN student enrollment and graduation. In addition, the team assessed whether the demonstration project had spillover effects on non-GNE SONs located within the same state as a GNE SON.

APRN STUDENT GROWTH

This section examines the growth of APRN students in GNE SONs during the demonstration years compared to the growth observed during the baseline years and also to the growth observed in non-GNE comparison SONs.

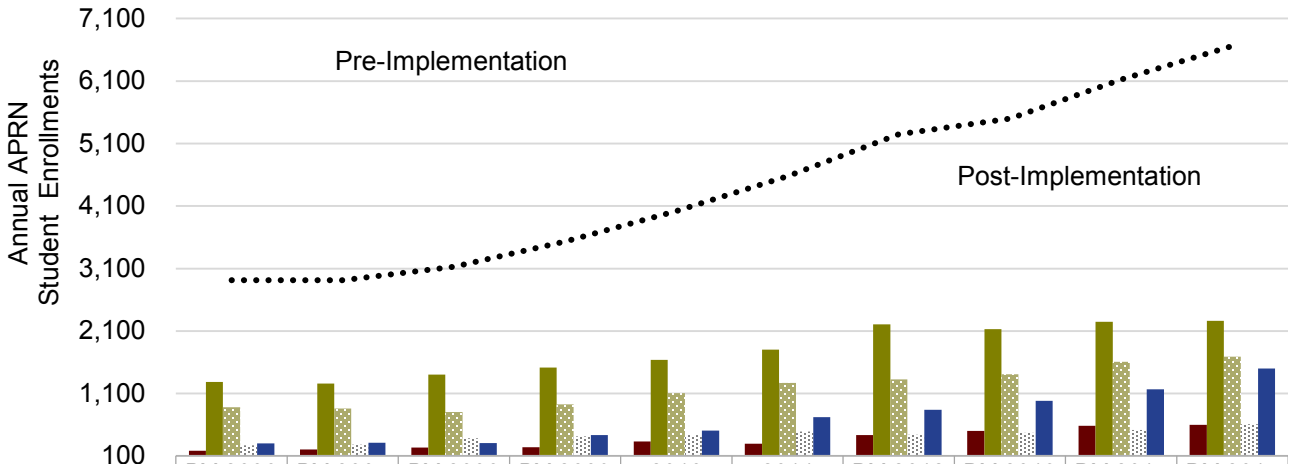
Descriptive Analysis of Enrollment and Graduations in GNE SONs

This section describes trends in APRN enrollment and graduations for SONs affiliated with the GNE demonstration project from baseline through DY 2014, using data from the AACN Annual Institutional Surveys.

Descriptive Enrollment Trends

The graph in Exhibit 4-1 shows annual APRN student enrollments in GNE SONs from BY 2006 to DY 2014 by network. Both full-time and part-time students are included. Overall, enrollments increased during both the pre- and post-implementation periods in all networks.

Exhibit 4-1. Total APRN Enrollment in GNE Network SONs, by Network and Year

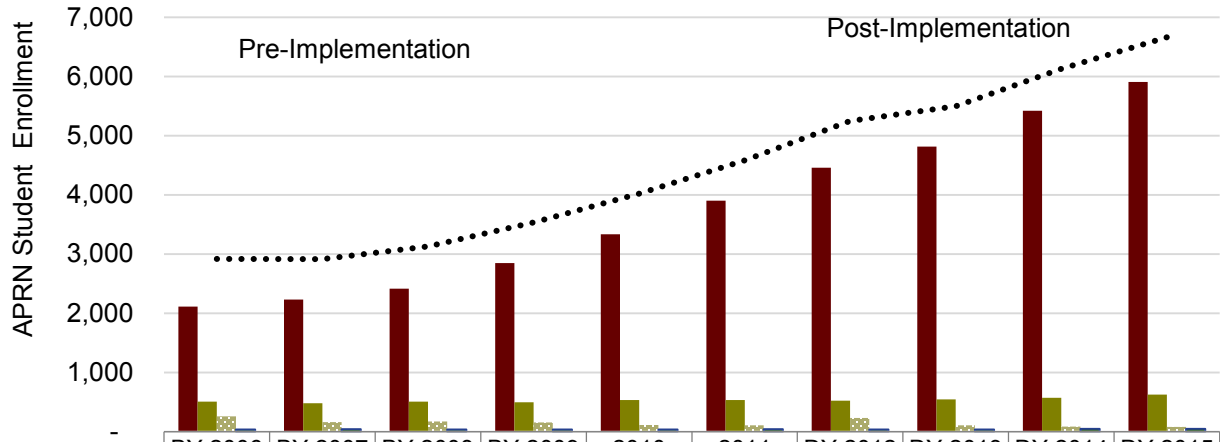


	BY 2006	BY 2007	BY 2008	BY 2009	2010	2011	DY 2012	DY 2013	DY 2014	DY 2015
DUH	184	205	235	241	334	296	435	501	581	598
HUP	1,284	1,260	1,404	1,518	1,637	1,801	2,208	2,131	2,250	2,265
MH	878	858	802	925	1,107	1,269	1,328	1,408	1,608	1,692
RUMC	269	280	383	416	433	492	439	472	517	607
SHC	300	310	305	435	507	721	838	985	1,169	1,499
Total	2,915	2,913	3,129	3,535	4,018	4,579	5,248	5,497	6,125	6,661

Source: American Association of Colleges of Nursing (AACN), Annual Institutional Surveys.
Note: BY = baseline year; DY = demonstration year.

The graph in Exhibit 4-2 shows the trends in the number of students actively enrolled in APRN programs offered by GNE SONs during each academic year, between BY 2006 and DY 2015. Over the five-year period prior to the start of the demonstration in DY 2012, APRN enrollment among the GNE SONs increased by 57 percent, from 2,915 to 4,579 students. During the first four years of the demonstration project, enrollment in APRN programs increased by 27 percent, from 5,248 to 6,661 students. The largest increase in enrollment occurred in NP programs—32 percent between DY 2012 and DY 2015. Active enrollment in CRNA and CNM specialty programs grew during the same period by 20 percent and 29 percent, respectively. By contrast, enrollment in CNS specialty programs declined by 66 percent.

Exhibit 4-2. Total APRN Enrollment in Specialty Programs across GNE SONs, by Year



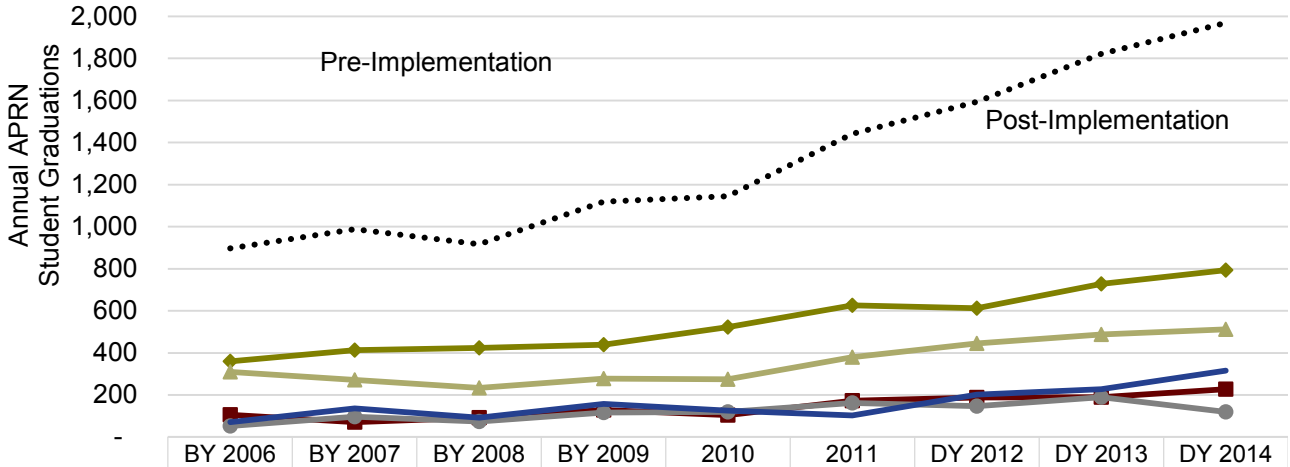
	BY 2006	BY 2007	BY 2008	BY 2009	2010	2011	DY 2012	DY 2013	DY 2014	DY 2015
NP	2,113	2,230	2,415	2,848	3,335	3,900	4,459	4,812	5,421	5,907
CRNA	506	478	505	496	534	533	520	544	570	626
CNS	259	162	171	153	111	107	231	105	86	79
CNM	37	43	38	38	38	39	38	36	48	49
Total	2,915	2,913	3,129	3,535	4,018	4,579	5,248	5,497	6,125	6,661

Source: American Association of Colleges of Nursing (AACN), Annual Institutional Surveys.
Notes: Total APRN enrollments are the sum of NP, CRNA, CNS and CNM enrollments for that year.
BY = baseline year; DY = demonstration year.

Descriptive Graduation Trends

Exhibit 4-3 shows the number of APRN graduations from GNE network SONs between BY 2006 and DY 2014 by network. Overall, graduations increased across all networks during both the pre- and post-implementation periods, with the exception of RUMC, which had an increase in graduations through DY 2013 and then a slight decrease.

Exhibit 4-3. Total Annual APRN Graduations from GNE Network SONs, by Network and Year

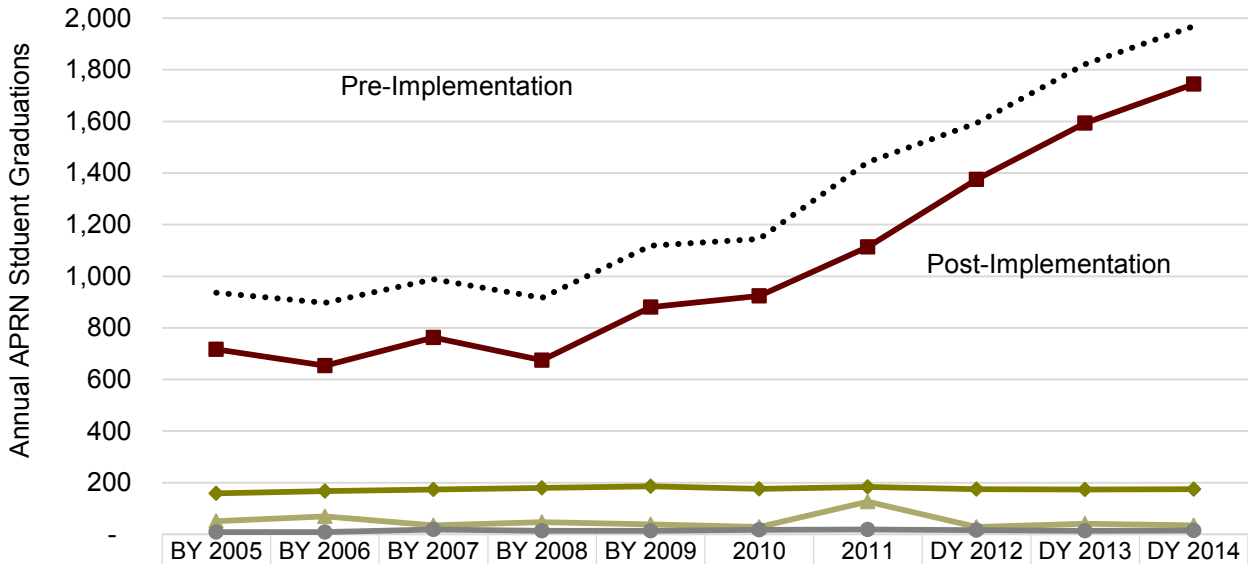


	BY 2006	BY 2007	BY 2008	BY 2009	2010	2011	DY 2012	DY 2013	DY 2014
DUH	106	71	92	128	104	172	188	190	227
HUP	359	413	424	439	523	626	613	728	794
MH	310	272	234	277	274	379	445	487	512
RUMC	52	96	74	117	119	162	147	190	120
SHC	70	136	92	158	125	103	201	227	316
Total	897	988	916	1,119	1,145	1,442	1,594	1,822	1,969

Source: American Association of Colleges of Nursing (AACN) annual institutional surveys.
Notes: BY = baseline year; DY = demonstration year.

Exhibit 4-4 shows the number of APRN graduations in GNE SONs in each year from BY 2006 through DY 2014. Prior to the start of the demonstration project in DY 2012, APRN graduations from GNE SONs increased by 61 percent, from 897 to 1,442. After project implementation, graduations from APRN programs grew across all GNE SONs, by 24 percent, from 1,594 to 1,969. Graduations in the NP specialty programs closely tracked overall enrollment growth during both the pre- and post-implementation periods. By contrast, graduations in the CRNA and CNM specialties remained relatively flat after implementation of the demonstration project.

Exhibit 4-4. Total Annual APRN Graduations from GNE Demonstration-Affiliated Specialty Programs, by Year



	BY 2005	BY 2006	BY 2007	BY 2008	BY 2009	2010	2011	DY 2012	DY 2013	DY 2014
Total	936	897	988	916	1,119	1,145	1,442	1,594	1,822	1,969
NP	717	653	762	675	881	924	1,114	1,375	1,593	1,745
CRNA	159	167	173	180	186	176	183	175	174	175
CNS	51	69	35	47	38	28	126	28	41	34
CNM	9	8	18	14	14	17	19	16	14	15

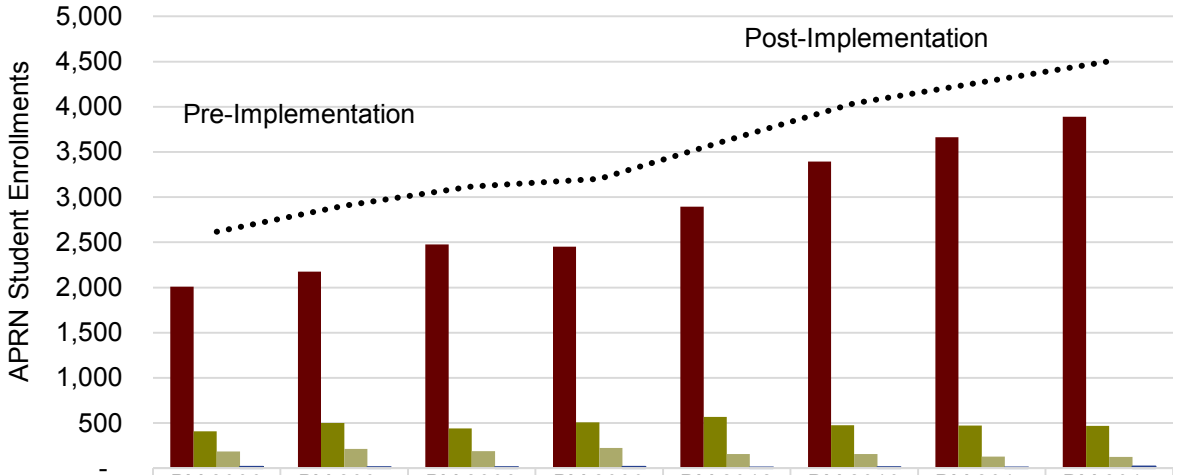
Source: American Association of Colleges of Nursing (AACN) annual institutional surveys
Notes: APRN graduations are the sum of NP, CRNA, CNS and CNM graduations for that year.
BY = baseline year; DY = demonstration year.

Descriptive Analysis of Enrollment and Graduations in Non-GNE Comparison SONs

The evaluation team also examined descriptive enrollment and graduation trends in non-GNE comparison SONs. The graph in

Exhibit 4-5 shows annual APRN student enrollments in comparison SONs from BY 2006 to DY 2015. Both full-time and part-time students are included. Similar to the trend for the GNE SONs, total enrollment increased steadily between DY 2012 and DY 2015 compared to the baseline period. Again, the largest increase occurred in NP programs.

Exhibit 4-5. Total APRN Enrollment in Specialty Programs across Non-GNE Comparison SONs, by Year

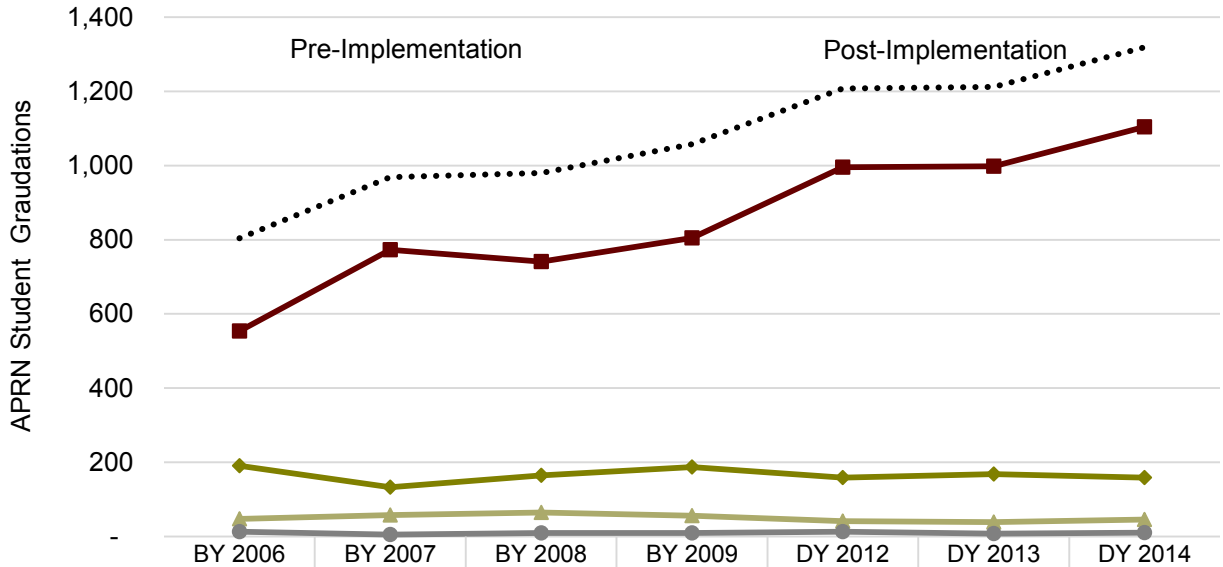


	BY 2006	BY 2007	BY 2008	BY 2009	DY 2012	DY 2013	DY 2014	DY 2015
NP	2,008	2,177	2,475	2,452	2,894	3,393	3,662	3,888
CRNA	409	502	440	509	569	475	471	470
CNS	185	212	189	225	156	156	130	125
CNM	15	13	13	16	9	12	8	20
Total	2,617	2,904	3,117	3,202	3,628	4,037	4,271	4,503

Source: American Association of Colleges of Nursing (AACN) annual institutional surveys.
Notes: Total APRN enrollments are the sum of NP, CRNA, CNS and CNM enrollments for that year.
BY = baseline year; DY = demonstration year.

The graph in Exhibit 4-6 shows the total number of APRN graduations from comparison SONs from BY 2006 to DY 2015. Total APRN graduations increased between DY 2012 and DY 2015 compared to the baseline period. Similar to enrollment trends, the largest increase in graduations occurred in NP programs.

Exhibit 4-6. Total APRN Graduations from Specialty Programs across Non-GNE Comparison SONs, by Year



	BY 2006	BY 2007	BY 2008	BY 2009	DY 2012	DY 2013	DY 2014
Total	804	968	980	1,057	1,208	1,212	1,319
NP	554	773	741	805	995	998	1,104
CRNA	191	132	165	187	158	168	158
CNS	47	58	65	56	42	39	46
CNM	12	5	9	9	13	7	10

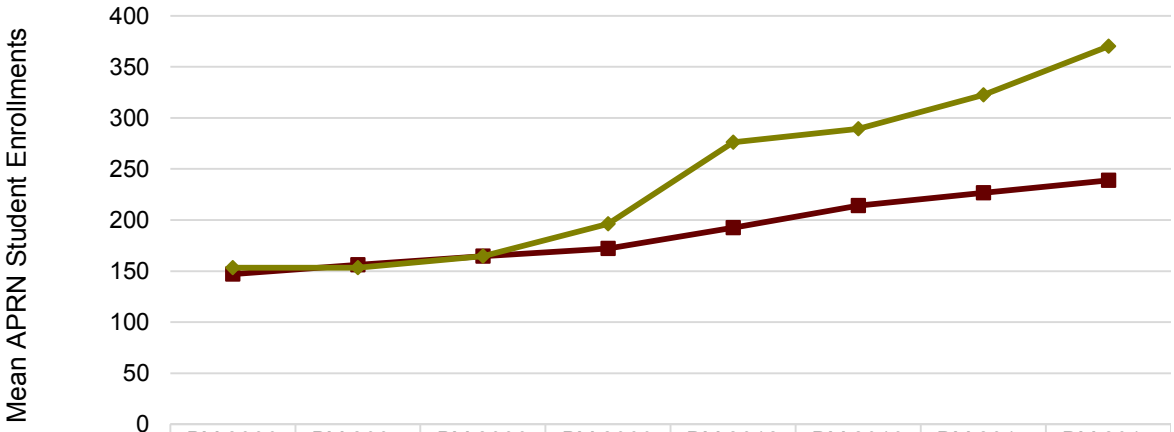
Source: American Association of Colleges of Nursing (AACN), Annual Institutional Surveys.
Notes: Total APRN graduations are the sum of NP, CRNA, CNS and CNM graduations for that same year.
BY = baseline year; DY = demonstration year.

Impact of the GNE Demonstration on APRN Student Growth

Descriptive Enrollment Trends, GNE Network SONs versus Non-GNE Comparison SONs

Exhibit 4-7 shows that mean APRN enrollment in the GNE group accelerated between DY 2013 and DY 2015, while it increased more gradually for the non-GNE comparison group. This difference provided initial evidence of a positive effect of the demonstration on APRN enrollment.

Exhibit 4-7. Mean APRN Enrollments per SON, GNE Group vs. Entropy Weighted Comparison Group

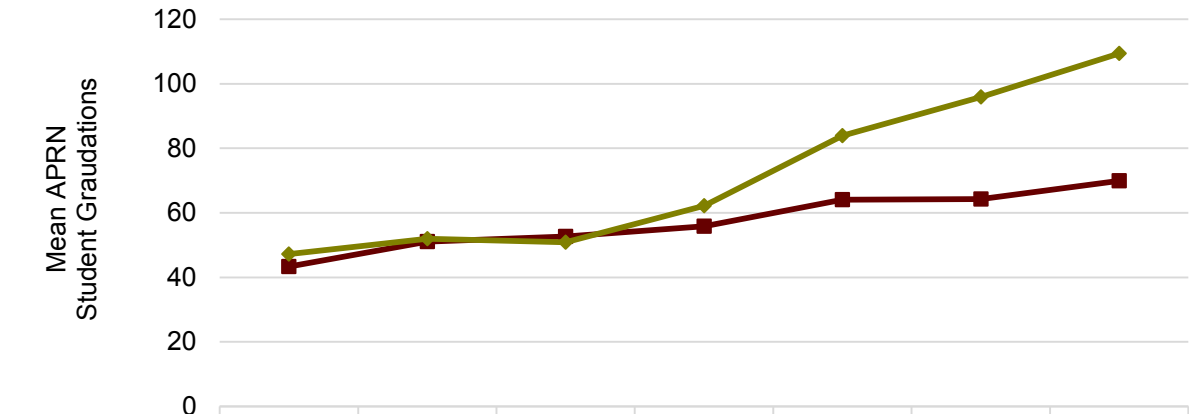


	BY 2006	BY 2007	BY 2008	BY 2009	DY 2012	DY 2013	DY 2014	DY 2015
Comparison	147	156	164	172	192	214	227	239
GNE	153	153	165	196	276	289	322	370

Notes: BY = baseline year, DY = demonstration year. Baseline comparison group: weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.

Exhibit 4-8 shows that mean APRN graduations increased steeply for the GNE group between 2012 and 2014, while increasing at a more modest rate for the comparison group. This difference provided initial evidence that the demonstration project had a positive effect on the number of APRN graduations.

Exhibit 4-8. Mean APRN Graduations per SON, GNE Group vs. Entropy Weighted Comparison Group



	BY 2006	BY 2007	BY 2008	BY 2009	DY 2012	DY 2013	DY 2014
Comparison	43	51	53	56	64	64	70
GNE	47	52	51	62	84	96	109

Notes: BY = baseline year, DY = demonstration year. Information for APRN graduations is reported with a one-year lag (the AACN 2015 Annual Institutional Survey reports graduation data for AY August 1, 2014 through July 31, 2015). Baseline comparison group: weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.

Effect of the GNE Demonstration Project on APRN Student Enrollment

As described in Chapter 2, the evaluation team analyzed the impact of the demonstration project on enrollment using three alternative comparison groups: a propensity score weighted comparison group (comparison group 1); an entropy weighted comparison group that balances in continuous quadratic and several cubic terms (comparison group 2); and an entropy weighted comparison group that balances in continuous quadratic terms (comparison group 3). The results associated with each estimation are discussed below.

KEY FINDINGS

- The results suggest that the GNE demonstration project had a positive effect on APRN enrollment.
- The effect ranges from a 34 to 52 percent increase in total APRN enrollment for GNE SONs.
- The DID coefficient estimates show that the project significantly increased enrollment in the master's degree program and the NP specialty.

Overall Effect of the GNE Demonstration Project on Enrollment

Exhibit 4-9 shows the DID coefficient estimates for the average effect of the demonstration project on total APRN enrollment using each of the three alternative comparison groups. The first column of the table reports the results using comparison group 1. The DID coefficient estimate is statistically significant at the 10 percent level and shows that average APRN enrollment increased by 71 students relative to the comparison group as a result of the

demonstration project. This represents an increase of 43 percent with respect to the baseline mean.

The second column of Exhibit 4-9 shows the estimated effect of the demonstration project on enrollment using comparison group 2 (the preferred comparison group).[70] The DID coefficient estimate suggests that annual APRN enrollment in GNE SONs increased by an average of 87 students as a result of the demonstration project. This represents a 52 percent increase with respect to the baseline mean and is statistically significant at the 1 percent level.[71] The last column in the table shows the results obtained using comparison group 3. These results suggest that the demonstration project increased annual APRN student enrollment by an average of 57 students.

Exhibit 4-9. Weighted Difference-in-Differences Results: APRN Enrollment

	Propensity Score Weighted Propensity (Comparison Group 1)	Entropy Weighted[a] (Comparison Group 2 – Preferred)	Entropy Weighted[b] (Comparison Group 3)
DID coefficient estimate:[c] GNE_s*$After_t$	71.052*	87.077***	57.291
90 percent confidence interval	[9.507, 132.596]	[32.989, 141.165]	[-0.486, 115.068]
Standard error	(37.413)	(32.880)	(35.123)
P-value	[0.059]	[0.009]	[0.104]
Baseline mean for GNE SONs	166.560	166.560	166.560
DID coefficient estimate as a percentage of the GNE baseline mean	43%	52%	34%
Number of observations	1,521	1,848	1,848

Notes: Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2015.
The propensity score weighted model has fewer observations than the entropy balanced models because 40 SONs were dropped due to perfect prediction when estimating propensity scores, but these observations were not dropped in the entropy balancing algorithm.
[a] Weights estimated including quadratic and cubic terms. [b] Weights estimated including quadratic terms only.
[c] The GNE_s variable indicates whether a SON is a GNE SON; the variable $After_t$ is an indicator variable for the demonstration period.

[70] Comparison group 2 estimates the comparison group weights using an entropy balancing approach that includes quadratic and cubic terms for continuous covariates.

[71] The percentage change is calculated by dividing the DID estimate by the baseline level of the outcome for the GNE SONs. For total APRN enrollment, this calculation is: (87.077/166.56)=0.522, which is rounded to 52 percent.

Effect of the GNE Demonstration Project on Enrollment by Specialty and Degree

Exhibit 4-10 displays the DID coefficient estimates for APRN enrollment by specialty using comparison group 2. The baseline means for GNE SONs show that there were small increases in CRNA, CNM, and CNS enrollments as a result of the demonstration project, but none of these estimates were statistically significant. In contrast, the last column shows that after the GNE demonstration project was implemented, annual NP enrollment increased by an average of about 84 students compared to the non-GNE SONs. This estimate is statistically significant at the 5 percent level and represents a 65 percent increase in NP enrollment for the GNE SONs as a result of the demonstration project.

Exhibit 4-10. Weighted Difference-in-Differences Results: APRN Enrollment by Specialty Outcomes: CRNA, CNM, CNS, and NP Enrollment

	CRNA	CNM	CNS	NP
DID coefficient estimate: GNE_s*$After_t$	2.615	0.250	0.465	83.748**
90 percent confidence interval	[-2.591,7.820]	[-0.121,0.621]	[-5.303,6.233]	[29.349,138.146]
Standard error	(3.164)	(0.226)	(3.506)	(33.069)
P-value	0.409	0.269	0.895	0.012
Baseline mean for GNE SONs	26.467	2.080	9.933	128.080
DID coefficient estimate as a percentage of the GNE baseline mean	10%	12%	5%	65%
Number of observations	1,848	1,848	1,848	1,848

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms. Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2015.
Exhibit A-6, Appendix A, contains estimates for all covariates used in this regression model.
The GNE_s variable indicates whether a SON is a GNE SON; the variable $After_t$ is an indicator variable for the GNE demonstration period.

Exhibit 4-11 shows the DID coefficient estimates for APRN enrollment by degree using comparison group 2. Column 1 shows that annual enrollment in master's programs increased by an average of 69 students in the GNE SONs relative to the comparison group. This represents a 44 percent increase in master's-level enrollment for the GNE SONs with respect to the baseline mean, and is statistically significant at the 10 percent level. In addition, after the GNE demonstration project was implemented, post-master's-level enrollment in GNE SONs

increased by 3 students on average relative to the comparison group, and DNP enrollment increased by 16 students on average. These results show that most of the increase in total APRN enrollment shown in Exhibit 4-11 was due to an increase in master's-level enrollment.

Exhibit 4-11. Weighted Difference-in-Differences Results: APRN Enrollment by Degree Outcomes: Master's, Post-Master's, and DNP Enrollment

	Master's	Post-Master's	DNP
DID coefficient estimate: GNE_s*$After_t$	68.670	2.857	15.550
90 percent confidence interval	[-2.783,140.124]	[-2.324,8.037]	[-29.772,60.873]
Standard error	(43.437)	(3.149)	(27.552)
P-value	0.115	0.365	0.573
Baseline mean for GNE SONs	157.493	1.227	7.840
DID coefficient estimate as a percentage of the GNE baseline mean	44%	233%	198%
Number of observations	1,848	1,848	1,848

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.
Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2015.
The GNE_s variable indicates whether a SON is a GNE SON; the variable $After_t$ is an indicator variable for the demonstration period.
See Appendix A, Exhibit A-7, for all covariates used in this regression model.

Effect of the GNE Demonstration Project on APRN Graduations

Using the same approach that was used to analyze the impact of the demonstration project on enrollment, the team also examined the impact of the demonstration project on APRN graduations using the three alternative comparison groups. The results associated with each estimation are discussed below.

Overall Effect of the GNE Demonstration Project on Graduations

Exhibit 4-12 shows the weighted DID coefficient estimates for the effect of the demonstration project on total APRN graduations using the propensity score weighted comparison group, an entropy weighted comparison group that achieves balance in means, quadratic, and cubic terms (the preferred comparison group), and an entropy weighted comparison group that achieves balance in means and quadratic terms. The results suggest that after the GNE demonstration project was implemented, there was an average annual increase in APRN graduations in the

GNE SONs of 28 students relative to comparison group 2 (see Exhibit 4-12, column 2). This estimate is statistically significant at the 5 percent level.

The DID coefficient estimates from the three comparison groups show that the GNE demonstration project had a positive effect on APRN graduations. The effect ranges from a 30 percent to a 52 percent increase in total APRN graduations for the GNE SONs, depending on the particular comparison group used.

Exhibit 4-12. Weighted Difference-in-Differences Results: APRN Graduations

	Propensity Score Weighted Comparison Group (Comparison Group 1)	Entropy Weighted Comparison Group[a] (Comparison Group 2–Preferred)	Entropy Weighted Comparison Group[b] (Comparison Group 3)
DID coefficient estimate:[c] GNE_s*$After_t$	21.312	27.600**	15.833
90 percent confidence interval	[-3.153, 45.776]	[7.065, 48.135]	[-5.417, 37.083]
Standard error	(14.872)	(12.483)	(12.918)
P-value	[0.153]	[0.028]	[0.222]
Baseline mean for GNE SONs	52.973	52.973	52.973
DID coefficient estimate as a percentage of the GNE baseline mean	40%	52%	30%
Number of observations	1,338	1,625	1,625

Notes: Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2014. At the time of this report, however, DY 2015 graduation data were not available.
The propensity score weighted model had fewer observations than the entropy balanced models because 40 SONs were dropped due to perfect prediction when estimating propensity scores, but these observations were not dropped in the entropy balancing algorithm. There are fewer observations for graduations than enrollment because the demonstration period is shorter.
[a] Weights estimated including quadratic and cubic terms. [b] Weights estimated including quadratic terms only.
[c] The GNE_s variable indicates whether a SON is a GNE SON; the variable $After_t$ is an indicator variable for the demonstration period.

Effect of the GNE Demonstration Project on Graduations by Specialty and Degree

Exhibit 4-13 reports the DID coefficient estimates for APRN graduations by specialty using comparison group 2. Similar to the results for enrollment, increases in total APRN graduations were driven mainly by increases in NP graduations. The last column of the table shows that annual NP graduations in GNE SONs increased by an average of 27 students relative to the comparison group. This estimate is statistically significant at the 5 percent level and represents

a 67 percent increase relative to the baseline mean for the GNE SONs. The first three columns show small, increases in CRNA, CNM, and CNS graduations as a result of the demonstration project, but these were not statistically significant.

Exhibit 4-13. Weighted Difference-in-Differences Results: APRN Graduations by Specialty Outcomes: CRNA, CNM, CNS, and NP Graduations

	CRNA	CNM	CNS	NP
DID coefficient estimate: GNE_s*$After_t$	0.503	0.030	0.140	26.927**
90 percent confidence interval	[-2.319,3.326]	[-0.225,0.285]	[1.600,1.880]	[7.432,46.421]
Standard error	(1.716)	(0.155)	(1.058)	(11.851)
P-value	0.770	0.846	0.895	0.024
Baseline mean for GNE SONs	9.541	0.730	2.554	40.149
DID coefficient estimate as a percentage of the GNE baseline mean	5%	4%	5%	67%
Number of observations	1,625	1,625	1,625	1,625

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms. Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2014. At the time of this report; however, no graduation data were available for DY 2015.
The GNE_s variable indicates whether a SON is a GNE SON; the variable $After_t$ is an indicator variable for the demonstration period.
Exhibit A-8, Appendix A, contains estimates for all covariates used in this regression model.

Exhibit 4-14 displays the DID coefficient estimates for mean APRN graduations by degree using comparison group 2. The baseline mean for GNE SONs shows that the master's degree program accounted for the majority of the increase in graduations. Master's-level graduations increased annually by an average of 25 students for the GNE SONs relative to the comparison group. This estimate is statistically significant at the 10 percent level and represents a 53 percent increase, compared to baseline, in master's-level graduations. In addition, the GNE SONs increased post-master's-level graduations by about 1 and DNP graduations by 2, on average, but these estimates were not statistically significant.

The DID coefficient estimates for the impact of the demonstration project on graduations by specialty and degree show that the demonstration project increased graduations for every specialty and degree, but the majority of the increases were concentrated at the master's level and in the NP specialty programs.

Exhibit 4-14. Weighted Difference-in-Differences Results: APRN Graduations by Degree Outcomes: Master's, Post-Master's, and DNP Graduations

	Master's	Post-Master's	DNP
DID coefficient estimate: GNE_s*$After_t$	25.330*	0.676	1.595
90 percent confidence interval	[4.027,46.632]	[-2.101,4.351]	[-4.855,8.044]
Standard error	(12.950)	(1.688)	(3.921)
P-value	0.052	0.689	0.685
Baseline mean for GNE SONs	47.757	4.351	0.865
DID coefficient estimate as a percentage of the GNE baseline mean	53%	16%	184%
Number of observations	1,625	1,625	1,625

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms. Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2014. At the time of this report, however, no graduation data were available for DY 2015.
The GNE_s variable indicates whether a SON is a GNE SON; the variable $After_t$ is an indicator variable for the demonstration period.
Exhibit A-9, Appendix A, contains estimates for all covariates used in this regression model.

Testing for Differential Pre-Demonstration Trends

Estimation of the causal effect of the demonstration relies on the assumption that, conditional on observable covariates, changes in APRN student enrollment and graduations would have been the same for the GNE SONs and the non-GNE SONs if the GNE demonstration project had not occurred. It is not possible to directly test these assumptions since we cannot observe the outcomes of the GNE group in a hypothetical world where the demonstration was not implemented. However, we can indirectly assess the likelihood of this assumption holding by estimating a weighted DID model that interacts the GNE SONs dummy with the full set of year fixed effects, leaving 2006 as the base year. Each GNE*Year variable is interpreted as the change in trends in that particular year compared to 2006. If the GNE*Year indicator variables for the baseline years (GNE*2007, GNE*2008, GNE*2009) are not statistically significant, this would indicate that the parallel trend assumption is likely satisfied because the differences

between the GNE SONs and the non-GNE SONs did not change over time during the baseline period.

Exhibit 4-15 shows the results of this specification for the two main outcomes of the evaluation: APRN enrollment, and APRN graduations. In addition, we constructed F-statistics and associated p-values that indicate whether enrollment and graduations in the GNE SONs and the non-GNE SONs were statistically different from each other in the baseline period overall. Specifically, we tested whether coefficients in the baseline period, shown as the first three rows of Exhibit 4-8, are jointly zero. For each regression, the p-value and F-statistics of the joint significance of the three coefficients in the baseline years are reported at the bottom of the table. These results show that for both enrollment and graduations, the F-test fails to reject the null hypothesis of joint insignificance of the three baseline coefficients. The p-value is higher than 0.1, which means that there is no evidence that the GNE SONs and the comparison group had significantly different enrollment or graduation trends at baseline. This test formally shows that the trends were parallel in the baseline, providing greater confidence that the parallel trends assumption is satisfied.

In addition, the coefficient estimates in Exhibit 4-15 show that the increases in APRN enrollment in the GNE SONs, relative to the comparison group, began in 2012, the first demonstration year. Moreover, statistically significant increases in APRN graduations start showing up in 2013, the second demonstration year. The increases in enrollment and graduations become larger each year thereafter. The results reported in Exhibit 4-15 provide further validity that the model can be used to estimate the causal effect of the demonstration project.

Exhibit 4-15. Weighted Difference-in-Differences Results using GNE-Year Interactions Outcomes: Total APRN Enrollment and Graduations

	APRN Enrollment	APRN Graduations
GNE*2007	-11.667	-3.423
	(11.145)	(7.479)
GNE*2008	-9.763	-8.393
	(9.794)	(5.782)
GNE*2009	7.271	-0.594
	(16.237)	(6.792)
GNE*2012	65.262**	12.498

	APRN Enrollment	APRN Graduations
	(26.200)	(13.202)
GNE*2013	65.745** (32.400)	27.517** (13.873)
GNE*2014	86.366** (40.176)	33.443** (15.941)
GNE*2015	116.712** (50.236)	---
Number of observations	1,848	1,625
F-Statistic for joint baseline trend test	2.04	1.45
P-value for joint baseline trend test	0.109	0.229

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms. Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2015 for enrollment and DY 2012–2014 for graduations.
DID coefficient estimates should be interpreted with respect to the omitted category, GNE*2006.
Exhibit A-10, Appendix A, contains estimates for all covariates used in this regression model.

Perceived Impact of the Demonstration Project on APRN Student Growth

During semi-annual in-person and telephone interviews, GNE SON stakeholders discussed their perceptions of the impact of the demonstration project on APRN student growth. Generally, most stakeholders reported that student enrollment increased during the GNE demonstration period. They discussed various reasons why this had occurred and whether the growth could be attributed specifically to the demonstration project.

GNE stakeholders from all networks reported that APRN enrollments have increased since the demonstration project began, but not all networks were willing to attribute the enrollment increase solely to the demonstration project. Some stakeholders in the HUP network were particularly cautious when asked if the GNE Demonstration project contributed to APRN enrollment increases. One SON administrator explained:

> *"Very gently and kindly I want to say, we increase our numbers because of the IOM [Institute of Medicine] and because this is where health care is going, and because we have had GNE behind us to help us with some of the challenges."*

Conversely, other stakeholders reported a direct tie between the demonstration project and the increase in enrollment. An oversight team member commented:

> *"The [GNE] investment has really been with the schools on enrollment and increasing the visibility of APRN education. Realizing that they [SONs] are part of something big and transformative has been huge for us in terms of PR."*

Still, all interviewed stakeholders emphasized the importance and impact of the GNE demonstration project in increasing APRN enrollment. As one oversight team member reported:

> *"I think we couldn't have grown our enrollment the way we did, without those [GNE] investments and certainly not without the site payments."*

FACTORS PERCEIVED TO INCREASE APRN ENROLLMENT AND GRADUATIONS

- Expanded partnerships with clinical education sites
- Developed and standardized SON clinical placement practices and policies
- Built relationships and strengthened collaboration with internal and external partners
- Allowed SONs to hire dedicated clinical placement staff such as recruiters and coordinators

Interestingly, some SONs reported that in order to increase APRN student enrollment, they accepted students with weaker applications whom they might otherwise have rejected, but they did not discuss the nature of the weaknesses. Though this was not expressed by administrators or faculty at all SONs, it highlights an important unintended consequence of the demonstration project.

According to GNE stakeholders, the demonstration project contributed to increases in student enrollment and graduations in a variety of ways. Clinical placement coordinators, in particular, were mentioned by all networks as a key driver of increased enrollment, because they facilitated the growth of the preceptor/clinical site pool and helped standardize and oversee the clinical placement processes.

Stakeholders from one network discussed the benefit the demonstration project afforded by paying clinical sites, rather than paying preceptors directly. This allowed the network to incentivize and reward placement sites for testing new models of care that include APRN student education. Conversely, a few SON administrators noted that some preceptors chose not to precept because the precepting payments would not go directly to them.

Across all five networks, SONs hired both adjunct and full-time clinical faculty using demonstration payments to support a growing APRN student body. Clinical faculty helped to

recruit and facilitate placements, conduct evaluations of student and preceptor performance, and support communication between students and their clinical placement sites. Many GNE SONs used their own funds to hire didactic faculty and other administrative staff to meet the needs of the additional students. As noted by the SON stakeholders, without additional faculty to facilitate classroom and clinical education, it would have been very difficult for the SONs to accept the large number of students that they enrolled over the course of the demonstration period. Stakeholders noted, however, that even with the additional support from demonstration payments and non-demonstration funds, faculty and advisors were still "stretched" due to a larger number of students.

Stakeholders discussed the tension between the two primary objectives of the demonstration project—increased enrollment and enhanced utilization of CCSs. With a large and growing number of APRN enrollees, GNE SONs had to significantly increase their preceptor pools. To do this, they targeted larger clinical practices that were able to place multiple students every semester. These sites were located in well-served geographic areas and were often affiliated with a hospital system. However, a key goal of the demonstration project was to place students in medically underserved areas, including rural communities, and in community-based sites such as FQHCs, where students would continue to practice after graduation. Often these types of sites can accommodate only one or two placements and can commit to only one semester each year. Stakeholders commented on the tension between these two project objectives, noting that it was not always clear how to target resources to accomplish both goals.

SPILLOVER EFFECTS

Spillover effects occur if non-GNE SONs are affected by the GNE demonstration project. For instance, as a result of the precepting payments under the demonstration project, preceptors from the non-GNE SONs might elect to precept only APRN students at GNE SONs. During the first year of the demonstration project, non-GNE SONs claimed that increases in preceptorships among participating schools were resulting in fewer opportunities for clinical training sites for APRN students from their own schools. The evaluation examined whether APRN student enrollment and graduations at non-GNE SONs located in the same state and with characteristics similar to those of GNE SONs were impacted by the demonstration project.

Exhibit 4-16 presents the DID coefficient estimates for spillover effects. The results show that the annual APRN enrollment in spillover SONs decreased by 16 students, on average, relative to the comparison group. The results show that the annual APRN graduations decreased by an average of 6 students. Neither effect was statistically significant, suggesting that no negative spillover effects occurred as a result of the demonstration project.

Exhibit 4-16. Weighted Difference-in-Differences Results: Spillover Effects Outcomes: APRN Enrollment, APRN Graduations

	APRN Enrollment	APRN Graduations
DID coefficient estimate: $Spillover_s$*$After_t$	-15.571	-5.755
90 percent confidence interval	[-59.165,28.022]	[--32.711,21.202]
Standard error	(26.501)	(16.387)
P-value	[0.557]	[0.726]
Baseline mean for spillover SONs	128.205	44.841
DID coefficient estimate as a percentage of the spillover baseline mean	-12%	-13%
Number of observations	1,786	1,572

Notes: Comparison group is weighted to be balanced with the spillover group, with weights found using entropy balancing. Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
The $Spillover_s$ variable indicates whether a SON is a Spillover SON; the variable $After_t$ is an indicator variable for the demonstration period.
Baseline period = BY 2006–2009; demonstration period = DY 2012–2015 for enrollment and DY 2012–2014 for graduations. There are fewer observations for graduations than for enrollment because the demonstration period is shorter.

Chapter 5: Summary and Conclusions

The GNE demonstration project was designed to increase APRN student enrollments and graduations by expanding the number of clinical training sites and the supply of APRN clinical preceptors. Participating hospitals received payments for providing qualified clinical training to incremental APRN students. The evaluation team used data from primary and secondary sources to understand how the demonstration project was implemented and operationalized and to assess the impact of APRN enrollments and graduations overall and by specialty. This chapter discusses the cumulative evaluation findings for the first four years of the GNE demonstration project.

SUMMARY OF FINDINGS

Network Characteristics and Demonstration Operation Processes

Prior to the GNE demonstration project, partnerships among hospitals, SONs, and CCSs differed across networks. While some participating hospitals had informal partnerships with network SONs and CCSs, others had very few such interactions prior to the demonstration project. SONs competed for preceptors among themselves and with medical schools located within the same geographic area. Clinical placement processes varied across networks, with some SONs having well-structured processes administered by designated staff members, while others relied on faculty members and students to recruit preceptors and arrange placements.

As required by the project's terms and conditions, the five hospital participants formalized their relationships with network partners (SONs, CCSs, and other hospitals) upon receiving GNE demonstration payments in July 2012. The size and composition of the five networks varied widely. While all the networks have a single hospital participant, the number of affiliated hospitals in each network ranges from 2 to 8, and the number of SONs ranges from 1 to 9. DUH and RUMC both have only a single SON, and have 5 and 3 partner hospital affiliates, respectively. HUP's network, on the other hand, is composed of 8 partner hospitals and 9 SONs. In addition, there is variation in the geographic location of the networks: some represent urban centers in Chicago (RUMC) and Philadelphia (HUP), while others are composed of both urban and rural partners (SHC-O).

To assist with project implementation, the strategic oversight teams at all networks established regular channels of communication and collaboration among their network partners. In initial meetings, stakeholders discussed the challenges they encountered early in the implementation

process regarding the development and formalization of the requirements and procedures governing precepted clinical education, hiring support staff within a limited timeframe, and establishing uniform data collection activities. The networks reported that these regular meetings prior to implementation helped to reinforce existing partnerships and establish new ones, and enabled the partners to reexamine and improve their processes.

Clinical Education Placements and Processes

Prior to the GNE demonstration project, competition for preceptors and a lack of standardized placement processes were obstacles to the enrollment and timely graduation of APRN students. The demonstration project attempted to facilitate APRN student growth by expanding opportunities for precepted clinical education, particularly in community settings, as a means of increasing and strengthening the primary care workforce. To achieve this goal, there must be a sufficient number of preceptors and clinical training sites to place all enrolled students who qualify for clinical education.

To expand opportunities for precepted clinical education, the networks used GNE demonstration payments to streamline clinical education placement processes, such as developing standardized and more robust data collection practices. Investments made in clinical placement processes, such as clinical placement coordinators and site recruiters, led to new partnerships with clinical education sites that had not previously accepted APRN students, and strengthened relationships with sites that had precepted students in the past. Although not a specific goal of the demonstration project, the GNE SONs reported that hiring additional support staff allowed the faculty, many of whom were closely involved in the clinical placement process prior to the GNE project, to refocus their time and energy on their teaching and clinical practice.

In addition, many networks used demonstration payments to develop a database system to track clinical placements, site/preceptor contact information, placement needs, and clinical hour logs, and to manage contracts with placement sites. Such databases enabled more efficient communication between the sites, preceptors, faculty advisors, and students.

The terms and conditions of the demonstration project include CMS payments for allowable costs related to the clinical training of APRN students. The networks' efforts to expand the pool of available clinical training sites, preceptors, and community-based preceptorships included offering precepting payments to clinical sites or directly to preceptors. The method for determining which preceptors received payments varied across networks; however, all networks strategically targeted preceptors and sites serving medically underserved populations and supported interprofessional or other innovative models of clinical education. A key strategy used to expand the preceptor pool was to partner with clinical education sites that offered multiple

preceptors each semester, rather than developing ad hoc relationships with individual preceptors. GNE stakeholders reported that finding preceptors specializing in midwifery, obstetrics, gynecology, and pediatrics continued to be a challenge during the demonstration.

GNE stakeholders agreed that the clinical education sites were motivated by precepting payments. These payments helped compensate sites for the time preceptors spent with students, enabling sites to more easily take on students without affecting the quality of care they provided or their financial bottom line. As such, stakeholders believed that the payments were instrumental in recruiting new sites, securing more preceptors each semester at existing sites, and developing more consistent relationships with sites that had only occasionally precepted students in the past. Looking beyond the demonstration project, stakeholders expressed concern that clinical education sites might not be willing to precept students if they were not compensated.

Successes and Challenges

The evaluation team assessed network-reported implementation successes and challenges through semi-annual interviews with stakeholders. Importantly, stakeholders reported that the demonstration project fostered new and diverse precepted clinical education opportunities and enabled the creation of new resources to support the expanded pool of preceptors. Another benefit of the project was the enhanced coordination between partners as well as across the networks, and improvements to placement processes within and across SONs. The demonstration project also afforded faculty and administrators more time to focus on improving other aspects of APRN training, such as aligning curricula or admissions criteria. In addition, many interviewees stated that the demonstration project created a dialogue and encouraged greater awareness in the medical community about the role and value of APRNs in providing care.

On the other hand, some stakeholders described challenges inherent in the demonstration project's design. All the networks reported having minimal start-up time at the beginning of the demonstration project, which obliged them to simultaneously plan, design, and implement the project. Due to the short time period between demonstration project award and implementation, stakeholders across all networks reported "playing catch-up" for most of the first demonstration year. As a result, this iterative process of implementation required more time and resources than network stakeholders had allocated.

A second challenge was that the significant increase in enrollments applied pressure on faculty and university resources. Since the CMS payments do not cover didactic education, the SONs are still attempting to balance the goal of increasing the number of APRN graduates with the

reality of limited resources. Some SONs have used non-demonstration funds to hire faculty to teach in didactic settings, advise students, and supervise master's papers and projects. For other SONs, however, hiring additional faculty for these purposes was not financially feasible.

Finally, network leaders universally mentioned difficulties meeting the demonstration project's reporting requirements. During initial implementation, the networks spent significant time and resources to ensure that all data forms required by CMS were uniform and captured the required information. When the data requirements changed during the demonstration period, the networks had to update their data collection forms and tracking documents. Large networks that contained multiple SONs reported that this was a particularly difficult issue. Moreover, when the demonstration project ends, many data collection activities will no longer be required.

Sustainability Plans

Network administrators expressed concerns about whether the growth in APRN enrollment and the structural and process changes made during the project can be sustained after the demonstration project ends. Many stakeholders reported that they were hopeful that the relationships and the increased communication across SONs and other network members would continue. However, their views were mixed about the ability of the SONs to maintain the increased number of APRN students after the project ends. Two networks viewed the surge in enrollment compared to baseline as unsustainable and began to decrease admissions in 2015. However, other SONs stated that they will maintain the increase in student enrollments after the project ends, though some were uncertain about how they would do this. Many stakeholders also anticipated a decrease in the number of preceptors and clinical education sites willing to take students after the precepting payments end.

SON administrators and network leaders discussed potential strategies to maintain the investments and processes developed through the demonstration project. Though not an ideal option, many SONs have considered increasing student enrollment in order to maintain the support staff that oversees the clinical placement process. A few stakeholders discussed pursuing other funding opportunities and to engaging with local and state government officials as a way to sustain demonstration project efforts and activities.

In addition to exploring funding sources, SONs reported that they are developing compensation strategies to sustain current clinical education sites and preceptors beyond the demonstration period. Such strategies include offering new resources, trainings, and tokens of appreciation to motivate preceptors to continue precepting APRN students. Stakeholders reported that over the next academic year they will continue to discuss how to further solidify relationships and maintain key GNE investments.

Effects of the Demonstration on APRN Growth

To understand whether the GNE demonstration project led to increased enrollment and graduations of APRN students, the evaluation team examined trends in enrollments and graduations relative to a comparison group of similar non-GNE SONs. The results showed that during the first four years of the demonstration period, the project increased APRN enrollment in GNE SONs by an average of 87 students per SON, per year, and increased graduations by an average of 28 students per SON, per year. Both results were statistically significant. Sensitivity analyses using alternative methods to form the comparison group showed that the demonstration project increased APRN enrollment in GNE SONs by an average of between 57 and 71 students per SON, per year. Although the results are sensitive to the specification of the comparison group, the demonstration project has had a positive impact on APRN student growth.

Interviews conducted with GNE SON administrators and oversight teams provided additional evidence of a positive effect of the demonstration project on growth in APRN enrollments. Many stakeholders mentioned a direct relationship between increased enrollments and the project's investments in expanding clinical precepting opportunities and transforming placement processes. But not all network administrators were willing to attribute the enrollment increases solely to the demonstration. Stakeholders commented that "the increases were due to the upward trajectory of the health care field in general," and that "the SONs would have experienced larger enrollment cycles even without the demonstration project." Upward enrollment and graduation trends in the non-GNE SONs that were included in the comparison group support this view. However, stakeholders reported unequivocally that without the GNE demonstration payments, sustaining increased enrollment would not be possible in their networks.

The evaluation team estimated the effect of the demonstration project on enrollments and graduations in the CRNA, CNM, CNS, and NP specialty programs. The results show that the demonstration resulted in a statistically significant increase in NP enrollments by an average of 84 students per SON, per year, and an increase in NP graduations by an average of 27 students per SON, per year, relative to the comparison group of non-GNE SONs. Other specialty programs did not experience enrollment and graduation increases of a meaningful magnitude, nor were the increases statistically significant. These findings suggest that the overall impact of the demonstration project was driven primarily by the growth in NP enrollments.

The team also estimated the effect of the demonstration project on enrollments and graduations by degree type and found that the GNE SONs graduated an average of 25 more master's

degree students per SON, per year, relative to the comparison SONs. The demonstration project did not have effects on enrollments by degree type.

Spillover Effects to Non-GNE SONs

The team tested whether the demonstration project had a negative spillover effect on non-GNE SONs that did not receive Medicare funds to provide payments to clinical sites and preceptors. Although the design of the evaluation precluded a qualitative exploration of negative spillover effects to non-GNE SONs, some findings may indicate the mechanism through which spillover effects may occur. For example, preceptors or clinical sites may prioritize students in the GNE SONs because of the precepting payments, which would suggest that students from non-GNE SONs might be accepted less often at those sites. On the other hand, preceptor loyalty to specific SONs may be protective against spillover, if preceptors or clinical sites prioritize students enrolled in SONs with whom they have longstanding relationships.

Given the lack of qualitative data on this topic, the team relied on quantitative analyses for more direct evidence of whether the demonstration project impacted enrollment or graduations at non-GNE SONs located in the same state as the GNE SONs. The team found an average annual reduction in enrollment and graduations in same-state non-GNE SONs of 16 and 6 students per SON, per year, respectively. However, this decrease was not statistically significant. Thus, there is little evidence to suggest unintended consequences of the demonstration project for nearby SONs not participating in the GNE project.

LIMITATIONS OF THE EVALUATION

The evaluation findings should be assessed in the context of several limitations of the demonstration and the evaluation design.

Small, Voluntary Nature of the GNE Demonstration Project

Some design features of the GNE demonstration project placed limitations on estimating the impact of the project and generalizing findings to other SONs. First, only 19 SONs participated in the demonstration project, of the more than 420 SONs that offer master's-level or DNP APRN programs. The analysis of AACN data suggests that GNE SONs had characteristics that differed from those of non-GNE SONs. For example, at baseline, GNE SONs were more likely than non-GNE SONs to have an APRN NP specialty program, had more faculty, and were more likely to have an affiliated health center. These differences were not directly due to the eligibility criteria described in the solicitation, but were likely an indirect consequence of the administrative infrastructure required to meet the terms of participation (e.g., form partnerships, accept and

channel CMS payments). Implementation of the demonstration project across a larger number or a more diverse set SONs might have yielded different results.

Second, CMS gave preference to "hospital applicants who create partnerships and agreements in order to significantly increase the number of APRNs." As such, all participating network partners were affiliated with a large academic institution. It is uncertain whether the findings reported here could be achieved by smaller, non-affiliated SONs.

Finally, CMS distributed CMS payments to participating hospitals, but did not specify the processes through which the payments would be passed through to SONs, clinical education sites, and preceptors. For this reason, the team is unable to say with confidence whether the payment distribution processes were effective or efficient.

Limitations of the Demonstration Evaluation

Lack of Data on Non-GNE SONs

The design of the evaluation limited the team's ability to monitor the context of APRN growth in non-GNE SONs and in spillover SONs. For example, the evaluation team did not conduct site visits, telephone calls, or other qualitative data collection with non-GNE SON leadership, preceptors, hospitals, or clinical sites. The team was therefore not able to assess which specific demonstration project processes or features (e.g., precepting payments, streamlined placement processes, number of affiliated SONs or CCSs) contributed to increased APRN student enrollments and graduations. As a result, the team depended primarily on estimates based on secondary data from AACN to determine the impact of the demonstration project on APRN student growth. A notable strength of the AACN data is that it offers consistent measurement of enrollments and graduations across GNE and non-GNE SONs. However, not all SONs that offer graduate APRN programs complete the annual AACN surveys. For this reason, the pool of non-GNE SONs available for use in constructing a comparison group is not fully representative. Other limitations associated with the secondary data and with the method used to select a comparison group are discussed below.

Inability to Identify Previously Certified APRNs

According to the solicitation for the GNE demonstration project, individuals who had already been licensed to practice as APRNs were not eligible for further training under the project. However, the AACN data do not distinguish between individuals who already have an APRN certification from those who do not. To address this, the team used a proxy estimation of prior APRN certification. Students enrolled in post-master's and DNP programs are more likely to have an APRN certification prior to enrollment than students pursuing a master's degree. The regression results by degree level show that the largest increases in APRN enrollment (and

graduations) were observed among master's-level students. The weighted DID results show that annual APRN enrollment (including all degrees) increased by 87 students with respect to the comparison group, while annual enrollment in master's-level programs increased by 69 students with respect to the comparison group. This means that 80 percent of the estimated increase in APRNs was due to an increase in master's-level enrollment. Similar calculations show that 92 percent of the increase in APRN graduations was due to an increase in master's-level graduations. These findings suggest that including existing APRNs in the analysis did not pose a major threat to the interpretation of the findings.

Imprecise Measurement of Incremental Students

Another limitation of the evaluation is that the demonstration project reimburses networks based on the number of incremental FTE APRN students, whereas the impact evaluation examined the total number of APRN students enrolled regardless of whether they were part-time or full-time students. Ideally, the impact calculations would use the same FTE measure that is used to calculate payments to the networks, but AACN does not include in its annual survey the number of credit hours that students register for, which is needed to calculate the FTE measure. An analysis by full-time and part-time status (not reported here) showed that the majority of the increase in enrollment was due to increases in part-time enrollment. The average increase in APRN enrollment by 87 students per SON was due to an increase of 51 part-time students and 36 full-time students. This suggests that if an FTE measure had been used for the evaluation, the size of the increase in APRN FTE enrollment due to the demonstration project would have been smaller.

Limitations of the Impact Estimation Model

To estimate the impact of the demonstration project, the evaluation team implemented two alternative models, propensity score weighting and entropy weighting, to balance covariates and create weights to form the comparison group. After the construction of the comparison group, the team used a difference-in-differences (DID) model to estimate the causal effect of the demonstration project. There are some potential concerns with this approach. First, the magnitude and statistical significance of the impact estimates were sensitive to the method and covariates used to construct the comparison group. Although each specification showed a positive impact of the demonstration project, the team was not able to pinpoint the exact magnitude of the effect. Second, while DID models control for any time-invariant SON characteristics, they do not control for time-varying unobservable characteristics. Although the methods that were used balance the level and trend of baseline outcomes between the GNE SONs and the non-GNE SONs, the possibility that unobservable characteristics not captured by the observable covariates and past outcomes might bias the estimates cannot be ruled out. Finally, a common concern with any weighting approach is that estimates can be unstable when

very small or very large weights are used. To address this concern, the team confirmed that the models did not produce extreme weights, by re-estimating the impact results after removing the comparison SONs that had relatively high weights.

DISCUSSION AND CONCLUSION

APRNs perform a wide range of primary care activities, including assessing and diagnosing patients, prescribing medications, and managing chronic conditions; therefore, increasing the APRN supply may ease a growing shortage of primary care providers in the United States. The APRN workforce has grown in recent years. Factors such as a greater demand for care, increased demand for nurses, and wider recognition of the role played by APRN providers have contributed to this trend. In 2011, the IOM advocated that NPs be permitted to practice to the full extent of their training, and encouraged states to relax "scope of practice" regulations and grant NPs prescriptive authority.[72] These recommendations promote an expanded role for APRNs in primary care and encourage changes in the education system to enable nurses to more easily obtain advanced education in schools of nursing.[73] State and federal programs incentivizing APRN education also likely play a role in the recent APRN workforce growth.

Despite student interest in APRN education, SONs have faced continued challenges in increasing the number of APRN students. Part of the problem is a shortage of community-based clinical education opportunities and primary care providers willing to serve as preceptors. While CMS provides payments to support clinical education sites and preceptors for medical students, there is no established mechanism for Medicare to support similar payments to APRN preceptors.

The GNE demonstration project aims to promote growth in the APRN workforce by providing financial support to SONs to expand the number of clinical education sites and preceptors. Estimates of the effect of the demonstration project presented in this report provide consistent evidence that the project increased overall APRN student enrollment and graduations, compared to a set of similar non-GNE SONs. The results, however, are sensitive to the methodology used to select the comparison group.

The findings also suggest that the project succeeded in strengthening the ability of the GNE SONs to identify, recruit, and manage opportunities for APRN students to receive clinical

[72] Institute of Medicine. (2011). The Future of Nursing: Leading Change, Advancing Health. Washington, DC: National Academies Press.

[73] Institute of Medicine. (2011). The Future of Nursing: Leading Change, Advancing Health. Washington, DC: National Academies Press.

training in community-based settings. This goal was achieved through the demonstration networks' use of CMS payments to provide administrative support for the centralization and greater coordination of precepted clinical education. A limitation, however, is that the demonstration project was implemented across five networks led by established, academic hospitals. Thus, it is plausible that implementation was more effective than it might be in less established or non-academic networks. Community hospitals and smaller, rural SONs, for example, may not have the administrative infrastructure to support centralized and coordinated clinical education training processes.

The value of providing payments to CCSs or preceptors was less clear. The results suggest that the availability of payments helped to expand clinical precepted education opportunities. At the same time, network administrators said that they found the payments challenging to manage and administer.

Further, the design of the demonstration project precluded payments to reimburse didactic faculty. SON administrators reported that the increased APRN student enrollments placed pressure on classroom-based faculty. According to some SON administrators, this burden was reduced because the project permitted the CMS payments to be used to hire administrative staff, such as placement coordinators, who eased some of the didactic faculty members' day-to-day responsibilities for the clinical placement of students.

The evaluation results to date suggest that the GNE SONs and their APRN students will continue to benefit from the improved partner collaboration and clinical placement processes after the demonstration project ends. However, the networks reported concerns regarding the sustainability of other project efforts. They suggested that the increased student enrollments and the expanded pool of preceptors and clinical sites may be difficult to sustain without the ability to offer precepting payments or compensation for preceptors' time in educating APRN students. External efforts to encourage APRN preceptorship may mitigate this potential outcome.

Conclusion

Five diverse networks that varied in composition and implementation processes implemented the GNE demonstration project. This report has focused on the networks' implementation experiences, trends in clinical precepted education, the project's successes and challenges, and estimates of the impact of the demonstration on APRN student growth as measured by SON enrollment and graduations. The networks reported that the demonstration project facilitated more streamlined clinical education processes and an expanded pool of clinical education sites and preceptors. The results show that, compared to a similar group of non-GNE SONs, APRN student enrollment and graduations increased across the GNE SONs, particularly in NP

programs and at the master's degree level. Nonetheless, network administrators expressed concern about sustaining increased student enrollments after the demonstration project ends, when they will no longer able to reimburse clinical sites and preceptors. Overall, the results of the GNE demonstration project evaluation show that the project has significantly increased APRN student growth and has had positive effects on APRN clinical education.

A final evaluation report that will provide findings for the complete six-year demonstration project experience will be available in the fall of 2019.

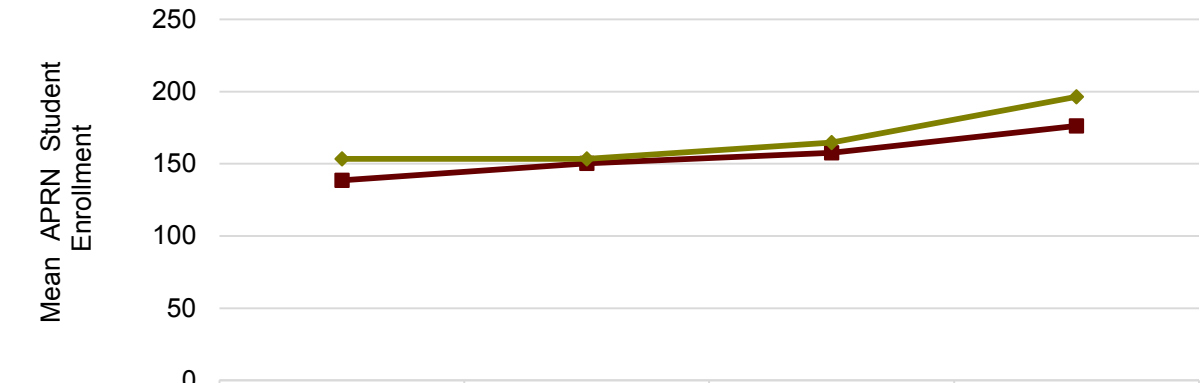
Appendix A. Additional Impact Analyses

This appendix presents supplementary analyses for the impact analysis.

Baseline Trends and Standardized Biases for Comparison Group 1

Exhibits A-1 and A-2 present baseline trends in total APRN enrollment and total APRN graduations, respectively, using comparison group 1. These trends show that the GNE SONs and comparison group 1 have parallel trends during the baseline period for both APRN enrollment and graduations.

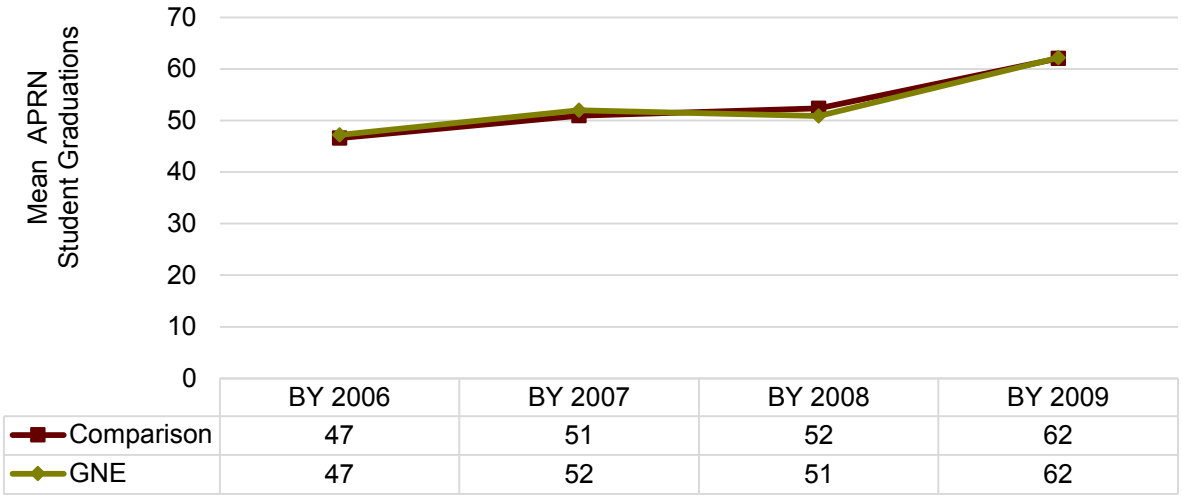
Exhibit A-1. Mean APRN Students Enrolled per SON, GNE SONs vs. PS-Weighted Comparison Group 1



	BY 2006	BY 2007	BY 2008	BY 2009
Comparison	138	150	158	176
GNE	153	153	165	196

Notes: BY = baseline year, DY = demonstration year. Weighted comparison group with propensity score weights.

Exhibit A-2. Mean APRN Student Graduations per SON, GNE SONs vs. PS-Weighted Comparison Group 1



	BY 2006	BY 2007	BY 2008	BY 2009
Comparison	47	51	52	62
GNE	47	52	51	62

Notes: BY = baseline year, DY = demonstration year. Information for APRN graduations is reported with a one-year lag (the AACN 2015 Annual Institutional Survey reports graduation data for AY August 1, 2014 through July 31, 2015). Weighted comparison group with propensity score weights.

Exhibit A-4 displays the standardized difference between the GNE SONs and comparison group 1. Several covariates for comparison group 1 have standardized biases exceeding the 10 percent threshold recommended in the literature. This means that comparison group 1 is different from GNE SONs along some observable characteristics.

Exhibit A-3. Covariate Balance Statistics, Standardized Biases (%)—Comparison Group 1

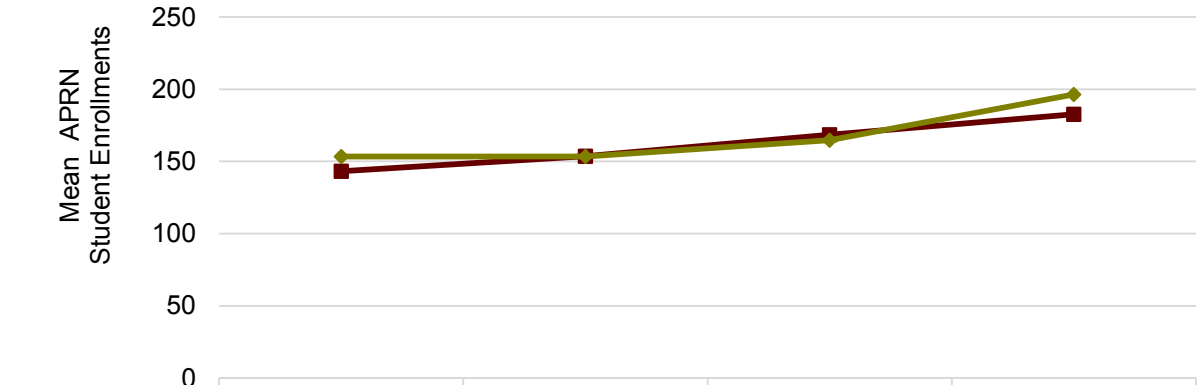
Variable	Propensity Score Weighted Comparison Group (Comparison Group 1)
Indicator for master's NP program	0.000
Indicator for master's CNS program	18.587
Indicator for master's CNM program	10.959
Indicator for master's CRNA program	6.490
Indicator for DNP NP program	-2.159
Indicator for DNP CNS program	7.148

Variable	Propensity Score Weighted Comparison Group (Comparison Group 1)
Indicator for DNP CNM program	16.209
Indicator for DNP CRNA program	5.447
Total number of applications	17.029
Total number of qualified applicants not admitted	10.406
Total APRN graduates in 2008	18.232
SON US News Ranking in 2011	1.472
Total number of faculty	11.550
Indicator for health center	-18.342
Indicator for public institution	4.822
Indicator for affiliated hospital	32.553
Indicator for university/college is located in a city	-7.089
Indicator for university/college is located in a suburb	8.717
Indicator for a SON that belongs to the Midwestern Higher Education compact	8.109
Indicator for a SON that belongs to the Southern Regional Education Board compact	18.246
SON belongs to no regional compact	-23.927
(SON US News Ranking in 2011)^2	2.379
(SON US News Ranking in 2011)^3	1.305
(Total number of faculty) ^2	15.280
(Total number of faculty) ^3	11.074
(Total number of applications)^2	14.836
(Total APRN graduates in 2008)^2	21.508

Note: Demonstration group has 19 SONs; comparison group 1 has 178 SONs.

Exhibit A-4 and Exhibit A-5 present trends in total APRN enrollment and total APRN graduations, respectively, using comparison group 3. These trends show that the GNE SONs and comparison group 3 have parallel trends during baseline for both APRN enrollment and graduations.

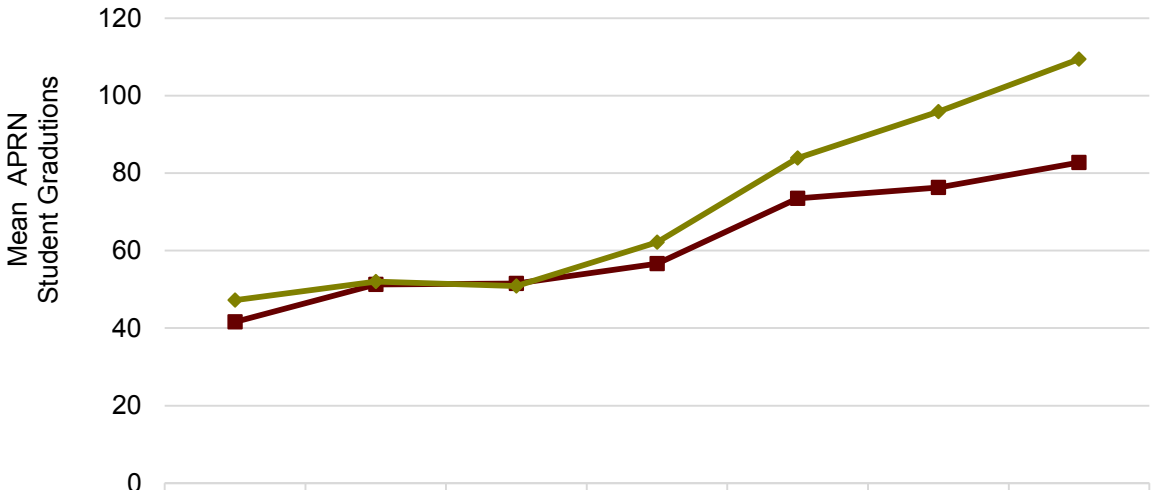
Exhibit A-4. Mean APRN Students Enrolled per SON, GNE SONs vs. Entropy Weighted Comparison Group 3, No Cubic Terms



	BY 2006	BY 2007	BY 2008	BY 2009
Comparison	143	154	168	183
GNE	153	153	165	196

Notes: BY = baseline year, DY = demonstration year. Baseline comparison group: weighted comparison group with weights found using entropy balancing on means, quadratic terms.

Exhibit A-5. Mean APRN Student Graduations per SON, GNE SONs vs. Entropy Weighted Comparison Group 3, No Cubic Terms



	BY 2006	BY 2007	BY 2008	BY 2009	DY 2012	DY 2013	DY 2014
Comparison	42	51	52	57	73	76	83
GNE	47	52	51	62	84	96	109

Notes: BY = baseline year, DY = demonstration year. Information for APRN graduations is reported with a one-year lag (the AACN 2015 Annual Institutional Survey reports graduation data for AY August 1, 2014 through July 31, 2015). Baseline comparison group: weighted comparison group with weights found using entropy balancing on means, quadratic terms.

Exhibit A-6 displays the standardized difference between the GNE SONs and comparison group 3. Comparison group 3, like comparison group 2 described in the main body of the report, has observable characteristics very similar to the GNE SONs, as reflected by standardized biases very close to zero.

Exhibit A-6. Covariate Balance Statistics, Standardized Biases (%)—Comparison Group 3

Variable	Entropy Weighted Comparison Group[a] (Comparison Group 3)
Indicator for master's NP program	0.000
Indicator for master's CNS program	-0.090
Indicator for master's CNM program	0.017
Indicator for master's CRNA program	0.018
Indicator for DNP NP program	0.060

Variable	Entropy Weighted Comparison Group[a] (Comparison Group 3)
Indicator for DNP CNS program	-0.054
Indicator for DNP CNM program	-0.065
Indicator for DNP CRNA program	0.029
Total number of applications	0.022
Total number of qualified applicants not admitted	0.006
Total APRN graduates in 2008	-0.014
SON US News Ranking in 2011	0.071
Total number of faculty	-0.016
Indicator for health center	0.098
Indicator for public institution	-0.020
Indicator for affiliated hospital	-0.097
Indicator for university/college is located in a city	0.060
Indicator for university/college is located in a suburb	0.052
Indicator for a SON that belongs to the Midwestern Higher Education compact	0.014
Indicator for a SON that belongs to the Southern Regional Education Board compact	0.039
SON belongs to no regional compact	0.118
(SON US News Ranking in 2011)^2	0.062
(SON US News Ranking in 2011)^3	
(Total number of faculty) ^2	0.000
(Total number of faculty) ^3	
(Total number of applications)^2	0.020
(Total APRN graduates in 2008)^2	0.014

Note: Demonstration group has 19 SONs; comparison group 3 has 218 SONs.
[a] Weights estimated including quadratic terms.

Baseline APRN Enrollment and Graduations in GNE and non-GNE Comparison SONs

Mean enrollments and graduations, by specialty and degree types, for GNE SONS and for comparison group 2 during the baseline period are shown in ***Exhibit A-7***. The table also shows the mean differences between these two groups to indicate how similar these groups were at baseline and to put into context the magnitude of the resulting impact estimates in context.

The first row shows that mean annual APRN enrollment in the GNE group was 167 students, which is slightly more than the 160 APRN students in the comparison group. The majority of students in both groups were enrolled in the NP specialty in a master's degree program. Total APRN graduations were also slightly higher in the GNE group than in the comparison group. Consistent with what was observed in APRN enrollments, the majority of students graduated with a master's degree in an NP specialty. However, none of the differences in means were statistically significant at the 10 percent level.

Exhibit A-7. Mean APRN Enrollment and APRN Graduations, GNE vs. Comparison SONs, Baseline Period

Outcome	GNE SONs	Entropy Weighted Comparison Group (Comparison Group 2)	Difference
Total APRN Enrollment	166.560	160.157	6.403
Enrollment by Specialty			
CRNA (master's and DNP)	26.467	25.155	1.311
CNM (master's and DNP)	2.080	0.767	1.313
CNS (master's, post-master's, and DNP)	9.933	10.975	-1.042
NP (master's, post-master's, and DNP)	128.08	123.26	4.820
Enrollment by Degree			
Master's	157.493	155.192	2.301
Post-master's	1.227	0.869	0.358
DNP	7.840	4.096	3.744
Total APRN Graduations	52.973	50.757	2.216

Outcome	GNE SONs	Entropy Weighted Comparison Group (Comparison Group 2)	Difference
Graduations by Specialty			
CRNA (master's and DNP)	9.541	8.994	0.547
CNM (master's and DNP)	0.730	0.479	0.250
CNS (master's, post-master's, and DNP)	2.554	3.009	-0.455
NP (master's, post-master's, and DNP)	40.149	38.275	1.874
Graduations by Degree			
Master's	47.757	47.069	0.688
Post-master's	4.351	2.972	1.379
DNP	0.865	0.716	0.149

Notes: Comparison group observations are weighted using entropy balancing weights, using the preferred specification balanced on quadratic and cubic terms.
Baseline period: BY 2006–2009.
The total number of observations is equal to the number of SONs that provided information each year multiplied by the number of years.
Means were calculated for 19 GNE SONs and 218 weighted comparison SONs.

Impact Analysis Supporting Tables

Exhibit A-8 and Exhibit A-9 display the estimates of the effect of the demonstration project on total APRN enrollment by specialty and degree, respectively, including the coefficient estimates of every covariate included in the model.

Exhibit A-8. Weighted Difference-in-Differences Results
Outcomes: Total APRN Enrollment and Enrollment by Specialty (CRNA, CNM, CNS, and NP)

	Total APRN Enrollment	Enrollment by Specialty			
		CRNA	CNM	CNS	NP
GNE*Post	87.077*** (32.880)	2.615 (3.164)	0.250 (0.226)	0.465 (3.506)	83.748** (33.069)
Control Variables					
Indicator variable for GNE SONs	6.566	1.774	1.447	-1.201	4.546

	Total APRN Enrollment	Enrollment by Specialty			
		CRNA	CNM	CNS	NP
	(19.014)	(10.812)	(1.999)	(3.782)	(16.688)
Indicator variable for year 2007	5.629 (5.638)	2.089 (2.483)	0.219 (0.273)	-2.192 (1.395)	5.513 (4.501)
Indicator variable for year 2008	16.081*** (5.052)	0.987 (2.272)	0.127 (0.211)	-2.704** (1.308)	17.670*** (4.237)
Indicator variable for year 2009	31.052*** (8.040)	3.191 (3.735)	0.180 (0.218)	-1.929 (1.436)	29.610*** (7.266)
Indicator variable for year 2012	37.617** (16.895)	4.796* (2.900)	-0.006 (0.276)	-1.859 (3.466)	34.686** (16.050)
Indicator variable for year 2013	-105.002* (56.524)	49.329** (23.543)	3.572 (3.983)	7.207 (6.035)	-165.110** (74.011)
Indicator variable for year 2014	-82.220 (58.352)	49.918** (23.586)	3.760 (4.259)	6.019 (5.825)	-141.916* (76.077)
Indicator variable for year 2015	-55.138 (59.785)	51.904** (23.682)	4.155 (4.249)	5.776 (5.931)	-116.973 (77.183)
Total number of faculty	3.857*** (0.713)	0.377 (0.283)	0.117 (0.111)	-0.006 (0.094)	3.369*** (0.840)
Indicator for health center	29.522 (43.629)	-14.104 (20.684)	1.387 (3.329)	2.681 (6.305)	39.558 (44.655)
SON ranking	0.544*** (0.176)	-0.030 (0.072)	0.002 (0.010)	0.013 (0.023)	0.558*** (0.167)
Indicator for affiliated hospital	-20.723 (49.583)	-8.115 (17.780)	-1.635 (5.413)	7.313 (6.324)	-18.285 (40.645)
Indicator if the university/college is located in a city	125.463*** (30.011)	13.642 (16.863)	-0.560 (1.899)	5.774 (5.782)	106.607*** (33.661)

	Total APRN Enrollment	Enrollment by Specialty			
		CRNA	CNM	CNS	NP
Indicator for Midwestern Higher Education Compact	59.400	-3.801	-6.910	33.389***	36.722
	(51.819)	(19.139)	(4.748)	(7.671)	(45.182)
Indicator for Southern Regional Education Board compact	74.172**	0.153	-3.603	3.607	74.016***
	(30.152)	(15.304)	(2.998)	(3.934)	(25.883)
Indicator for Western Interstate Commission for Higher Education compact	-12.276	-4.094	-2.482	-4.000	-1.701
	(26.925)	(19.667)	(2.133)	(5.248)	(37.118)
Indicator for public institution	-112.119***	-23.826*	-2.362	0.558	-86.489***
	(22.517)	(12.530)	(1.929)	(3.345)	(19.547)
Participation in a HRSA program that might increase the number of APRNs	164.392***	-47.656**	-3.635	-12.731*	228.414***
	(55.719)	(23.637)	(3.959)	(6.532)	(72.659)
Number of observations	1,848	1,848	1,848	1,848	1,848

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms. Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = AY 2006/2007–AY 2009/2010, demonstration (or post) period = AY 2012/2013–AY 2015/2016.

Exhibit A-9. Weighted Difference-in-Differences Results
Outcomes: Master's, Post-Master's, and DNP Enrollment

	APRN Enrollment by Degree		
	Master's	Post-Master's	DNP
GNE*Post	68.670 (43.437)	2.857 (3.149)	15.550 (27.552)
Control Variables			
Indicator variable for GNE SONs	1.854 (21.698)	0.432 (0.905)	4.281 (9.306)
Indicator variable for year 2007	1.897 (6.311)	-0.236 (0.400)	3.969* (2.022)
Indicator variable for year 2008	7.771 (6.470)	0.020 (0.667)	8.289*** (3.087)
Indicator variable for year 2009	17.629** (8.749)	0.139 (0.522)	13.284*** (4.719)
Indicator variable for year 2012	6.323 (25.192)	5.104 (4.825)	26.190* (14.195)
Indicator variable for year 2013	-158.417** (61.444)	7.618 (6.840)	45.797* (24.886)
Indicator variable for year 2014	-149.128** (64.371)	8.175 (6.794)	58.734** (25.880)
Total number of faculty	4.119*** (0.662)	-0.005 (0.022)	-0.257 (0.340)
Indicator for health center	8.476 (48.376)	-2.300 (2.888)	23.345 (26.913)
SON ranking	0.653*** (0.155)	-0.023 (0.021)	-0.087 (0.072)
Indicator for affiliated hospital	3.566	0.123	-24.412

	APRN Enrollment by Degree		
	Master's	Post-Master's	DNP
	(46.131)	(1.127)	(22.698)
Indicator if the university/college is located in a city	152.409***	-5.050	-21.895
	(34.883)	(3.632)	(14.640)
Indicator for Midwestern Higher Education Compact	-13.129	0.159	72.371
	(30.212)	(2.309)	(48.152)
Indicator for Southern Regional Education Board compact	66.441**	-0.825	8.557
	(29.611)	(1.558)	(16.357)
Indicator for Western Interstate Commission for Higher Education compact	-60.098*	-0.295	48.117**
	(31.334)	(1.979)	(19.043)
Indicator for public institution	-121.800***	-0.466	10.147
	(21.633)	(1.030)	(15.733)
Participation in a HRSA program that might increase the number of APRNs	183.261***	-9.747	-9.123
	(58.432)	(8.263)	(20.169)
Number of observations	1,848	1,848	1,848

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms. Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = AY 2006/2007–AY 2009/2010, demonstration (or post) period = AY 2012/2013–AY 2015/2016.

Exhibit A-10 and Exhibit A-11 present the estimates of the effect of the demonstration project on total APRN graduations by specialty and degree, respectively, including the coefficient estimates of every covariate included in the model.

Exhibit A-10. Weighted Difference-in-Differences Results
Outcomes: Total APRN Graduations and APRN Graduations by Specialty (CRNA, CNM, CNS, and NP)

	Total APRN Graduations	Graduations by Specialty			
		CRNA	CNM	CNS	NP
GNE*Post	27.600**	0.503	0.030	0.140	26.927**
	(12.483)	(1.716)	(0.155)	(1.058)	(11.851)
Control Variables					
Indicator variable for GNE SONs	1.334	0.486	0.256	-0.501	1.093
	(7.960)	(3.841)	(0.772)	(1.262)	(6.055)
Indicator variable for year 2007	6.481*	-1.427	0.085	-0.654	8.477***
	(3.719)	(1.107)	(0.329)	(0.538)	(3.195)
Indicator variable for year 2008	5.255*	-0.214	0.079	-0.100	5.491**
	(2.942)	(0.667)	(0.174)	(0.553)	(2.610)
Indicator variable for year 2009	12.556***	0.508	0.090	-0.602	12.560***
	(3.366)	(0.737)	(0.167)	(0.809)	(2.892)
Indicator variable for year 2012	13.501	-0.592	0.239	-1.267*	15.121*
	(8.952)	(1.233)	(0.234)	(0.763)	(8.712)
Total number of faculty	1.214***	0.130	0.029	0.033	1.023***
	(0.336)	(0.088)	(0.043)	(0.039)	(0.280)
Indicator for health center	2.296	-0.275	1.574	2.249	-1.252
	(16.180)	(6.769)	(1.978)	(1.986)	(13.875)
SON ranking	0.113**	-0.002	-0.002	0.008	0.109**
	(0.053)	(0.022)	(0.005)	(0.006)	(0.047)
Indicator for affiliated hospital	-21.521	-2.280	0.978	2.000	-22.220
	(23.220)	(6.775)	(2.828)	(2.266)	(17.698)
Indicator if the university/college is located in a city	29.562***	3.193	0.136	0.864	25.369***
	(8.574)	(4.111)	(0.872)	(1.493)	(8.881)

	Total APRN Graduations	Graduations by Specialty			
		CRNA	CNM	CNS	NP
Indicator for Midwestern Higher Education Compact	12.391	-0.900	-2.907	8.274**	7.924
	(14.101)	(6.781)	(1.821)	(3.919)	(11.549)
Indicator for Southern Regional Education Board compact	26.741**	2.094	-1.268	1.056	24.859***
	(12.687)	(5.298)	(1.102)	(1.365)	(9.330)
Indicator for Western Interstate Commission for Higher Education compact	-6.662	0.034	-1.335	-0.820	-4.541
	(9.084)	(5.581)	(1.037)	(1.538)	(9.803)
Indicator for public institution	-36.491***	-8.309**	-0.992	0.237	-27.427***
	(8.519)	(4.132)	(0.767)	(1.158)	(6.531)
Participation in a HRSA program that might increase the number of APRNs	55.550***	-13.053*	-1.131	-2.335	72.068***
	(15.204)	(6.741)	(1.515)	(1.882)	(16.178)
Number of observations	1,625	1,625	1,625	1,625	1,625

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.
Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = AY 2006/2007–AY 2009/2010, demonstration (or post) period = AY 2012/2013– AY 2015/2016. At the time of this report, no graduation data were available for AY 2015/16.

Exhibit A-11. Weighted Difference-in-Differences Results
Outcomes: Master's, Post-Master's, and DNP Graduations

	APRN Graduations by Degree		
	Master's	Post-Master's	DNP
GNE*Post	25.330* (12.950)	0.676 (1.688)	1.595 (3.921)
Control Variables			
Indicator variable for GNE SONs	-0.130 (7.481)	1.388 (0.919)	0.076 (1.050)
Indicator variable for year 2007	3.443 (3.550)	2.938*** (0.949)	0.100 (0.064)
Indicator variable for year 2008	1.878 (3.145)	2.216*** (0.697)	1.161 (0.827)
Indicator variable for year 2009	8.117*** (3.060)	3.730*** (0.668)	0.709 (0.464)
Indicator variable for year 2012	5.449 (8.581)	3.852* (2.219)	4.200** (1.767)
Indicator variable for year 2013	-52.462*** (16.940)	5.950*** (2.268)	12.074** (5.563)
Indicator variable for year 2014	-49.567*** (17.360)	8.513*** (2.329)	15.148** (6.068)
Total number of faculty	1.175*** (0.326)	0.054** (0.022)	-0.015 (0.052)
Indicator for health center	-0.092 (15.461)	1.165 (1.238)	1.223 (3.195)
SON ranking	0.124*** (0.048)	0.003 (0.004)	-0.014 (0.012)
Indicator for affiliated	-15.304	-3.890***	-2.328

	APRN Graduations by Degree		
	Master's	Post-Master's	DNP
hospital	(21.516)	(1.288)	(2.372)
Indicator if the university/college is located in a city	32.705*** (8.366)	-1.721 (1.135)	-1.421 (1.582)
Indicator for Midwestern Higher Education Compact	7.667 (13.939)	6.811*** (1.913)	-2.086 (2.539)
Indicator for Southern Regional Education Board compact	22.492* (11.451)	2.392** (1.111)	1.857 (3.343)
Indicator for Western Interstate Commission for Higher Education compact	-13.168 (8.751)	2.932*** (1.035)	3.574 (2.235)
Indicator for public institution	-35.261*** (7.626)	-2.794*** (0.818)	1.564 (2.907)
Participation in a HRSA program that might increase the number of APRNs	64.812*** (16.266)	-2.999 (1.955)	-6.263 (4.975)
Number of observations	1,625	1,625	1,625

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.
Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = AY 2006/2007–AY 2009/2010, demonstration (or post) period = AY 2012/2013–AY 2015/16. At the time of this report, no graduation data were available for AY 2015/2016.

Exhibit A-12 displays the estimates of the effect of the demonstration project separately for each year on total APRN enrollment and total APRN graduations, including the estimates of all covariates used in the model.

Exhibit A-12. Weighted Difference-in-Differences Results Using GNE-Year Interactions Outcomes: APRN Enrollment and APRN Graduations

	APRN Enrollment	APRN Graduations
GNE*2007	-11.667 (11.145)	-3.423 (7.479)
GNE*2008	-9.763 (9.794)	-8.393 (5.782)
GNE*2009	7.271 (16.237)	-0.594 (6.792)
GNE*2012	65.262** (26.200)	12.498 (13.202)
GNE*2013	65.745** (32.400)	27.517** (13.873)
GNE*2014	86.366** (40.176)	33.443** (15.941)
GNE*2015	116.712** (50.236)	----
Control variables		
GNE==1	10.222 (21.125)	4.419 (9.853)
Year = 2007	11.562 (9.785)	8.213 (5.752)
Year = 2008	21.026*** (5.284)	9.430*** (3.382)

	APRN Enrollment	APRN Graduations
Year = 2009	27.571** (12.499)	12.908*** (4.012)
Year = 2012	48.355*** (16.370)	20.923** (9.599)
Year = 2013	-104.120* (56.490)	-40.832** (16.762)
Year = 2014	-91.688 (57.112)	-35.151** (16.549)
Year = 2015	-79.380 (58.644)	----
Total number of faculty	3.852*** (0.712)	1.211*** (0.337)
Associated Health Center	29.808 (43.603)	2.502 (16.211)
SON ranking	0.543*** (0.177)	0.113** (0.053)
Indicator for affiliated hospital	-20.735 (49.617)	-21.530 (23.251)
Indicator if the university/college is located in a city	125.051*** (29.875)	29.406*** (8.537)
Indicator for Midwestern Higher Education Compact	59.476 (51.778)	12.467 (14.125)
Indicator for Southern Regional Education Board compact	74.047** (30.177)	26.718** (12.710)
Indicator for Western Interstate Commission for Higher Education compact	-12.056 (26.835)	-6.486 (9.057)

	APRN Enrollment	APRN Graduations
Indicator for public institution	-112.240*** (22.516)	-36.548*** (8.529)
Participation in a HRSA program that might increase the number of APRNs	174.269*** (52.732)	62.000*** (14.833)
Number of observations	1,848	1,848

Notes: Weighted comparison group with weights found using entropy balancing on means, quadratic, and cubic terms.
Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = AY 2006/2007–AY 2009/2010, demonstration (or post) period = AY 2012/2013–AY 2015/16.
DID coefficient estimates should be interpreted with respect to the omitted category, GNE*2006.

Exhibit A-13 displays the annual spillover effects on total APRN enrollment and total APRN graduations.

Exhibit A-13. Weighted Difference-in-Differences Results using Spillover-Year Interactions
Outcomes: APRN Enrollment and APRN Graduations

	APRN Enrollment	APRN Graduations
Spillover*2007	39.018 (30.033)	-6.111 (16.220)
Spillover *2008	15.397 (10.985)	6.258 (5.815)
Spillover *2009	60.450* (35.450)	7.741 (6.737)
Spillover *2012	58.566 (41.986)	-1.023 (19.429)
Spillover *2013	7.896 (29.604)	-5.308 (21.898)
Spillover *2014	-3.304 (31.425)	-5.011 (22.193)
Spillover *2015	-9.599 (33.079)	---
Number of observations	1,786	1,572
F-statistic for joint baseline trend test	1.29	0.94
P-value for joint baseline trend test	0.279	0.423

Notes: Comparison group is weighted to be balanced with the spillover group, with weights found using entropy balancing.
Standard errors, clustered at the SON level, are in parentheses.
*** indicates statistically significant at the 1% level; ** 5% level; * 10% level.
Baseline period = AY 2006/2007–AY 2009/2010, demonstration (or post) period = AY 2012/2013–AY 2015/16.
DID coefficient estimates should be interpreted with respect to the omitted category, Spillover*2006.