Measuring the Success of a Pipeline Program to Increase Nursing Workforce Diversity

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The purpose of this study was to understand changes in knowledge and opinions of underserved American Indian and Hispanic high school students after attending a 2-week summer pipeline program using and testing a pre/postsurvey. The research aims were to (a) psychometrically analyze the survey to determine if scale items could be summed to create a total scale score or subscale scores; (b) assess change in scores pre/postprogram; and (c) examine the survey to make suggestions for modifications and further testing to develop a valid tool to measure changes in student perceptions about going to college and nursing as a result of pipeline programs. Psychometric analysis indicated poor model fit for a 1-factor model for the total scale and majority of subscales. Nonparametric tests indicated statistically significant increases in 13 items and decreases in 2 items. Therefore, while total scores or subscale scores cannot be used to assess changes in perceptions from pre- to postprogram, the survey can be used to examine changes over time in each item. Student did not have an accurate view of nursing and college and underestimated support needed to attend college. However students realized that nursing was a profession with autonomy, respect, and honor. (Index words: Measurement; Surveys; Workforce diversity; Pipeline programs; Nursing American Indian; Hispanic; Psychometric testing) J Prof Nurs 32:6–14, 2016. © 2016 Elsevier Inc. All rights reserved.

THE PIPELINE REFERS to programs at all levels of education intended to target, enroll, and support graduation of certain students, usually underrepresented students including minority, low income, and women, with the goal of increasing their representation in certain fields. For instance, in the health sciences, the goal of pipeline programs is to increase college graduation and career attainment in professional or research degrees of minority and underserved or underrepresented students. Pipeline strategies often address awareness and knowledge of professions and science and income through financial aid and connect students to mentors and others who can help with academics (Katz, 2007; Katz, Smart, & Paul, 2010). In a survey of federal K-12 pipeline programs, outreach (52%) was the most frequently employed strategy, followed by mentoring (32%), academic

enrichment, (27%), and scholarships (16%) (Danek & Borrayo, 2012). Among strategies for students attending college, prematriculation and postbaccalaureate programs were considered by schools as most successful in increasing underrepresented students in public health, medicine, dentistry, and in nursing. In nursing, success in increasing baccalaureate of science in nursing (BSN)-prepared graduates has been seen in programs that offered community college students a seamless bridge to a BSN program.

Pipeline programs can be successful in recruiting and graduating underserved and underrepresented minority and disadvantaged students in the health sciences (Danek & Borrayo, 2012; Johnson & Bozeman, 2012; Toney, 2012). Data concerning pipeline success come primarily from schools tracking changes in student demographics rather than from data about specific pipeline strategies. Universities attribute their successes to pipeline program strategies, stating that such strategies are more helpful than others, for example, one-time outreach and recruitment, short-term programs (Danek & Borrayo, 2012). Yet, because of a wide variety of strategies used within pipeline programs to increase underrepresent students in the health sciences, including science, technology,

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engineering, and math (STEM) programs, it is difficult to measure the effectiveness of any one (National Academy of Sciences, 2014). This study looked at one strategy in a pipeline program, a summer enrichment residency program, to determine effectiveness of changing high school participant's perceptions and knowledge of going to college and of nursing.

Pipeline programs can benefit students who may not have accurate perceptions or knowledge about nursing and other health careers. For instance, a common component of pipeline programs is job shadowing. Job shadowing can change high school students' views of nursing to become more accurate and thus more favorable (Katz & ONeal, 2011; Porter, Edwards, & Granger, 2009). Another similar intervention used in pipeline programs is simulation to replicate job-shadowing experiences. In a study of 30 high school students in the U.K., students reported much higher understanding of nursing and a greater interest in the profession after attending a simulation program (Rush, Shepard, Firth, & Marks-Maran, 2013). An example of a successful pipeline program is Baylor Dental School. They have increased the number of minority students more than any other nonminority school in the United States (Lacey, McCann, Miller, Solomon, & Reuben, 2012). The dentistry program attributes its success to four strategies: (a) increasing student awareness and interest in dental careers in high school; (b) providing academic classes; (c) preparing students for admissions; and (d) supporting students to graduate. Precollegiate factors were also seen as critical in health career choice and achievement in a study using statistical modeling (Hinton, Howell, Merwin, et al., 2009).

Other important influences in increasing minority students in health careers are reported by the National Institutes of Health Research Initiative for Science Excellence who advocate providing prelicensure students with financial and mentoring experiences (Schultz, Hernandez, Woodcock, et al., 2012), strategies supported in many studies of pipeline programs (Katz & ONeal, 2011). In addition, minority students may have needs that differ significantly from majority students. For instance, young African American students indicated "personal influences," "career opportunity," and "self-efficacy" as much stronger influences on enrollment compared to Caucasian students (Barfield, Cobler, Lam, Zhang, & Chitiyo, 2012). The influence of self-efficacy was also deemed important at two summer pipeline programs provided by the Pennsylvania State University. Among the 62 pipeline students studied, self-efficacy scores, interest, and intent to attend college increased significantly after attending the pipeline program (Baber, Pifer, Colbeck, & Furman, 2010).

Pipeline programs specifically offered to American Indian and Alaska Natives (AIAN) students include the University of Alaska Anchorage School of Nursing's Project Recruitment and Retention of Alaska Natives into Nursing. In the 7 years they reported, 66 AIAN students enrolled in the associate's degree or bachelor's degree in nursing programs. The Recruitment and Retention of Alaska Natives into Nursing project focused on creating community partnerships and faculty student connections with high school, prenursing, and associate and bachelor's degree students (DeLapp, & Hautman, 2008). Another AIAN program is the Na-ha-shnee Summer Institute at Washington State University. This program employs a 2-week residency program with intensive classes for high students on math, chemistry, and English and cultural classes, job shadowing, mentorship, and hands-on laboratories' experiences (Katz, Smart, & Paul, 2010). To date, the program has seen over 100 students enrolled in health science career programs.

Another avenue to minority student recruitment is STEM education programs. STEM recruits students into science careers by utilizing familiar pipeline strategies, for example, job shadowing, improving self-efficacy through work and laboratory experiences, role modeling, and mentoring. STEM pipelines have been studied in part for their failures or what some termed *a leaky pipeline*, in specific reference to the failure to increase women scientists at universities (Pell, 1996). The National Academy of Science also applied the leaky pipeline term to efforts to recruit minority students into research careers (Committee for the Assessment of NIH Minority Research Training Programs, 2005). However, National Academy of Science described the leaky pipeline as not necessarily an indication of failure but an expected consequence of people leaving to fulfill other commitments possibly returning later to graduate or obtain graduate degrees. The leaky pipeline analogy has been extended to include community-based participatory research. In a strengths-based approach, students leaving the pipeline to return to their communities could become liaisons to improve community campus partnerships (James, Starks, Segrest, & Burke, 2012). This concept was especially relevant for AIAN communities where distrust of universities may inhibit partnerships making a strength-based focus critical to success. As such, AIAN students leaving the pipeline are not seen as failures but critical to partnerships.

A 2010 survey of tools to measure nursing pipeline programs analyzed 22 studies and found that 80% of participants were non-Hispanic White students (Matutina, Newman, & Jenkins, 2010). Only one used a theoretical framework, and 30% reported no statistical reliability strategies. The survey reported here stood out among the others for its sample of primarily American Indian participants and for including males. The work by Matutina, Newman, and Jenkins in part provides rationale for the current study, and importantly, it calls for sound tools to measure the results of pipeline programs. In addition, the need for intervention studies along with in-depth reporting of strategies and challenges is needed (Condon et al., 2013; Loftin, Newman, Gilden, Bond, & Dumas, 2013).

The need for a diverse health workforce has not diminished in the decades educators, providers, and communities have been working to educate and graduate health care students that represent the U.S.