

Development and Validation of the Cultural Competence Assessment Instrument: A Factorial Analysis

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Resumen

The purpose of this study was to develop and validate an instrument to measure cultural competence among rehabilitation practitioners. The authors developed an instrument to measure perceived levels of cultural competence based on an extensive literature review, feedback from experts, and a synthesis of prevalent instruments and conceptual models of cultural competence available in the literature. The validation study was conducted with a random sample of 477 practitioners. Both exploratory and confirmatory factor analysis yielded a three-factor model with the following components: cultural awareness/knowledge, cultural skills, and organizational support. The third factor is seldom addressed in the literature- the role of the organization in supporting practitioners' efforts to engage in culturally appropriate practices. We discuss the research and practice implications of using a validated instrument to assess cultural competence among rehabilitation professionals.

Texto

The United States is becoming increasingly diverse. Recent data indicates that in 2007 the total non-European White population registered at 34% and that people of color have become numerical majorities in some of the largest U.S. cities (Minckler, 2008). As the ethnically diverse population in the US increases, so does the number of people with chronic health conditions and disability (Balcazar, Suarez-Balcazar, Taylor-Ritzier, & 2010; Fiscella, Franks, Gold, & 2000; Stone, 2004). Given



these trends, rehabilitation professionals are more likely than ever to encounter individuals with disabilities from diverse ethnic backgrounds in their practice and/or research endeavors and may not necessarily feel prepared to address their needs (Balcazar, Suarez-Balcazar & Taylor-Ritzier, 2009; Leung, Flowers, Talley, & Sanderson, 2007; Suarez-Balcazar & Rodakowski, 2007).

Cultural competence has emerged as essential in understanding and effectively serving people with disabilities from diverse backgrounds (Balcazar, Suarez-Balcazar, Willis, & Alvarado, 2010). In fact, the construct of cultural competence has received much attention in several fields, including rehabilitation (Balcazar, et al., 2009; Balcazar, Suarez-Balcazar, Willis, 2010; Lewis & Shamburger, 2010; Martellano & Stone, 2010; Moffat & Tung, 2004; Olney & Kennedy, 2002; Wilson, 2002); counseling (Dunn, Smith, & Montoya, 2006; Sodowsky, 1996; Sue, Arredondo, & McDavis, 1992); health care and nursing (Campinha-Bacote, 2001; Leninger, 2000; Purnell & Paulanka, 2008); and other health professions such as occupational therapy (Black & Wells, 2007; Bonder, Martin, & Miracle, 2004; Suarez-Balcazar & Rodakowski, 2007; Suarez-Balcazar et al, 2009).

Despite the attention that cultural competence has received within these bodies of literature, researchers and practitioners have highlighted the lack of a unified definition of cultural competence. Many of the available definitions propose something slightly different and some definitions omit that becoming culturally competent is a process that takes time and effort (Balcazar, Suarez-Balcazar, Willis, et al. 2010). One of the most commonly accepted definitions of cultural competence in the healthcare field was developed in the nursing profession by Campinha-Bacote (1999). According to the author, cultural competence is demonstrated when the practitioner understands and appreciates differences in health beliefs and behaviors, recognizes and respects variations that occur within cultural groups, and is able to adjust his/her practice to provide effective interventions for people from various ethnic groups (Campinha-Bacote, 1999). In the field of rehabilitation counseling, the new code of professional ethics emphasizes the capacity of counselors to work with diverse groups of individuals while embracing a cultural approach that supports the worth, dignity, potential, and uniqueness of individuals with disabilities within their social and cultural context (Commission on Rehabilitation Counselor Certification, 2008).

Regarding the process of becoming culturally competent, Suarez-Balcazar and Rodakowski (2007) concluded that "becoming culturally competent is an on-going contextual, developmental, and experiential process of personal growth that results in professional understanding and improved ability to adequately serve individuals who look, think, and behave differently from us" (p. 15). Balcazar, Suarez-Balcazar, Taylor-Ritzier, et al., (2010) added that the process of becoming culturally competent can take place through repetitive engagements with diverse groups, by increasing one's critical awareness and knowledge, and by having opportunities for reflection and analysis of professional performance. Professionals are often challenged by the growing number of encounters with immigrants from all areas of the world, whom may require language and cultural adaptations in order to receive services.

Another challenge in the current cultural competence literature is the measurement of cultural competence. Although there are several validated measures and assessment instruments that are available to measure cultural competence (see reviews by Dunn et al., 2006; Ponterotto, Rieger, Barrett, & Sparks, 1994), none have been validated with rehabilitation professionals. Our review of the literature on culturalcompetence-assessment instruments yielded 1 3 scales, nine of which included psychometric properties and were validated - 3 with samples of practitioners, 3 with mixed samples of practitioners and students, and 3 with student populations only. Examples of such scales include Campinha-Bacote 's (1999), who validated her scale with licensed nurses and nursing students and measured four factors: cultural awareness, cultural knowledge, cultural skills, and cultural encounters. Another scale often used in the counseling and rehabilitation psychology literature is the Multicultural Awareness, Knowledge, and Skills Survey, developed by Kim, Cartwright, Asay, & D'Andrea (2003), which measures three components: cultural awareness, knowledge, and skills. A third scale that is often used to measure cultural competence in the context of psychological counseling is the Multicultural Counseling Inventory developed by Sodowsky (1996), designed to measure multicultural counseling skills, awareness, multicultural relationships and knowledge. Dunn et al., (2006) conducted an extensive analysis of the cultural competence scales and concluded that the most commonly used scales present some psychometric problems that have not been resolved, such as lack of psychometric analysis of the instruments, including adequate attention to goodness of fit and a need for more refined analysis of the concept of cultural competence. As indicated by Arredondo and Toporek (2004), the provision of culturally competent counseling and rehabilitation services requires refinement and development of the concept of cultural competence; a process that relies on the quality of the instruments available to use.

Understanding cultural competence among disability providers has been lacking. Strike, Skovholt, and Hummel (2004) reported the development of a survey of disability competence among health professionals. Although their survey was not intended to measure cultural competence, like previous measures of cultural competence, their survey yielded three key factors of multicultural disability competence: self-awareness, perceived knowledge, and perceived skills.

In sum, a measure of cultural competence among rehabilitation service providers that utilizes a validated scale with sound psychometric properties is lacking. This study describes the validation of the Cultural Competence Assessment Instrument from the University of Illinois at Chicago (CCAI-UIC), an instrument designed to measure cultural competence among rehabilitation practitioners who work with people with disabilities from diverse ethnic backgrounds.

Method

Development of the Cultural Competence Assessment Instrument (CCAI-UIC)

The development of the Cultural Competence Assessment Instrument-UIC involved a



systematic process of analysis that followed established procedures (see Clark & Elark Watson, 1995) and confirmatory factor analysis (Long, 1983). The process included five phases. First, we conducted a detailed literature review of cultural competence and cultural competence scales. We searched databases in the social sciences (PsychINFO), education (ERIC), and health and rehabilitation (PubMed), as well as Google Scholar for all English- language journal articles and books published from 1991 to 2007 using the following search terms: cultural competence models, cultural competence evaluation, cultural knowledge, cultural awareness, cultural competency research, multiculturalism, minorities, and cross-cultural services/care. From these searches, we identified 259 peer-reviewed articles or book chapters, excluding dissertations, technical reports, and conference presentations. Two independent reviewers examined the abstracts of these documents and identified 32 publications that refer to cultural competence models. After reviewing the full manuscripts, we identified 1 8 articles representing unique cultural competence models Balcazar, Suarez-Balcazar, Taylor- Ritzier, et al., (2010).

Second, we analyzed the factors identified in the cultural competence models and concluded that four factors were the best synthesis of the existing literature. These were (a) cultural awareness, which was primarily related to developing a critical view of cultural differences, people's experiences of oppression and marginalization, class differences, discrimination, racism, and becoming aware of ones' cultural biases; (b) cultural knowledge, which referred to learning about the cultural practices of specific racial or ethnic groups; (c) cultural skills, which focused on developing professional practices and behaviors designed to improve service delivery to diverse populations; and (d) cultural practice, which referred to experiencing other cultures and learning to appreciate diversity in society (see Balcazar, et al., 2009).

Third, based on our literature review, we identified key areas and developed questions under each of these four factors. A total of 49 items were developed, 24 of which were generated by the authors based on the above analysis and 25 that were adapted from existing scales. As such, four items were adapted from the Cultural Competency Advisory Group (CCAG) Assessment Tool for Cultural Competence by Arthur et al. (2005); four items were adapted from the Cultural Self-Efficacy Scale by Coffman, Shellman, and Bernal, (2004); three items from the California Brief Multicultural Competence Scale by Gamst et al. (2004); six items from the Cross Cultural Counseling Inventory-Revised by LaFromboise, Coleman, and Hernandez (1991); three items from Goode's, (2003) Environment Checklist; and five items were adapted from Sue's (2001) Multidimensional Model of Cultural Competence.

Fourth, a panel of three experts in the area of cultural competence in rehabilitation and multicultural counseling reviewed all the items and provided feedback. Experts were asked to focus on content, wording of each item, uniqueness of each item compared to other items on the scale, and the type of factor covered by each item. All of the CCAI-UIC survey questions were rated using a four-point scale in which 4 was strongly agree and 1 was strongly disagree. The experts' feedback was incorporated into the scale.



Fifth, an early version of the instrument was pilot tested with a group of 10 clinical practitioners working with people with disabilities from various ethnic backgrounds. The practitioners were asked to complete the scale and comment on items that were confusing, difficult to understand, or difficult to rate. They were also asked to comment on the overall content and format of the instrument. Their feedback was used to revise the instrument.

Sample Selection and Procedure

One thousand names were randomly generated from the American Occupational Therapy Association's (AOTA) list of currently registered occupational therapists. Participants received in the mail a letter describing the purpose of the study, a copy of the survey, a stamped self-addressed return envelope, and a one-dollar bill as an incentive to participate. A total of 477 occupational therapy practitioners returned the survey for a response rate of 47.7%.

Analysis of the Data: Validation of the Instrument

Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) for model generation (Jöreskog, 1993) were used to determine the underlying dimensional structure of perceived cultural competence. In particular, data were analyzed using a threestep process that systematically combined both factorial techniques. In the first step, an EFA with principal components and varimax rotation was performed to determine the dimensionality of the measure. In the second step, the identified factorial solution was refined by eliminating items that failed to load, did not psychometrically strengthen the internal consistency of the factors identified, or were not in tune with the underlying factor on which they loaded. In the third step, the resulting factor solution was tested using CFA and its statistical plausibility was evaluated based on a series of fit indices. This three-step process was applied in an iterative way.

Two competing models, a four-factor and a three-factor solution regarding perceived cultural competence, were compared based on the following indices of fit: relative chisquare (y?/df) (e.g., Carmines & McIver, 1981), root mean square error of approximation (RMSEA) (e.g., Browne & McIver, 1992), comparative fix index (CFI) (e.g., Bentler, 1990), non-normed fit index (NNFI) (e.g., Bentler & Many; Bonett, 1980), and Akaike's information criterion (AIC) (Akaike, 1974). The internal consistency (i.e., Cronbach's alpha) of the factors obtained in each model was computed as well. The strategy of using confirmatory factor analysis with structural equation modeling techniques, specifically indices of fit, to determine the underlying latent structure of perceived cultural competence was favored over eigenvalues or scree plots in order to achieve greater precision in establishing the best solution (see Tabachnick & Many; Fidell, 2001).

A set of specific criteria was defined a priori to assess the plausibility of the models tested (see Hu & amp; Bentler, 1999). First, the cutoff used to include items in a factor was set at a value of .40 or higher (Jöreskog, 1 993 & amp; Raubenheime, 2004)



Second, it was stipulated that relative chi-square and RMSEA values should be lower than 2 and .06, respectively. Third, CFI and NNFI indices needed to be at least .95 or greater. When comparing non-nested models, models between 5 and 10 AIC units were considered rather different and those with smaller AIC units were deemed superior. Finally, a model that included factors with acceptable Cronbach's alphas (> .75) and that was both highly interpretable and parsimonious was favored (see Bentler & & amp; Mooijaart, 1989). Pairwise deletion was used for EFAs (N = 477), whereas listwise deletion was used for CFAs (V= 235).

Results

Study Sample

Description of Participants. The vast majority of the survey respondents were female (94%) with a mean age of 43.3 years (SD = 10.43, Range: 23 to 69). Most respondents identified themselves as Caucasians (91%). The remaining 9% identified themselves with one or more racial/ethnic minority groups. In terms of educational degrees obtained, 53% of the respondents had an occupational therapy (OT) bachelor's degree, 45% had an OT master's degree, and 2% had either a Ph.D. or other doctorate degree. Respondents indicated the following primary practice settings: 25% were in schools, 14% were practicing in nursing homes, 14% were in rehabilitation facilities, 9% in individual home care, 8% in private practice, 6.4% in inpatient hospital care, 5.5% in outpatient hospital care, and 4% in community-based practice. Fourteen percent of the respondents reported other practice settings. All participants reported working with children, youth, or adults with disabilities (for a more detailed description of participants see Suarez-Balcazar et al., 2009).

Years of professional practice and experience working with multicultural populations. Study participants reported a wide range of years of practice, ranging from 1 year to 53 years (Af= 17.32, SD = 10.64). Participants were asked to check all the ethnic groups they work with, and most checked more than one group. About 96% reported working with Caucasians, 72% with African Americans, 69% with Hispanics, and 37% with Asians.

EFA and CFA Analyses

Using varimax rotation, four distinctive principal components were extracted in the initial EFA (awareness, knowledge, skills, and organizational support). From the 49 total items entered in the analysis, 26 had loadings over .40 and contributed to increase the internal consistency of each of the four factors identified. Together, they explained 50% of the variance. The first two factors (awareness and knowledge) explained 14% each, whereas the two remaining factors explained 11% each. Two cross-loadings were identified in factors 3 and 4 respectively (skills and organizational support).

The first factor included seven items and was labeled awareness. An example of the items that loaded on this factor is "I feel that I can learn from my ethnic minority

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clients." The internal consistency of this factor was exactly at the cutoff established a priori (.75). The second factor included four items and was labeled knowledge seeking. An example of the items loading on this factor is "I learn about different ethnic cultures through educational methods and/or life experiences." The internal consistency of the second factor fell short of the cutoff established a priori (.72). The third factor was labeled organizational support for multicultural practice and included seven items. An example of this factor is "Cultural competence is included in my work place's mission statement, policies, and procedures." The internal consistency of the third factor was the second highest of all factors at .78. The fourth factor was labeled skills and included eight items. An item from this factor is "I am effective in my verbal communication with clients whose culture is different from mine." The internal consistency of the fourth factor was the highest at .83.

The initial four-factor solution identified in the EFA was subsequently tested using a CFA to determine the degree to which the model fit the data. In this test, all four latent variables of cultural competence were allowed to covary with each other. Results presented in Table 1 show that the initial four-factor solution model (Model 1) performed fairly well based on the fit criteria established a priori. Two positive and highly significant correlations among the latent variables, nevertheless, suggested that the underlying structure of the cultural competence construct could be explained in a more parsimonious fashion; that is, the model could be explained with fewer factors. In particular, results showed that the adjusted correlation between the latent variables of Awareness and Organizational support was .80, and between Awareness and Skills was .87. An additional source of concern was that some of the items describing situations related to the workplace failed to load in the organizational support factor.

Based on the previous findings, the initial four-factor model was verified and a new EFA and CFA were performed. In the second EFA, three distinctive principal components were extracted using varimax rotation. All 26 items obtained in the initial analysis loaded successfully on the three identified factors and contributed to the internal consistency of each. Each factor explained an equal amount of variance (15%). Only one cross-loading was identified in factor 2.

The three factors identified in the second model resembled those previously found in the initial four-factor model. The main difference between the two models was the disappearance of the factor labeled Knowledge seeking. The four items that previously made up this factor all loaded in the Awareness factor in the second model tested (the three-factor model). The factor labeled Skills, which contained eight items, remained unchanged. Two additional items shifted from the Awareness factor to the Organizational support factor. Internal consistency coefficients for all three factors, Awareness, Skills, and Organizational support, were above the .75 threshold criteria established a priori (.78, .83, and .82, respectively; total scale = .90).

Upon closer examination, however, results showed that 2 of the 26 items were not in tune with the underlying nature of the factors they loaded on and, thus, they were eliminated from the analysis. The item "I do not possess the knowledge and



information about the ethnic minority group that I work with" loaded in the Organizational support factor and the item "Addressing cultural competency is not relevant to my work setting" loaded in the Awareness factor. Because eliminating these two items could have changed the underlying structure of the three-factor solution that they came from, an additional trimmed EFA was conducted with only 24 items. Using varimax rotation, three distinctive principal components were extracted. Each factor explained an equal amount of variance (15%), just as it occurred with the three-factor solution that included all 26 items. All items loaded on the factors where they had loaded before, minus the two dropped items. The internal consistency coefficients of all three factors were very similar to those obtained previously (Awareness = .76; Organizatioanal support= .81; Skills = .83; and total scale = .89). In addition, the trimmed three-factor solution contained the same cross-loading identified earlier. The results obtained indicated that trimming the three-factor model from 26 to 24 items not only yielded a clearer and theoretically more coherent structure, but it did not alter the basic underlying factorial structure.

The final three-factor solution was further tested in a CFA (Model 2). The three-factor model was not nested within the fourfactor model since it did not share the same number of items (24 instead of 26) and, consequently, did not share the same parameters. According to Table 1, fit indices for the three-factor model were better than the criteria stipulated a priori: both relative chi-square and RMSEA were below 2 and .06, respectively, and both CFI and NNFI indices were above .95. In addition, Table 1 shows that the Model 2 yielded the smallest AIC, and this was well above the 10 units needed to reject Model 1. The covariances among the three factors, although strong, did not seem to suggest major factorial overlaps.

Table 2 includes the final factorial solution of the Cultural Competence Assessment Instrument (CCAI-UIC).1 Figure 1 illustrates the measurement model obtained for the three latent variables of the chosen model. In particular, it shows that the association among the three latent variables ranged between .58 for the Awareness and Organizational support factors, and .74 for Awareness and Skills. The correlation between Awareness and Organizational support was .69. These correlations were higher than the simple interfactor correlations (also presented in Figure 1) because they controlled for all interdependencies in the model and are error free. Table 3 summarizes the descriptive statistics of the three factors.

To summarize, the three factors that were identified demonstrated fairly strong reliability and explained equal proportions of the variance. More specifically, the first factor, Awareness, refers to the appreciation and understanding of other people's cultures and the perception of biases toward other people's cultures. The second factor, Skills, assesses the degree to which one perceives having the necessary ability to adjust practices to meet the needs of diverse populations. The third factor, Organizational support refers to perceptions about the institutional value placed on the promotion of multicultural practice and the organizational opportunities to become culturally competent.

Discussion

This study yielded strong psychometric data to support a three-factor model to measure cultural competence. Although early analysis also yielded a four-factor model, the three-factor model was determined to be a better fit for the data. This finding is consistent with researchers' difficulty in operationalizing and differentiating between developing cultural awareness and seeking knowledge (Gamst et al., 2004). In this study, these two domains were combined in the same factor. The CFA also demonstrated that although there are strong correlations among the factors, the three separate factors are distinct and explain equally large proportions of the variance in the data. Moreover, the results support a cognitive component (awareness/knowledge), a behavioral component (skills), and a contextual component (organizational support) related to the delivery of culturally competent services to diverse populations. The authors believe that cultural knowledge was not necessarily supported as an independent factor, in part because the measure is not designed to assess specific information and facts practitioners might know about diverse ethnic groups. The finding that the three-factor model yielded stronger psychometric properties might reflect the debate in the literature regarding the difficulty in defining cultural competence and lack of agreement about the content of its main components. According to this study, cultural competence involves three components - cognitive, skills/behavioral, and contextual (organizational) - and each component is measured by eight items. Of the items that are included in the final scale, 9 were adapted from other published scales and none was used literally. The authors developed the other half based on the procedure outlined in the method section.

An interesting result of this study is the fact that organizational support emerged as a strong, distinctive, and critical factor in the measurement of cultural competence. This factor has not previously been included in other validated scales. One reason may be that the previous scales were developed with an emphasis on identifying specific behaviors and skills associated with the implementation of cultural competence in therapeutic or professional practice, independent of context. However, through our own research that involves following up multiple cultural competence training participants (see Taylor-Ritzier et al., 2008), we learned that practitioners may intend to implement cultural competence-related changes in their work, but often need the support of their organization (e.g., VR office, rehabilitation unit) in order to make these changes actually happen. For example, rehabilitation work settings may need to embrace culturally competent services in their mission and vision statements, allocate resources for training, foster a learning culture related to valuing diversity, support and allow rehabilitation professionals to adopt culturally competent models of practice, allow physical changes to their work place (e.g., developing translations of promotional materials, placing posters of diverse customers on the walls), or support changes in work schedules to allow employees to conduct outreach activities in the community during evenings or on weekends. Given the strong correlations between organizational support, awareness and skills, it seems that organizational support may be a very important factor in determining the capacity of individual practitioners to deliver culturally competent services.

The U.S. Department of Health and Human Services Office of Minority Health (2001)



has developed the National Standards on Culturally and Linguistically Appropriate Services (CLAS). The CLAS standards are primarily directed at healthcare organizations; however, individual providers from other organizations are also encouraged to use the standards to make their practices more culturally and linguistically accessible. The Office of Minority Health argues that the principles and activities of culturally and linguistically appropriate services should be integrated throughout an organization and undertaken in partnership with the communities being served. The 14 standards are organized in three main themes: Culturally Competent Care (Standards 1-3), Language Access Services (Standards 4-7), and Organizational Supports for Cultural Competence (Standards 8-14). For example, Standard 9 says, "Health care organizations should conduct initial and ongoing organizational selfassessments of CLAS-related activities and are encouraged to integrate cultural and linguistic competence-related measures into their internal audits, performance improvement programs, patient satisfaction assessments, and outcomes-based evaluations." The findings of this study are consistent with this emphasis on organizational support for cultural competence.

From the review of existing scales conducted by the authors, only Goode's (2003) Cultural Competency Self-Assessment checklist included a subscale on characteristics of the practitioner's physical environment, materials, and resources. However, Goode does not mention any psychometric or validation data of the checklist. This study makes a concrete contribution to the field of rehabilitation by proposing a validated measure to assess perceived levels of cultural competence that includes an emphasis on individual as well as organizational aspects of cultural competence.

One of the limitations of this study in terms of its implications for rehabilitation is the fact that all participants were occupational therapy clinicians; thus its applicability to other types of rehabilitation practitioners needs to be considered in future studies. On the other hand, these practitioners were serving a very diverse group of clients, not only in terms of racial composition but in terms of lifespan and disability types. Thus, the CCAI-UIC could be used with other rehabilitation professionals so that they can analyze and reflect upon their relationships with their clients with disabilities from multicultural backgrounds. As stated by Sharma and Keri (2002), understanding culturally diverse populations is important for rehabilitation professionals working in a variety of settings.

Given the current evidence of health and rehabilitation disparities in the US (Balcazar, Suarez-Balcazar, Taylor- Ritzier, et al., 2010; Betancourt, Green, Carrillo, & Damp; Ananeh-Firempong, 2003), rehabilitation professionals are placing much emphasis on cultural competence training. A systematic review of the studies that evaluated interventions designed to improve the cultural competence of health professionals (see Beach et. al., 2005), indicated that training improves the attitudes, knowledge, and skills of trainees, and that the training can affect patient satisfaction. Only a few studies have evaluated consumer rehabilitation outcomes resulting from culturally competent interventions (see Hasnain et. al., 2009). Although the CCAI-UIC is not designed to link the professional's level of cultural competence to actual consumer outcomes, this is a fruitful direction for future research.



This study also calls for attention to organizational practices that can either support or hinder culturally competent service delivery. Individual practitioners may be motivated and eager to modify and adapt their practices to better serve minority populations, but agencies may have rigid policies or guidelines - often dictated by reimbursement policies - that preclude or inhibit such innovation. This is an issue practitioners need to be prepared to recognize and address. For example, how are particular clients excluded from services they cannot afford or for which there is no reimbursement available? Given that many minority clients are also poor, this issue has great relevance. More research in this area is needed.

The current study yielded an instrument with sound psychometric properties, one of the few validated instruments in the rehabilitation literature related to cultural competence. The data analysis presented herein demonstrated strong psychometric properties. Specifically, this instrument addressed some of the limitations of previous instruments that lacked adequate fit indices. Although practitioners have underscored the importance of becoming culturally competent, they often allude to the fact that they lack effective ways to conceptualize and evaluate such a complex set of skills. The CCAI-UIC could help organizations develop a more accurate understanding of the degree of cultural competence among staff members and identify needs for training and for policies and procedures that can be conducive to better outreach and services to underserved populations.

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