

# Policy Research Brief



Langston University  
 Rehabilitation Research and Training Center  
 (RRTC) on Research and Capacity Building  
 for Minority Entities

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## Immigration Trends' Impacts on State Vocational Rehabilitation Agency Minority Application Rates: A National Time Series Forecast Model Demonstration Study

### ■ Purpose of Study

Although Section 21 of the 1998 Rehabilitation Act Amendments (Public Law 93-112) spawned a plethora of research examining rehabilitation experiences along racial and

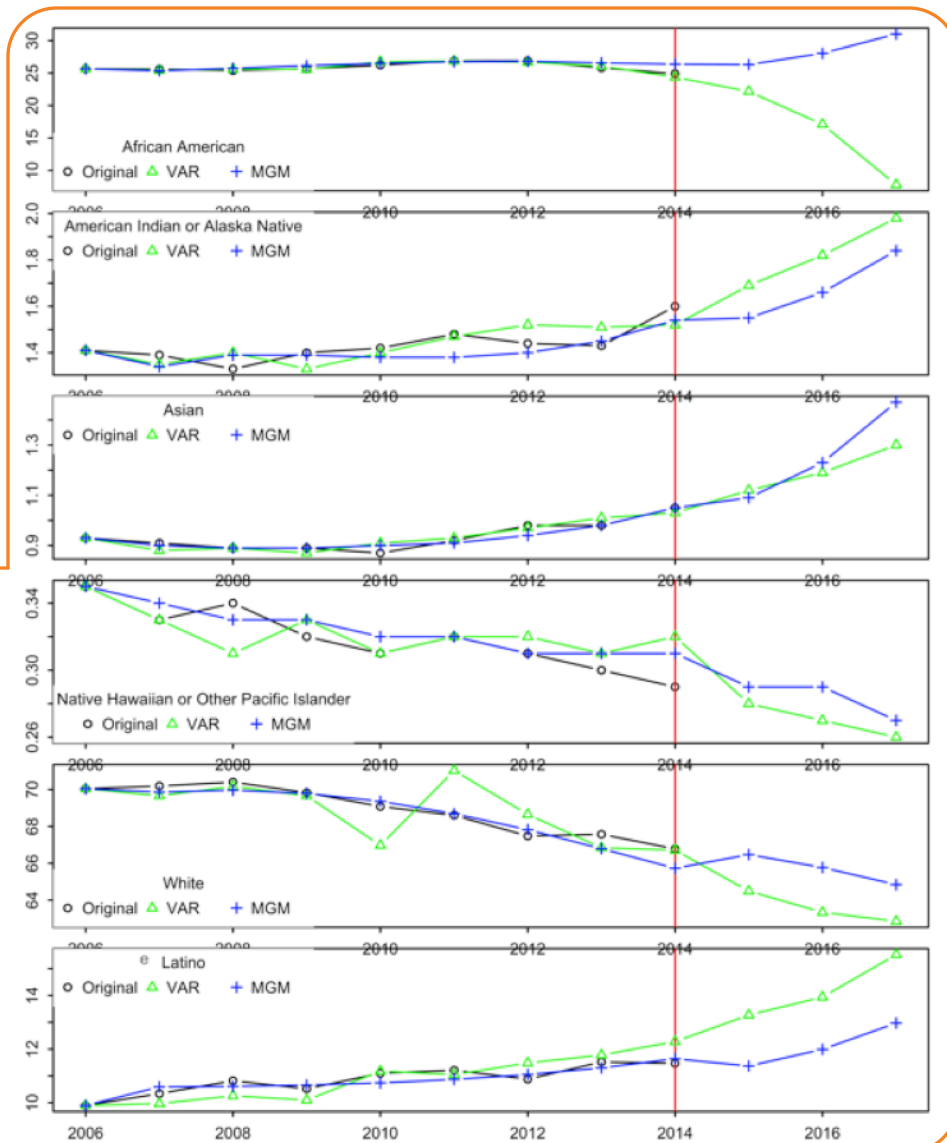
ethnic lines, scant attention has been paid to understanding state vocational rehabilitation agency (SVRA) and minority immigrant intersection phenomena. More specific, little information is available on the potential impacts of immigration trends on SVRA application rates. Consequently,

Frequency and percent of new unduplicated SVRA applicants and foreign born individuals in the U.S. by time series

Year	Time series	RSA-911 Data		Foreign Born Population	
		$x_1^{(0)}$ (k)	%	$x_2^{(0)}$ (k)	%
2006	1	162029	100	37547789	100
2007	2	161822	100	38059694	100
2008	3	170008	100	37960935	100
2009	4	162552	100	38517234	100
2010	5	166829	100	39955854	100
2011	6	156866	100	40377860	100
2012	7	150866	100	40824658	100
2013	8	146003	100	41348066	100
2014	9	134256	100	42291794	100

### ■ Summary of Findings

The Multivariable Grey Model (MGM) was demonstrated to be superior to the Vector Autoregressive (VAR) model in predictive accuracy. As reflected in this figure the MGM generated three-year forecast projected an upward curve trend trajectory in the percentage of new Black or African American, American Indian or Alaskan Native, Asian, and Latino SVRA applicants for Fiscal Years (FYs) 2015 thru 2017. The model can be considered for use by SVRAs as a promising tool to help them develop new policy initiatives that respond rapidly to the needs of minority group members.



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there is a need to demonstrate the efficacy of promising forecast models that can be considered for accurately predicting these trends impacts' on SVRA systems. These trends call for the development of a three-year forecast model to help SVRAs, policy makers, and researchers inform their strategic plans, policy formulation, and future research agendas. The purpose of this study was to demonstrate and assess the efficacy of the Vector Autoregressive [VAR] model's and Multivariable Grey Model's [MGM]) ability to accurately predict immigration trends' impact on SVRA new application rates among minorities.

## ■ Background

Gigantic migration trends among racially and ethnically diverse individuals (Blacks [e.g., from Kenya, Nigeria, South Africa, Cameroon], American Indians or Alaskan Natives [e.g., from Mexico], Asians [e.g., from China, India, Vietnam, Korea, Japan], Native Hawaiian or other Pacific Islanders [e.g., from the Philippines], and Latinos [e.g., from Mexico, El Salvador, Guatemala, Cuba, Dominican Republic) from economically and/or politically underdeveloped nations to countries that offer economic opportunity and political asylum continue to reshape the world's population. Consequently, nearly every country around the globe has experienced a substantial refashioning of its demographic landscape (Pérez-Armendáriz, 2014; Perez & Hirschman, 2009; Uhlenberg, 2013). The United States (U.S.) is no exception to this phenomenon. Migration to the U.S. has been attributed to individuals' pursuit of employment opportunities, meaningful wages and an improved quality of life (Bennett, Scornaiencki, Brzozowski, Denis, & Magalhaes, 2012; Kelly, 2010).

These uncertain migration patterns raise immediate questions regarding the American economy and varied constituencies that are tied to the socio-economic landscape. State vocational rehabilitation agencies (SVRAs), constituent entities, are principle stakeholders that may be heavily impacted by new and emerging racial and ethnic immigration trends. Whether the 80 SVRAs around the country have the capacity to effectively respond to this growing crisis and deliver services to new minority U.S. citizens, adult legal permanent residents, and citizen-children with disabilities (i.e., school-to-work transition services) is a question that demands immediate attention (Cross et al., 2015). Consequently, there exist a need for promising forecast applications that can be used by SVRAs, policy makers, researchers, and advocates to inform strategic planning, policy formulation, and research program development for improved rehabilitation experiences. To date, however, relatively few studies have forecasted minority SVRA application rate trends, and so these agencies have had little information available to strategically plan for a rapid and effective response to minority immigrants' and U.S. born minorities' needs. The following research questions were addressed:

1. Which forecast model (i.e., VAR model versus MGM) demonstrates the highest level of accuracy in predicting new SVRA application rate trends?

2. What is the three-year (FYs 2015 to 2017) forecast of the impacts of racial and ethnic immigration trends on SVRA minority application rates?

## ■ Methods

### *Sources of Data*

Nine years of national Rehabilitation Services Administration (RSA)-911 case record data (FY 2006 to FY 2014 [October 1, 2005 thru September 30, 2014]) on SVRA applicants and U.S. Census Bureau American Community Survey (ACS) 1-year estimates (Calendar Year 2006-2014 [January thru December]) on the foreign born populations were entered into the VAR model and MGM to develop a three-year forecast of new SVRA application rate trends. The subsequent section provides a brief description of each data source.

**RSA-911 data.** The RSA-911 database contains two distinct variables for race and ethnicity as defined in the most recent Reporting Manual for the Case Service Report. The "Date of Application" variable, which includes the year, month, and date that the SVRA received a completed and signed application form from the applicant, was used exclusively to eradicate data duplication and select case records included in the analysis. That is, only unduplicated case records representing individuals who applied for services in the same or "current" FY of the database were included for analysis. For example, if a case record for FY 2011 data indicated that the individual applied for services in FY 2009, that record was excluded from analysis. The PROC DATA and PROC FREQ procedures in SAS version 9.4 were used to calculate these statistics. (SAS Institute, 2014).

**U.S. census bureau data.** The ACS data source is a cross sectional survey that draws a new sample of individuals each calendar year and implements a large scale general survey designed to make estimates on various characteristic levels, e.g. race and ethnicity (Reamer, 2010). We obtained ACS 1-year estimates on the foreign born population's select characteristics (i.e., race and ethnicity) for calendar years 2006 thru 2014 data through the following website ink: [http://factfinder.census.gov/faces/nav/jsf/pages/community\\_facts.xhtml](http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml).

### *Forecasting Models and Data Analysis*

The VAR model in economics was introduced as an alternative to traditional large-scale macroeconomic models (Sims, 1980). One advantage of the model is that it provides a systematic way to capture rich dynamics in multivariate time series, and the approach has become increasingly popular in recent decades (Lütkepohl, 2009, 2011). The model is an approximation to larger structural systems and has shown optimal performance with extended time series historical data (Dekimpe & Hanssens, 2000). The Grey system theory was developed originally in 1985 (Julong, 1985). This model's focal point is uncertain systems forecasting where small amounts of data, discrete data and incomplete information (e.g. intervals, probability distributions, fuzzy sets, and imprecise

probability distributions) are difficult for probability and fuzzy mathematics to handle (Li, Yamaguchi, Mizutani, & Nagai, 2007; Shen, Ou, Chen, Zhang, & Tan, 2013).

The Grey Model (GM) is based on the grey system theory and has been widely applied in economics and financial areas (Kayacan, Ulutas, & Kaynak, 2010; Li et al., 2007; Liu, Wang, Liu, & Li, 2014), public health and biostatistics (Feng & Zhang, 2012; Jin et al., 2008; Shen et al., 2013), engineering (Kang & Zhao, 2012) as well as other specialties. The Multivariable Grey Model (MGM) (1, n) represents an expansion and complements the grey system model. This model is designed to work with systems where available information is insufficient to characterize the system, and where a complex relationship between response variables and the main influencing factors exists. The benefits of the MGM is that it has higher demonstrative accuracy prediction than traditional multivariate forecasting models (Jun et al., 1997; Pao, Fu, & Tseng, 2012).

In this study, nine years of data from two different sources (i.e., RSA-911 and ACS) were entered into these two different empirical forecast models (i.e., VAR and MGM [1, 2]) to test their predictive accuracy using Absolute Mean Percentage Error (AMPE) as the criterion. A final predictive model was selected based on smallest AMPE to develop the three-year forecast of SVRA application rate trends.

The algorithms utilized to reduce the data in the VAR model and MGM (1, 2) follow.

#### Model 1: Vector Autoregressive (VAR) model.

The VAR model was used to analyze the dynamic effects of the ACS data on the foreign born population and SVRA application rates in the RSA-911 databases. The basic modeling procedures are presented below.

**Step 1. Obtaining original series.** Let  $X_t = (x_{1t}, x_{2t}, \dots, x_{nt})'$  denote a  $(n \times 1)$  vector of time series variables. In this case,  $n=2$  and  $t=8$ .

**Step 2: VAR Model.** The basic p-lag vector autoregressive (VAR (p)) model has the form

$$X_t = c + \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + \dots + \Pi_p X_{t-p} + \varepsilon_t, \quad t=1, \dots, T \quad (1)$$

where  $\Pi_i$  are  $(n \times n)$  coefficient matrices and  $\varepsilon_t$  is an  $(n \times 1)$  unobservable zero mean white noise vector process (serially uncorrelated or independent) with time invariant covariance matrix  $\Sigma$ . For example, the simple VAR (1) model equation by equation has the following form

$$\begin{pmatrix} x_{1t} \\ x_{2t} \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} + \begin{pmatrix} \pi_{11} & \pi_{12} \\ \pi_{21} & \pi_{22} \end{pmatrix} \begin{pmatrix} x_{1t-1} \\ x_{2t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$$

or

$$x_{1t} = c_1 + \pi_{11}x_{1t-1} + \pi_{12}x_{2t-1} + \varepsilon_{1t}$$

$$x_{2t} = c_2 + \pi_{21}x_{1t-1} + \pi_{22}x_{2t-1} + \varepsilon_{2t}$$

**Step 3: Estimation in R.** The function VAR in the package *vars* was used to predict and forecast the time series sequences.

#### Model 2: Multivariable Grey Model.

MGM procedures were employed to develop a three-year forecast of SVRA application rate trends across racial and ethnic populations using nine years (FY 2006-2014) of RSA-911 data and ACS data denoted as  $X_1^{(0)}$  and  $X^{(0)}$  in Table 1, respectively. The basic procedures of modeling are presented below.

**Step1: Obtaining original series.** A non-negative sequence of raw data  $X^{(0)}$  with n samples was expressed as:

$$X_i^{(0)} = (X_i^{(0)}(1), X_i^{(0)}(2), \dots, X_i^{(0)}(n)) \quad n \geq 4, \quad \text{where} \\ i = 1, 2, \dots, J \quad \text{and } J \text{ was the variable.}$$

**Step 2: Pre-processing of the original raw data.**

a) Accumulating Generation Operator (AGO). A new sequence  $X_i^{(1)}$  was generated by AGO as:

$$X_i^{(1)} = (x_i^{(1)}(1), x_i^{(1)}(2), \dots, x_i^{(1)}(n)), \quad n \geq 4 \quad (2)$$

Where,  $x_i^{(1)}(1) = x_i^{(0)}(1)$ , and  $x_i^{(1)}(k) = \sum_{j=1}^k x_i^{(0)}(j)$ ,  $k = 1, 2, \dots, n \quad j = 1, 2, \dots, J$

b) The Mean operation. The generated mean sequence of  $Z^{(1)}$  was defined as:

$$Z_i^{(1)} = (z_i^{(1)}(1), z_i^{(1)}(2), \dots, z_i^{(1)}(n)) \quad (3)$$

where,  $z_i^{(1)}(k)$  was the mean value of adjacent data, i.e.,

$$z_i^{(1)}(k) = 0.5x_i^{(1)}(k) + 0.5x_i^{(1)}(k-1), \quad k = 2, 3, \dots, n \quad (4)$$

**Step 3: MGM (1, J) Model equation.** The MGM (1, J) model was constructed by establishing a J variable first order differential equation for  $x_i^{(1)}(k)$  expressed as:

$$\begin{cases} \frac{dx_1^{(1)}}{dt} = a_{11}x_1^{(1)} + a_{12}x_2^{(1)} + \dots + a_{1J}x_J^{(1)} + b_1 \\ \frac{dx_2^{(1)}}{dt} = a_{21}x_1^{(1)} + a_{22}x_2^{(1)} + \dots + a_{2J}x_J^{(1)} + b_2 \\ \vdots \\ \frac{dx_J^{(1)}}{dt} = a_{J1}x_1^{(1)} + a_{J2}x_2^{(1)} + \dots + a_{JJ}x_J^{(1)} + b_J \end{cases} \quad (5)$$

**Step 4:** We took the inverse AGO (IAGO) to find the predicted values of primitive sequence by using the IAGO:

$$\frac{\partial X^{(1)}(k)}{\partial t} + AX^{(1)} = B \quad (6)$$

The parameter A and B was estimated by the least square method:

$$\hat{a}_i = \begin{bmatrix} \hat{a}_{i1} \\ \hat{a}_{i2} \\ \vdots \\ \hat{a}_{iJ} \\ \hat{b}_i \end{bmatrix} = (L^T L)^{-1} L^T Y_i \quad (i = 1, 2, \dots, J), \text{ where}$$

$$L = \begin{bmatrix} z_1^{(1)}(1) & z_2^{(1)}(1) & \cdots & z_J^{(1)}(1) & 1 \\ z_1^{(1)}(2) & z_2^{(1)}(2) & \cdots & z_J^{(1)}(2) & 1 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ z_1^{(1)}(n) & z_2^{(1)}(n) & \cdots & z_J^{(1)}(n) & 1 \end{bmatrix} \text{ and}$$

$$Y_i = (x_i^{(0)}(2), x_i^{(0)}(3), \dots, x_i^{(0)}(n)).$$

$$\hat{A} = \begin{bmatrix} \hat{a}_{11} & \hat{a}_{12} & \cdots & \hat{a}_{1J} \\ \hat{a}_{21} & \hat{a}_{22} & \cdots & \hat{a}_{2J} \\ \vdots & \vdots & \ddots & \vdots \\ \hat{a}_{J1} & \hat{a}_{J2} & \cdots & \hat{a}_{JJ} \end{bmatrix} \text{ and } \hat{B} = \begin{bmatrix} \hat{b}_1 \\ \hat{b}_2 \\ \vdots \\ \hat{b}_n \end{bmatrix}$$

The solution, also known as time response function, of the above equation was given by:

$$X^{(1)}(k+1) = e^{-Ak} X^{(1)}(1) + A^{-1}(e^{Ak} - I) \cdot B, \quad (7)$$

Therefore, the fitted and predicted vector sequence  $\hat{X}^{(0)}$  was given as:

$$\hat{X}^{(0)}(1) = X^0(1)$$

$$X^{(0)}(k+1) = \hat{X}^{(1)}(k+1) - \hat{X}^{(1)}(k) \quad k=1, 2, 3, \dots$$

**Error Analysis and Validation.** In order to evaluate the prediction accuracy of the VAR model and MGM (1, 2), the Absolute Mean Percentage Error (AMPE) criterion was used to estimate model performances and reliability. AMPE is a general accepted percentage measure of prediction accuracy. This indicator was calculated as:

$$AMPE = \frac{1}{N} \sum_{k=1}^N \left| \frac{e(k)}{x^{(0)}(k)} \right| \times 100\%, \text{ where,}$$

$$e(k) = x^{(0)}(k) - \hat{x}^{(0)}(k).$$

Table 1 shows the AMPE of the two forecasting models across race and ethnicity. The model with the smallest mean AMPE was selected as the best forecasting model.

## Simulation Results

As can be drawn from the results presented in Table 1, the MGM's level of predictive accuracy was much higher than the VAR model's level (i.e., smaller results translate to higher predictive accuracy). The mean AMPE was enhanced from 3.25% for the VAR to 2.75% for the MGM.

**Table 1**

The models' predictive accuracy performance- Absolute Mean Percentage Error (AMPE).

Race/Ethnicity	VAR	MGM(1,2)
African American/Black	1.87	2.88
AI/AN	2.71	2.69
Asian	1.51	1.24
NH/OPI	6.08	4.58
White	3.60	2.09
Total	2.75	1.94
Latino	4.27	3.84
Mean	3.25	2.75

Note: AI/AN= American Indian or Alaska Native, NH/OPI= Native Hawaiian or Other Pacific Islander

The results point out that the MGM was superior in regard to predictive accuracy levels when compared to the VAR model. The MGM (1, 2) results demonstrate that the model can reflect the relationship of restriction and stimulation between the number of new unduplicated applicants and the foreign born population across racial and ethnicity variables. As shown in the Table 2, the MGM projected three-year (i.e., FYs 2015, 2016, and 2017) total frequencies for new applicants included 133,043, 123,920 and 108,713 individuals, respectively. Compared to the FY 2014 baseline total unduplicated application frequency (N = 135,319), FYs 2015 to 2017 projections represent a 1.68%, 8.42%, and 19.02% decrease in new applicants overall. In comparison to this same baseline, the number of new Black or African American applicants were projected to decrease by 2.52%, 2.61% and 5.51% during FY 2015, FY 2016 and FY 2017 respectively; new Native Hawaiian or Other Pacific Islander applicants were projected to decrease by 5.64%, 16.70% and 30.35%; and new White applicants were projected to decrease by 1.69%, 6.78%, and 13.70% for that same time series. The model projected an increase in the number of new American Indian or Alaska Native applicants by 1.44% in FY 2015 and a decrease of 1.20% and 3.80% in FY 2015 and FY 2016, respectively, when compared to FY 2014 baseline results. Remarkably, the numbers of new Asian applicants were projected to increase by 4.42%, 7.09%, and 12.20% across the same time series when compared to FY 2014 baseline results. Within this comparative context, the model also strikingly projected that the number of new Latino applicants would decrease by 1.82%, 5.7% and 10.47% during FY 2015 to FY 2017, respectively.

**Table 2**

The predictive (2006-2014) and forecast model (2015-2017) for the number of new applications by race and ethnicity and time series.

Year	Time series	RSA-911 data	VAR	MGM
<b>African American or Black</b>				
2006	1	41560	41560	41560
2007	2	41426	42333	42016
2008	3	43148	41914	42681
2009	4	41695	43054	43094
2010	5	43726	43279	43134
2011	6	42181	42028	42625
2012	7	40553	39837	41318
2013	8	37669	37535	38858
2014	9	33400	33820	35682
2015 (F)	10		28290(-16.35%)	34782(-2.52%)
2016 (F)	11		20420(-39.62%)	34752(-2.61%)
2017 (F)	12		8557(-74.70%)	33716(-5.51%)
<b>American Indian or Alaska Native</b>				
2006	1	2285	2285	2285
2007	2	2249	2247	2222
2008	3	2261	2290	2303
2009	4	2276	2232	2286
2010	5	2369	2257	2248
2011	6	2322	2304	2205
2012	7	2172	2266	2162
2013	8	2088	2176	2120
2014	9	2148	2113	2079
2015 (F)	10		2161(2.27%)	2109(1.44%)
2016 (F)	11		2174(2.89%)	2054(-1.20%)
2017 (F)	12		2182(3.27%)	2000(-3.80%)
<b>Asian</b>				
2006	1	1507	1507	1507
2007	2	1473	1468	1487
2008	3	1513	1460	1479
2009	4	1447	1467	1470
2010	5	1451	1472	1461
2011	6	1443	1448	1452
2012	7	1478	1444	1443
2013	8	1431	1449	1434
2014	9	1413	1437	1424
2015 (F)	10		1428(-0.63%)	1487(4.42%)
2016 (F)	11		1423(-0.97%)	1525(7.09%)
2017 (F)	12		1425(-0.83%)	1598(12.20%)

**Table 2 Continued**

Year	Time series	RSA-911 data	VAR	MGM
<b>Native Hawaiian or Other Pacific Islander</b>				
2006	1	567	567	567
2007	2	534	548	563
2008	3	578	513	551
2009	4	520	561	538
2010	5	517	499	523
2011	6	502	494	506
2012	7	468	479	485
2013	8	438	442	459
2014	9	393	442	425
2015 (F)	10		358(-19.00%)	401(-5.65%)
2016 (F)	11		324(-26.70%)	354(-16.70%)
2017 (F)	12		287(-35.06%)	296(-30.35%)
<b>White</b>				
2006	1	113485	113485	113485
2007	2	113583	116023	115941
2008	3	119686	114928	116001
2009	4	113510	117304	115055
2010	5	115245	108353	112941
2011	6	107610	111149	109481
2012	7	101804	102508	104476
2013	8	98654	96253	97709
2014	9	89654	92628	88940
2015 (F)	10		82283(-11.17%)	87430(-1.69%)
2016 (F)	11		75626(-18.35%)	81502(-6.78%)
2017 (F)	12		69130(-25.36%)	70494(-13.5%)
<b>Total</b>				
2006	1	162029	162029	162029
2007	2	161822	166548	165956
2008	3	170008	163795	165816
2009	4	162552	168401	164861
2010	5	166829	161792	162828
2011	6	156866	156485	159376
2012	7	150866	149317	154059
2013	8	146003	144003	146294
2014	9	134256	138862	135319
2015 (F)	10		127583(-8.12%)	133043(-1.68%)
2016 (F)	11		119400(-5.71%)	123920(-8.42%)
2017 (F)	12		110000(-10.47%)	108713(-19.02%)
<b>Latino /Hispanic</b>				
2006	1	16041	16041	16041
2007	2	16732	16598	17569
2008	3	18395	16807	17592
2009	4	17100	17012	17574
2010	5	18518	18087	17494
2011	6	17585	17299	17325
2012	7	16414	17143	17024
2013	8	16820	16959	16530
2014	9	15404	17058	15754
2015 (F)	10		16924(-0.79%)	15468(-1.82%)
2016 (F)	11		16639(-2.45%)	14855(-5.71%)
2017 (F)	12		17073(0.09%)	14104(-10.47%)

Figure 1 shows the frequency curves of new SVRA service applicants for the two models from FY 2006 to FY 2014 and the three-year forecast projections (FY 2015 to FY 2017) for each racial and ethnic target group. Several conclusions can be drawn from these results. First, they indicate that the MGM's (1,2) predictive value was more closely aligned to the actual number of new applicants than the VAR model generated number confirming that the former model was more accurate than the VAR model. Second, the MGM's (1, 2) curve showed

a striking three-year projected upward trend trajectory for the number of new Asian applicants, while such curve trends for Black or African American, Native Hawaiian or Other Pacific Islander, White, and Latino applicants decreased. Third, the curve projects that the number of new Native American applicants will slightly increase in FY 2015 and then decrease during the two subsequent fiscal years. Last, the total number of new applicants for SVRA services were projected to decrease over the three-year forecast time series.

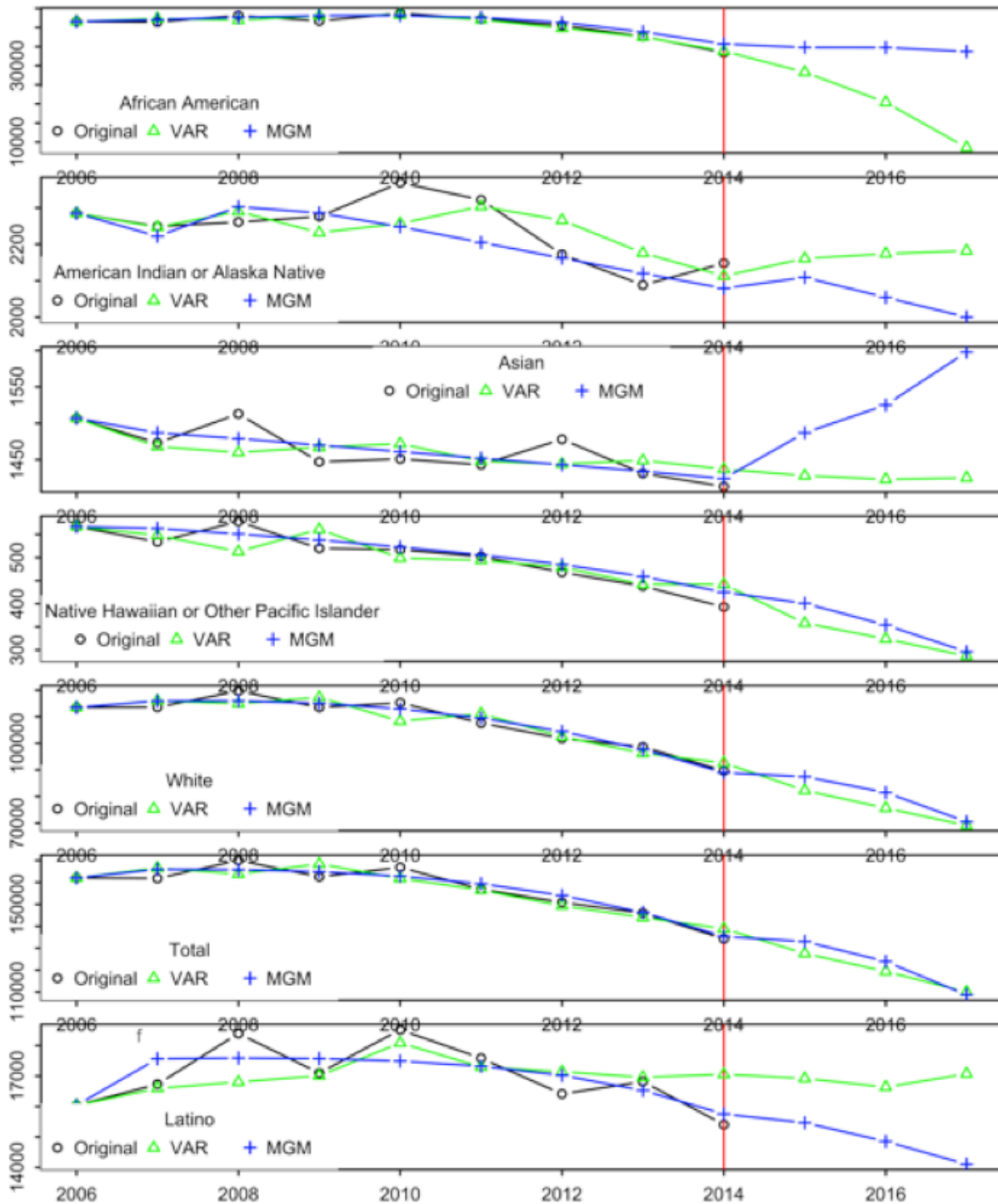


Figure 1: Forecast for number of new applicants by different models for FYs 2015-2017

The percentage curves of new applicants for each model across nine years (i.e., FY 2006 to FY 2014) for each racial and ethnic target cohort are presented in the summary of findings. These results project an increase in the percent of new Black or African American, American Indian or Alaska Native, Asian, and Latino applicants for FYs 2015 to 2017. On the contrary, however, projections indicate that the percentage of applications from Whites and Native Hawaiian or Other Pacific Islander will decrease.

## ■ Discussion

The findings indicated that the MGM was superior to the VAR model in regard to predictive performance. Consequently, the MGM has promise for use among SVRA leaders, policy makers, and researchers as an accurate forecasting tool to generate predictions that could inform their strategic plan development, policy formulation, and future research program development. Additional multiple demonstration trials that build upon these results, nonetheless, are needed to either confirm or refute the MGMs' veracity in curve fitting performance. The results also indicated two remarkable projections. First, the number of Asian applicants, when compared to the FY 2014 baseline frequency, are projected to increase by a 4.42%, 7.09%, and 12.20% for FYs 2015 to FY 2017, respectively. This projection represents a whopping 23% compound percent change (+) in applications (i.e., from FY 2015 to FY 2017).

Second, the findings suggest an upward curve trend trajectory in the percentage of new Black or African American, American Indian or Alaskan Native, Asian, and Latino applicants for FYs 2015 thru 2017. While the curves suggest that the three-year projected percentages of Blacks or African Americans, American Indians or Alaska Natives, Asians, and Latinos applying for services are anticipated to wax, the percentages for White and Native Hawaiian or Other Pacific Islander applicants are projected to wane. This finding can be attributed to the fact that the total number of projected applicants will decline more rapidly than the number of new African American or Black, Latino, or American Indian or Alaska Native applicants.

The bridge between culture and disability is intricate. As such, providing culturally sensitive care to minority immigrants with disabilities can be arduous because of language barriers and differences in values and beliefs (Bal & Perzigian, 2013; Lindsay, Tétrault, Desmaris, King, & Piérart, 2014). Most research on culturally sensitive care and services emphasize ethnic-minority groups as a whole, very little is known about immigrants. Differences between immigrant families and practitioners can significantly impact successful outcomes. Therefore, practitioners should be aware that immigrant families may have conflicting views about disability, establishing the need and having access to various health and rehabilitation related services (Lindsay et al., 2014). Because most practitioners are trained from a western perspective and lack training in working with families from diverse

backgrounds, SVRAs should be prepared to develop strategies that allow their personnel to work effectively in circumstances that may require additional cross-cultural competencies.

A second point for practitioners to consider while working with individuals from these diverse immigrant groups (i.e., Blacks, American Indian or Alaska Natives, Asians, and Latinos) is being able to understand the complexities of immigrants' family dynamics. In the U.S. immigrant families are increasingly composed of members of varying legal status or mixed-status families (Zayas & Bradlee, 2014). Approximately 4.5 million of the 5.5 million children of undocumented parents are U.S. citizens. Because of the nature of this demography, it is no longer possible to enforce immigration laws without directly affecting millions of U.S. citizens (Zayas & Bradlee, 2014). Deportation is an issue of critical concern. In light of removal strategies, increasing arrests and detention of undocumented immigrants, tremendous hardship is placed on citizen-children of undocumented immigrants. For example, a Latino high-school student with a disability receiving SVRA sponsored school-to-work transition services whose undocumented mother is deported is likely to experience many adjustment challenges that could result in the failure to place and maintain employment. In essence, the government may be creating two classes of vulnerable citizen-children: exiles (those children who go with their parents to another country, often one they do not know) and orphans (those children whose parents leave them in the U.S. in the care of others, sometimes in the child welfare system). Government policies and procedures relating to immigration laws may force undocumented immigrant parents to face awfully distressing choices (Zayas & Bradlee, 2014).

While it is deemed beneficial and desirable for rehabilitation counselors to be familiar with a finite knowledge about the cultural norms of every minority consumer (i.e., immigrant and U.S. born) that he/she serves, the 38<sup>th</sup> Institute on Rehabilitation Issues (IRI) Prime Study Group encourages them to adopt the more pragmatic cultural humility approach (IRI, 2015). In the cultural humility approach, "the goal is not to master a finite body of knowledge but to simultaneously look inward to examine one's own conscious and unconscious biases, to reach outward to build relationships with individuals and communities, and to see the client as the expert" (Tervalon & Murray-Garcia, 1998, p. 117). As the percentage of African American or Black, American Indian or Alaska Native, Asian, and Latino applicants increases, so will the demand for counselors who can embrace the cultural humility model in an effort to assist consumers to integrate into the competitive labor market. To this end, there will be a need for new policy initiatives and strategies that will assist SVRAs' rapid response to projected trends for this target population. For example, new policy initiatives that encourage staff and leadership trainings on the cultural humility approach could be beneficial. Such trainings could be carried out by Technical Assistance and Continuing Education centers located in RSA regions with heavy minority populations and significant migration trends.

## ■ Conclusion

This study assessed the predictive accuracy of select forecast models in regard to the impacts of immigration trends on SVRA application rates. The MGM was demonstrated to be superior to the VAR model. The MGM three-year forecast projected an upward curve trend trajectory in the percentage of new Black or African American, American Indian or Alaskan Natives, Asians, and Latino applicants for FYs 2015 thru 2017. These findings suggest that the MGM represents a promising forecast approach that could assist SVRAs in responding rapidly and appropriately to potential immigration trends impacts. Moreover, projected application percentage curve trends suggest that SVRAs should prepare and plan to serve individuals with disabilities from these minority groups. However, there remains a need for additional demonstration trials to either confirm or refute the MGM's efficacy in prediction accuracy in comparison to other multivariate forecast models.

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Services Administration (RSA)-911 database. The final predictive multinomial logistic regression model indicated that (a) the odds of White veterans successfully returning to work were nearly 1 ½ times the odds of African American veterans returning to work and (b) African American female veterans had the lowest probability for successfully returning to work. Moreover, findings indicated that African American veterans' successful return-to-work rates in 5 of the 10 RSA regions were below the national benchmark. Recommendations for policy development and future research directions are presented.

Source: Moore, C. L., Wang, N., Johnson, J. E., Manyibe, E. O., Washington, A. L., & Muhammad, A. (2015). Return-to work outcomes rates of African American versus White veterans served by state vocational rehabilitation agencies: A randomized split-half cross-model validation research design. *Rehabilitation Counseling Bulletin*, 1-14. doi:10.1177/10034355215579917

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### **Title: An Emerging Conceptual Framework for Conducting Disability, Health, Independent Living, and Rehabilitation Research Mentorship and Training at Minority Serving Institutions**

**Abstract:** Research mentorship has long been considered a preeminent research capacity building (RCB) approach. However, existing mentorship models designed to improve the research skills (i.e., research methods and grant writing) of faculty scholars at United States minority serving institutions (i.e., historically Black colleges and universities, Hispanic serving institutions, and American Indian tribal colleges and universities) may be insufficient for building such capacities. This paper proposes an emerging conceptual framework for a new Peer-to-Peer Mentor Research Team Model (PPMRTM) designed to enhance the research skills of faculty scholars (herein referred to as fellows) and help to build the needed critical mass of researchers of color in the field of disability, health, independent living, and rehabilitation. A combination of Lippett's planned change theory and critical mass theory provided a useful framework to contextualize and support the design of this model. A set of recommended approaches that can be considered by federal research organizations (i.e., National Institute on Disability, Independent Living, and Rehabilitation Research, and National Institutes of Health), minority serving institutions, and researchers for assessment of the model and advancing the current state of science on minority serving institution RCB are presented.

Source: Manyibe, E. O., Moore, C. L., Aref, F., Washington, A. L., & Hunter, T. (2015). An emerging conceptual framework for conducting disability, health, independent living, and rehabilitation research mentorship and training at minority serving institutions. *Journal of Rehabilitation*, 81(4), 25-37

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### **Title: Disability, Health, Independent Living, and Rehabilitation Research Leaders from Traditionally Underrepresented Racial and Ethnic Populations: Career Development and Success Factors**

## **■ Related RRTC Publications**

*The following other resources published by RRTC investigators may be of interest to readers of this Policy Research Brief.*

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### **Title: Return-to-Work Outcome Rates of African American Versus White Veterans Served by State Vocational Rehabilitation Agencies: A Randomized Split-Half Cross-Model Validation Research Design**

**Abstract:** The purpose of this study was to identify disparities in successful return-to-work outcome rates based on race, gender, and level of educational attainment at closure among veterans with a signed Individualized Plan for Employment (IPE). A randomized split-half cross-model validation research design was used to develop and test a series of logistic regression models for goodness of fit across two samples (i.e., screening and calibration) of case records (N=11,337) obtained from the national Fiscal Year (FY) 2013 Rehabilitation

**Abstract:** This article provides a comprehensive overview of select research skill and leadership building opportunities and research infrastructure systems that contribute to research leaders' from traditionally underrepresented racial and ethnic populations and communities (i.e., African Americans, Native Americans, Latinos, and Asians) in the field of disability, health, independent living, and rehabilitation career development and success. After a short presentation of the Social Change Model of Leadership (SCML) and issues relative to the current insufficient supply of such research leaders, the article shifts focus to a detailed synthesis of the available peer review and grey literature and policy on research career development and success factors. Critical contemporary issues affecting these target groups are discussed. Recommendations for advancing the current state-of-the-science for improving the research and leadership skills and career development outcomes for investigators from these populations, especially those with disabilities, are presented.

Source: Moore C. L., Wang N., Davis D., Aref, F., Manyibe E.O., Washington A.L., Johnson J., Cross K. E., Muhammad, A., & Quinn, J. (2015). Disability, health, independent living, and rehabilitation research leaders from traditionally underrepresented racial and ethnic populations: Career development and success factors, *Journal of Rehabilitation*, 81(1), 19-33

### **Title: Minority Entity Disability, Health, Independent Living, and Rehabilitation Productivity Facilitators: A Review and Synthesis of the Literature and Policy**

**Abstract:** The United States (U.S.) federal research agency (i.e., National Institute on Disability and Rehabilitation Research [NIDRR], National Institutes of Health [NIH]) sponsored research capacity building (RCB) efforts in the field of disability, health and rehabilitation have historically focused on individual research skill building activities (e.g., postdoctoral fellowships, advanced research methods and statistics courses, grant-writing workshops) as a main intervention to facilitate increased research productivity among investigators. However, investigators' personal intrinsic attributes as well as federal research agency policy and systems context are rarely considered as research productivity facilitators. On trend, minority entity (ME) RCB efforts tend to focus on addressing a single challenge, research skill building, while oftentimes neglecting the importance of intrinsic factors and federal agency policy and systems context. The purpose of this review was to synthesize the available peer review and grey literature, and policy on factors that facilitate investigators' research productivity. Recommendations for advancing the current state-of-the-science on research productivity facilitators are presented.

Source: Moore C. L., Aref F., Manyibe E. O., & Davis, E. (2015). Minority entity disability, health, independent living, and rehabilitation research productivity facilitators: A review and synthesis of the literature and policy. *Rehabilitation Counseling Bulletin*, 1-14. doi: 10.1177/0034355214568527

### **Title: New Immigrating Racial and Ethnic Populations and "Trends Impacts" on State Vocational Rehabilitation Agencies**

**Abstract:** Current migration trends and projections indicate that the United States (U.S.) population continues to increase and diversify. Consequently, the numbers of new citizens and legalized permanent residents with disabilities from traditionally underserved racial and ethnic populations are expected to grow at an accelerated rate-roughly 1 million new citizens and legal permanent residents annually. These unceasing migration patterns raise concerns about the capacity of state vocational rehabilitation agencies (SVRAs) across the U.S. to effectively respond to this growing crisis. There exists a serious need to forecast these trends' impacts on SVRA systems capacity to serve persons with disabilities from these new and emerging racial and ethnic populations and communities. The purpose of this review was to synthesize available peer reviewed literature and policy on multicultural migration trends and select SVRA systems forecast implications. A set of recommended approaches are presented that can be used to inform, guide, and forge future research directions. Keywords: immigration trends and policy, disability, state vocational rehabilitation agencies, multiculturalism

Source: Cross K. E., Moore C. L., Manyibe E. O., Aref, F., Washington A. L., Umadjela, A., Sanders P. R., Payma H. S., Pandey, J., & Cyprian, D. (2015). New immigrating racial and ethnic populations and "trends impacts" on state vocational rehabilitation agencies, *Journal of Applied Rehabilitation Counseling*, 46(2)

### **Title: Diffusion of Innovations Theory and Veterans of Color: A framework for Promoting the Adoption of Effective State Vocational Rehabilitation Agencies, American Indian Vocational Rehabilitation Programs, and Veterans Affairs-Vocational Rehabilitation & Employment Co-Service Practices in Vocational Rehabilitation**

**Abstract:** This article discusses the proposition of the adoption of co-service practices between state vocational rehabilitation agencies (SVRAs), American Indian vocational rehabilitation programs (AIVRPs), and Veterans Affairs-Vocational Rehabilitation and Employment (VA-VR&E) programs as a means to increase employment outcomes for veterans of color (i.e., African Americans, Latinos, Native Americans, and Asians) with disabilities. Collaborative agency practices have been shown to contribute to successful outcomes. However, there is less discussion on how to implement and promote the adoption of co-service practices between SVRA, AIVRP and VA-VR&E agencies. The purpose of this article was to discuss the need for interagency collaborations and Diffusion of Innovations Theory as an approach for promoting the adoption of co-service practices across these agency contexts to increase successful employment services and outcomes for

these veterans. A set of recommended approaches that can be considered for advancing the current state-of-the-science on improving SVRAs and VA-VR&E, and AIVRPs and VA-VR&E program co-service strategies for placing these veterans into competitive integrated employment are presented.

Source: Johnson, J. E., Moore, C. L., Wang, N., Sanders, P., & Sassin, J. (in press). Diffusion of innovations theory and veterans of color: A framework for promoting the adoption of effective state vocational rehabilitation agencies, American Indian vocational rehabilitation programs, and veterans affairs-vocational rehabilitation & employment co-service practices in vocational rehabilitation. *Journal of Applied Rehabilitation Counseling*

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**Title: A National Benchmark Investigation of Return-to-Work Outcome Rates Between African American, Native American or Alaskan Native, Latino, Asian American or Pacific Islander, and Non-Latino White Veterans Served by State Vocational Rehabilitation Agencies: Application of Bootstrap Data Expansion**

**Abstract:** Research examining the provision of effective state vocational rehabilitation agency (SVRA) sponsored services is pertinent to improving successful return-to-work outcomes among veterans of color (i.e., African Americans, Native Americans or Alaska Natives, Latinos, and Asian Americans or Pacific Islanders versus non-Latino Whites). To date, however, scant attention has been paid to examining such target group's outcome patterns. This study employed a stratified bootstrap data expansion approach to assess the relationship between race/ethnicity, gender, level of educational attainment at closure and return-to-work among veterans with a signed individualized plan for employment (IPE). National fiscal year (FY) 2013 Rehabilitation Services Administration (RSA)-911 case records (N =11,603) were extracted and re-sampled across multiple trials using bootstrap procedures to increase logistic regression model accuracy. The findings indicated that African American and female veterans were statistically significantly less likely to return-to-work compared to non-Latino White and female veterans, respectively. Return-to-work probabilities were 'poorest' for African American veterans followed by Native Americans or Alaska Natives, Asian Americans or Pacific Islanders, Latinos, and then non-Latino Whites. These findings warrant new service (e.g., greater SVRA and U.S. Department of Veterans Affairs' (VA) co-service provision) and policy initiatives.

Source: Moore, C. L., & Wang, N. (in press). A national benchmark investigation of return-to-work outcome rates between African American, Native American or Alaskan Native, Latino, Asian American or Pacific Islander, and Non-Latino White veterans served by state vocational rehabilitation agencies: Application of bootstrap data expansion. *Journal of Vocational Rehabilitation*

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Special Note: This brief represents an excerpt of a manuscript accepted for publication in the *Journal of Vocational Rehabilitation* titled "Immigration Trends' Impacts on State Vocational Rehabilitation Agency Minority Application Rates: An Empirical Forecast Model Demonstration Study".