Veterans Migration Trends, 2010 to 2019

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Abstract

In this paper we hope to track the migration trends of veterans from year to year. We are tracking the movements among the various metro areas as defined by the American Community Survey. We end up showing that while specific cohorts are moving from more rural areas to the more urban areas across the country, the rate is very low. We also show that when taken as a whole, it is very difficult to track the movement of veterans. This is due to a lot of movement among counties within a specific metro group. For example, moving from one very rural county to another similarly rural county. Even with this movement though, it does appear that the most populated areas are loosing veterans at a slightly faster pace than the lower populated areas.

1 Introduction

Currently the budget for Veterans Affairs is 301.4 billion, va.gov. This budget is to be used to assist veterans and their families to include compensation and pensions, housing, educational, and many other benefits. Providing so much money to veterans requires us to at least as the question, "Where are these veterans moving to?" For example, if we spend the lion share of this money in urban areas, upgrading facilities and providing urban housing and then find that veterans are leaving those areas for a more rural simpler life, then in several years those facilities or housing may be unused. Therefore, it will greatly benefit the US Government to understand where its veterans are moving to and at what rate.

2 Literature Review

[Amaral et al., 2018] is the most closely related paper to the question that I am asking. While published in 2018 they used data from the 2000 census and

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then added data from the Department of Veterans Affairs to determine the numbers of veterans in each cohort. They then use this data to estimate the location of veterans in 2014 and 2024. I will use the census data from 2010 to 2014 to try to get a more accurate picture of what happened during this time. My results should either validate or challenge what was expected. Either way, finding the migration patterns in veterans is important, especially in this age of limited resources. Veterans benefits account for a substantial portion of the federal budget. Using migration trends, policy makers can hope to direct this money where it is needed most. One example of this would be for the Veterans Affairs (VA) Hospitals. In [Buzza et al., 2011], the authors found that distance was identified by patients, providers, and staff to be the most important barrier to rural veterans in seeking healthcare. This team used surveys, interviews, and focus groups at 15 VA hospitals throughout the Midwest. This area has some of the largest distances between VA's in the nation. One of the main things I hope to use from this paper is they show that rural populations contribute disproportionately more veterans than urban populations.
Similarly, in [Buchmuller et al., 2004], the authors look at the effect of closing a hospital has on patients regarding the distance traveled to an open hospital. It goes into which patients may be affected more by a hospital closure. It also explores the consequences that this has on those patients affected. Finally, [Mooney et al., 2000], looks specifically at the effect travel distance to the VA hospitals has on surgical care. This paper contributes a few ideas to my own research. For starters they show that VA hospitals were not built near where the veterans lived as of 1990's. They also show that usage of the VA hospital decreases with an increase in travel of only 15 miles. This means VA usage is very sensitive to distance between the veteran's home and VA location. It does show though those veterans over 65 years of age are less effected by the travel distance than the younger veterans. They used the Zip Code Areas (ZCA) and compared the service area with the number of Service Connected (SC) veterans in that area. They then compared this with the VA usage to determine what percentage of usage the VA had.
Regarding migration trends, the working paper by Courtney Coile [Coile, 2021] attempts to explore the differences in locations for retirees. One of the main contributions from this paper is that it shows large differences in the locations of retirees, and it examines how health problems in low-income families are exacerbated by distance to a hospital. It also shows that mortality rates are more dependent on where the retiree lives as opposed to where they came from. Specifically, it shows that a lot of retirees where displaced due to hurricane Katrina and that their mortality rate was more dependent on where they ended up instead of where they started from. They use Commuting Zones (CZ) and Public Use Micro data Area (PUMA). They use these locations to show that there can be a large difference of retired population between 2 adjacent CZ. I hope to use a similar method to show that events happening around the country have displaced veterans causing the migration trends to change over time. One possible contribution to migration of veterans could be education, as is explored in [Malamud and Wozniak, 2012]. In this

paper the authors specifically focus on the effect that education had on Vietnam veterans' migration. This paper looks at the fact that the Vietnam War used the draft. Therefore, many people were randomly granted veteran status and therefore had access to education than would have without the war. While this may not be the only cause for a change in migration trends, it shows that there are exogenous factors that can affect migration patterns among veterans in the United States.
[Cowper et al., 1994] looks specifically at the mobility of older veterans in regards to migration trends. They specifically find that veterans of an older age tend to be residentially stable. Meaning that they are not as prone to movement. This would show up in our research as a limited amount of movement, especially among the older cohorts. [Bailey, 2011] also helps track the migration patterns of specific demographics of veterans. Specifically, it shows that, among all demographics, veterans showed elevated rates of migration as opposed to non veterans. Showing that migration trends among veterans may not coincide with civilian migration trends.
[Collins and Wanamaker, 2014] looks at the migration tends among certain demographics of civilians.

3 Data

For this paper, we are using data from the American Community Survey. We pulled the 5-Year Estimates Subject Tables for 2010 thru 2019. This gives me 10 years' worth of data. We also used the Rural Urban Codes (RUC) data from 2013 published by the United States Census Bureau. This data allowed us to identify what RUC the Census Bureau has assigned to each county in the United States of America. The RUC codes are a number from 1 to 7. 1 being the most populated urban areas and 7 being the least populated urban areas.

Statistic	N	Mean	St. Dev.	Min	Max
VetPop	25,749	7,813.731	17,108.730	0	368,128
CivPop	25,749	92,876.960	266,963.400	54	7,862,422
FIPS	25,749	31,534.110	16,703.640	1,001	72,153
RUC	25,749	4.005	2.210	1	7
Year	25,749	2,014.499	2.872	2,010	2,019
VetPercent	25,749	0.039	0.085	0.000	1.649
CivPercent	25,749	0.039	0.112	0.00002	3.202

Table 1: Summary Statistics Table

As we can see from the Summary Statistics Table, one issue with the data we use is the standard deviation of the number of veterans. Since the mean is 7,813 with a standard deviation of 17,108 it leaves a lot of zeros in the data.

Another thing to note is the mean, standard deviation and max of the VetPercent variable. This shows us that the maximum percentage of veterans in a county in a particular year is only 1.649 percent. So when we get to our results table, a change of 0.01 percent can by fairly significant to the overall change in veteran population percentage of a county.

4 Methods

For this paper, we are doing a simple regression model to determine the effect that an increase in years has on the veteran population as well as the civilian population. We began by merging the veteran data with the RUC code. Then, we made a subset for each RUC per year. We then used this to get a sum of each group of veterans, and civilians to be able to give me the percentage of both groups in each RUC per year. As one would expect it is not a very simple trend. The trend line is extremely obvious when you look at a particular RUC group, as in Figure 1.

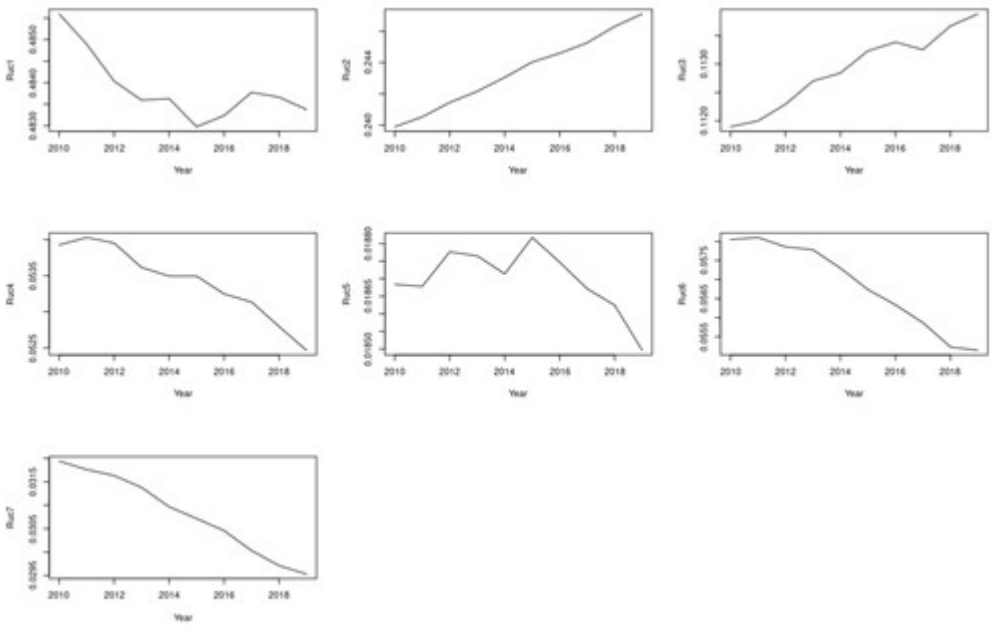

Figure 1: Graph of the change in RUC per year

RUC 1, 4, 6, and 7 all appear to be on a decline, while RUC 2 and 3 are gaining. RUC 5 however seems to be bouncing around. This leads me to the idea that it is not a simple matter of veterans moving from more urban areas to more rural areas, or vice versa. It appears that veterans may be migrating

to the middle RUC's. This would make sense due to the more rural areas not having the job infrastructure to be able to raise a family as well as the more urban areas being too populated for the veterans to feel comfortable. This trend is not as simple as what it appears on the graphs above though. There is a lot of movement from county to county within the same RUC areas as well as movement outside. So, when we do a county level regression this basic trend line does not hold up. As you can see in Table 1 when we run the regression at the county level there is not many statistically significant results. Also, the effect would seem very small, if it wasnt for the low percentages in even the largest counties.

Table 1 seems to substantiate the graphs in Figure 1. It appears that there is a correlation on RUC 6 and 7. The effect, however, is so small. This is due to movement among counties within a particular RUC. The only thing that holds up on the County level is the actual numbers show a decrease in veterans year after year. This is shown in Table 2.

Migration Results over 10 years

	Dependent variable:						
	VetPercent						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	-0.00004	0.0002	0.0001	-0.0001	-0.00002	-0.0001**	-0.0001**
	(0.001)	(0.0004)	(0.0002)	(0.0001)	(0.0001)	(0.00003)	(0.00003)
Constant	0.184	-0.395	-0.001	0.176	0.054	0.130**	0.139***
	(1.699)	(0.779)	(0.314)	(0.180)	(0.260)	(0.051)	(0.051)
Observations	4,720	3,944	3,690	2,170	920	5,965	4,340
R2	0.00000	0.0001	0.00004	0.0003	0.00002	0.001	0.002
Adjusted R2	-0.0002	-0.0002	-0.0002	-0.0001	-0.001	0.001	0.001
Residual Std. Error	0.166 (df = 4718)	0.070 (df = 3942)	0.027 (df = 3688)	0.012 (df = 2168)	0.011 (df = 918)	0.006 (df = 5963)	0.005 (df = 4338)
F Statistic	0.002 (df = 1; 4718)	0.343 (df = 1; 3942)	0.150 (df = 1; 3688)	0.710 (df = 1; 2168)	0.017 (df = 1; 918)	5.643** (df = 1; 5963)	6.613** (df = 1; 4338)
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 2: Percent change in Veteran population overall

Migration Results over 10 years

	Dependent variable:						
	(1)	(2)	(3)	VetPop (4)	(5)	(6)	(7)
Year	-530.422***	-268.529***	-143.551***	-140.250***	-106.523***	-60.400***	-49.308***
	(170.226)	(77.784)	(31.331)	(17.997)	(25.922)	(5.075)	(5.170)
Constant	1,089,163.000***	553,361.700***	295,337.900***	287,489.400***	218,680.200***	123,596.100***	100,761.300***
	(342,921.200)	(156,696.600)	(63,117.260)	(36,254.950)	(52,220.660)	(10,223.290)	(10,414.270)
Observations	4,720	3,944	3,690	2,170	920	5,965	4,340
R2	0.002	0.003	0.006	0.027	0.018	0.023	0.021
Adjusted R2	0.002	0.003	0.005	0.027	0.017	0.023	0.020
Residual Std. Error	33,591.120 (df = 4718)	14,032.690 (df = 3942)	5,466.641 (df = 3688)	2,408.000 (df = 2168)	2,258.372 (df = 918)	1,125.785 (df = 5963)	978.212 (df = 4338)
F Statistic	9.709*** (df = 1; 4718)	11.918*** (df = 1; 3942)	20.992*** (df = 1; 3688)	60.730*** (df = 1; 2168)	16.886*** (df = 1; 918)	141.655*** (df = 1; 5963)	90.972*** (df = 1; 4338)
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 3: Actual change in veteran population overall

5 Results

Where we see the most compelling results is when we combine all the veterans from each county together based upon their particular RUC. In this case, we only end up with 10 observations, one for each year, but we show that over a 10 year period RUC 1 has the largest decline. This is shown in Table 3.

Migration Results over 10 years

	Dependent variable:						
	Ruc1	Ruc2	Ruc3	Ruc4	Ruc5	Ruc6	Ruc7
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years	-0.001***	0.001***	0.0002	-0.00001	0.0001***	-0.00001	-0.00002***
	(0.0002)	(0.0001)	(0.0001)	(0.00004)	(0.00004)	(0.00001)	(0.00001)
Constant	0.566***	0.269***	0.119***	0.036***	0.009***	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0002)	(0.00004)	(0.00004)
Observations	10	10	10	10	10	10	10
R2	0.761	0.741	0.287	0.007	0.669	0.178	0.609
Adjusted R2	0.731	0.709	0.198	-0.118	0.627	0.075	0.560
Residual Std. Error (df = 8)	0.001	0.001	0.001	0.0004	0.0003	0.0001	0.0001
F Statistic (df = 1; 8)	25.405***	22.947***	3.221	0.053	16.159***	1.732	12.439***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 4: Each year regressed upon the sums of the total population for each RUC

In this table the effect still seems very small, but there is a definite decline in RUC 1. RUC 1 has approximately 10 million veterans total. so a decline yearly of 0.1 percent is a loss of 10,000 veterans a year. This table mainly shows that most RUC's are declining in population year after year.
Also in Table 3 you can see that RUC 1 and 2 appear to offset each other. However, the size of the veterans population is so much larger in RUC 1 than RUC 2 that it easily gets overwhemled. We show this in Table 4 by combining RUC 1 and 2, along with other combinations of RUC's in order to see the combined effect.
Table 3 demonstrates that the effect of combining RUC 1 and 2 together still results in a overall decrease in veterans though at a smaller percent. By looking at this table, you can see that by combining RUC's of different sizes reveals that overall, there are more veterans leaving the more populated areas and moving to the middle and least populated areas. The overall effect however, is still really small.

Migration Results Grouped Together over 10 years

	Dependent variable:		
	Ruc1 + Ruc2	Ruc3 + Ruc4	Ruc5 + Ruc6
	(1)	(2)	(3)
Years	-0.0003**	0.0001*	0.0001***
	(0.0001)	(0.0001)	(0.00003)
Constant	0.835***	0.154***	0.010***
	(0.001)	(0.0004)	(0.0002)
Observations	10	10	10
R2	0.506	0.373	0.688
Adjusted R2	0.444	0.294	0.649
Residual Std. Error (df = 8)	0.001	0.001	0.0003
F Statistic (df = 1; 8)	8.179**	4.750*	17.626***
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 5: Each year regressed upon the sums of the total population for combined RUC's

6 Cohort Results

In this section we begin to dive into the various cohorts of veterans. The American Community Service data breaks veterans up into five cohorts based on the individuals period of service. The cohorts are World War 2 (WW2), Vietnam War, Korean War, Gulf War 8/1990 thru 8/2001, and Gulf War 9/2001 and later. We calculate the age range of veterans as of 2022 by considering that the oldest member of the cohort would have turned 60 in the first year. Currently in the military you are not allowed to serve past age 60. There are exceptions that can be made, but they are so few and far between that it gives us a pretty good idea for the upper age limit. As for the lower, we will use age 18 at the end of the cohort period. Again, you can enlist at 17 with parental permission but it is not a frequent occurrence. By adding these ages to the difference between 2022 and the first and last year of the cohort we can determine the age range as of the writing of this paper, 2022. We will ignore the World War 2 veterans in this paper. Their period of service was 12/1941 to 12/1946. A veteran in this cohort would have an age range of 94 to 141 in 2022. At that age range, we do not believe it is valuable to track their migration patterns. Therefore we will start by looking at Korean War era veterans. This is veterans from the period of time 7/1950 to 1/1955. A veteran this cohort would have an age range of 85 to 132 in 2022. Table 5 shows the trends in migration for these veterans. As you can see there is a statistically significant positive correlation for Metro area's one and two, while

a negative trend exists in all other metro groups. This shows that either veterans are living longer in the two most urban areas as opposed to the rest of the areas, or that veterans are moving to these locations.

Korean Cohort Migration Results over 10 years

	Dependent variable:						
	VetPercent						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	0.010***	0.004***	-0.001***	-0.002***	-0.003***	-0.005***	-0.005***
	(0.001)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Constant	-19.681***	-7.375***	2.020***	4.110***	5.688***	9.388***	10.406***
	(1.283)	(0.615)	(0.286)	(0.176)	(0.257)	(0.111)	(0.147)
Observations	4,720	3,944	3,690	2,170	920	5,965	4,340
R2	0.048	0.036	0.013	0.199	0.346	0.545	0.535
Adjusted R2	0.048	0.035	0.013	0.198	0.345	0.545	0.535
Residual Std. Error	0.126 (df = 4718)	0.055 (df = 3942)	0.025 (df = 3688)	0.012 (df = 2168)	0.011 (df = 918)	0.012 (df = 5963)	0.014 (df = 4338)
F Statistic	237.066*** (df = 1; 4718)	145.823*** (df = 1; 3942)	48.073*** (df = 1; 3688)	536.930*** (df = 1; 2168)	485.482*** (df = 1; 918)	7,147.786*** (df = 1; 5963)	5,000.744*** (df = 1; 4338)
Note:	*p<0.1; **p<0.05; ***p<0.01						
	This is years regressed on the Veteran population of Korean War era veterans.						

Table 6: Korean War Era Cohort, 7/1950 thru 1/1955

We will now analyze the Vietnam War cohort. This period of time covers veterans from 8/1964 to 4/1975. A veteran in this cohort would have an age range of 65 to 118 as of 2022. You can see a very similar trend in Table 6. there is a definite positive correlation with the first two metro areas and a negative correlation with all the rest.

Vietnam Cohort Migration Results over 10 years

	Dependent variable:						
	VetPercent						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	0.009***	0.004***	-0.001***	-0.002***	-0.003***	-0.004***	-0.005***
	(0.001)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.00004)	(0.0001)
Constant	-18.327***	-7.225***	2.054***	3.820***	5.431***	8.822***	9.745***
	(1.148)	(0.554)	(0.246)	(0.155)	(0.260)	(0.086)	(0.106)
Observations	4,720	3,944	3,690	2,170	920	5,965	4,240
R2	0.052	0.042	0.018	0.216	0.320	0.635	0.658
Adjusted R2	0.051	0.042	0.018	0.216	0.319	0.635	0.658
Residual Std. Error	0.112 (df = 4718)	0.050 (df = 3942)	0.021 (df = 3688)	0.010 (df = 2168)	0.011 (df = 918)	0.010 (df = 5963)	0.010 (df = 4338)
F Statistic	256.873*** (df = 1; 4718)	172.775*** (df = 1; 3942)	67.517*** (df = 1; 3688)	597.255*** (df = 1; 2168)	432.453*** (df = 1; 918)	10,395.850*** (df = 1; 5963)	8,341.325*** (df = 1; 4338)
Note:	*p<0.1; **p<0.05; ***p<0.01						
	This is years regressed on the Veteran population of Vietnam era veterans.						

Table 7: Vietnam War Era Cohort, 8/1964 thru 4/1975

In looking at Table 7 we will start to notice that, not only does the pattern hold up of positive correlation to the 1st 2 metro areas, but also, the amounts seem to be very similar in all 3 tables. This is the Gulf War 8/1990 to 8/2001 cohort. They have an age range of 39 to 92 as of 2022.

1990 to 2001 Gulf War Cohort Migration Results over 10 years

	Dependent variable:						
	VetPercent						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	0.009***	0.003***	-0.002***	-0.002***	-0.003***	-0.004***	-0.004***
	(0.001)	(0.0004)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Constant	-18.504***	-6.620***	3.414***	4.952***	6.626***	8.158***	8.326***
	(1.329)	(0.737)	(0.343)	(0.232)	(0.351)	(0.112)	(0.134)
Observations	4,720	3,944	3,690	2,170	920	5,965	4,340
R2	0.040	0.020	0.026	0.172	0.277	0.468	0.470
Adjusted R2	0.040	0.020	0.025	0.172	0.277	0.468	0.470
Residual Std. Error	0.130 (df = 4718)	0.066 (df = 3942)	0.030 (df = 3688)	0.015 (df = 2168)	0.015 (df = 918)	0.012 (df = 5963)	0.013 (df = 4338)
F Statistic	195.487*** (df = 1; 4718)	81.916*** (df = 1; 3942)	96.839*** (df = 1; 3688)	451.649*** (df = 1; 2168)	352.417*** (df = 1; 918)	5,249.649*** (df = 1; 5963)	3,854.543*** (df = 1; 4338)
Note:	*p<0.1; **p<0.05; ***p<0.01						
	This is years regressed on the Veteran population of 1990 to 2001 Gulf War era veterans.						

Table 8: Gulf War Era Cohort, 8/1990 thru 8/2001

Table 8 shows the Gulf War veterans for 8/2001 and later. This group encompasses the widest age range. This covers veterans who are 18 up to 81 as of 2022. Again, we see similar results with the population trending towards the higher metro areas.

2001 and later Gulf War Cohort Migration Results over 10 years

	Dependent variable:						
	VetPercent						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	0.009***	0.003***	-0.002***	-0.003***	-0.004***	-0.004***	-0.004***
	(0.001)	(0.0004)	(0.0002)	(0.0002)	(0.0003)	(0.0001)	(0.0001)
Constant	-18.863***	-6.716***	4.140***	5.758***	7.933***	7.815***	7.976***
	(1.453)	(0.880)	(0.419)	(0.318)	(0.568)	(0.137)	(0.162)
Observations	4,720	3,944	3,690	2,170	920	5,965	4,340
R2	0.035	0.015	0.025	0.130	0.174	0.351	0.357
Adjusted R2	0.035	0.015	0.025	0.130	0.173	0.350	0.357
Residual Std. Error	0.142 (df = 4718)	0.079 (df = 3942)	0.036 (df = 3688)	0.021 (df = 2168)	0.025 (df = 918)	0.015 (df = 5963)	0.015 (df = 4338)
F Statistic	169.778*** (df = 1; 4718)	59.241*** (df = 1; 3942)	95.826*** (df = 1; 3688)	324.228*** (df = 1; 2168)	193.103*** (df = 1; 918)	3,219.346*** (df = 1; 5963)	2,410.571*** (df = 1; 4338)
Note:	*p<0.1; **p<0.05; ***p<0.01						
	This is years regressed on the Veteran population of 2001 and later Gulf War era veterans.						

Table 9: Gulf War Era Cohort, 9/2001 thru present

7 Conclusion

At this point in the paper I have drawn a few contradictory conclusions. For starters, when each RUC is looked at as a whole, it appears that the metro areas are loosing more veterans than the rural areas. However, when you look at each cohort it appears that the urban areas are actually gaining compared to the rural areas. I believe that the issue throwing off the numbers is the World War 2 veterans. They are still a large group, and it appears that they are grouped in the more urban areas. Probably due to nursing home availability's. This would lead to a decrease in the urban areas due to these veterans dieing at a faster rate than the younger veterans.

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