Veteran's Benefits (VB) Imputation

Current Population Survey (CPS) provides Veteran's Benefits (VB) micro-data in the March Supplement, such as the total number of VB recipients as well as their overall weighted-sum benefits. However, these numbers are underestimated compared with the reports from US Department of Veterans Affairs (USVA). We augmented total number of recipients and their dollar amount of benefits from CPS 2014 March Supplement to match the 2014, and some information in 2015, VB reports provided on USVA website.

In addition to match VB recipients number and total benefits, we tried to maintain CPS original micro-data distribution by utilizing USVA current distribution and VB rules. However, CPS data is insufficient in many ways. In order to augment data reasonably, a number of assumptions are made. This report illustrates details those assumptions and explains imputation procedure.

CPS micro-data and VB targets

CPS data on VB
In the VB section of CPS March Supplement, each respondent reports how much benefit received during previous calendar year. Meanwhile, they also report the type of VB received, within 5 types of categories: Disability compensation, Survivor benefit, Veterans' pension, Education assistance and Other payments. There is no overlap problem for recipients, which means a veteran would only receive one type of payments.

Besides, CPS does not report any Medical care benefits that veterans enjoy.

Targets for imputation
The targets for imputation come from USVA official data. In Fiscal Year 2014, an average of 5 million of veterans or veterans' dependents claims roughly 88 billion benefits. The annual average benefits for each recipient is 17 thousand, which varies across state. So, for our imputation, CPS March Supplement data is sub-grouped by state for a better measurement.

The Medical care benefits are 59 billion in total. In order to cover this part of benefits, a simple assumption is made: an evenly distribution on current VB recipients. The average Medical care benefit is also calculated by state.

Here is the summary of dollar benefit targets for each state:

State	CPS total benefits (Annually)	Admin total benefits (Annually)	Medical care benefits (Annually)
Alabama	1,047,362,612	2,100,415,963	1,021,715,496
Alaska	178,823,523	319,167,679	222,938,068
Arizona	1,635,036,508	2,076,211,334	1,375,088,364
Arkansas	905,104,453	1,150,998,996	940,245,623
California	5,216,169,010	8,224,416,627	5,584,851,466
Colorado	1,366,983,041	1,826,463,088	931,561,758
Connecticut	493,083,279	538,980,032	593,311,871

Delaware	204,019,532	237,857,966	150,788,104
District of Columbia	70,810,801	125,472,016	225,406,129
Florida	4,179,276,737	6,662,401,370	4,662,292,889
Georgia	1,926,513,955	3,533,617,453	1,707,820,976
Hawaii	327,430,648	555,979,428	254,148,535
Idaho	272,603,431	459,823,187	351,404,348
Illinois	1,660,124,736	2,029,701,338	2,088,426,338
Indiana	865,693,775	1,404,980,698	1,186,401,737
Iowa	215,665,926	671,201,478	638,220,784
Kansas	625,016,379	746,070,934	569,972,323
Kentucky	759,970,632	1,411,203,197	945,027,861
Louisiana	529,500,573	1,358,221,972	875,694,126
Maine	368,561,732	587,677,853	344,244,221
Maryland	1,082,698,822	1,593,195,764	1,027,396,915
Massachusetts	530,277,514	1,368,270,349	1,146,154,558
Michigan	1,036,254,445	2,215,964,286	1,420,982,005
Minnesota	908,636,318	1,297,971,519	1,136,312,754
Mississippi	577,560,933	877,145,223	698,779,879
Missouri	1,252,297,943	1,861,181,348	1,312,030,967
Montana	265,033,549	377,258,990	338,208,051
Nebraska	570,399,358	627,994,356	449,166,839
Nevada	889,449,339	885,350,225	818,193,335
New Hampshire	231,518,394	369,414,649	285,915,175
New Jersey	884,877,166	1,261,165,632	784,095,687
New Mexico	779,282,838	873,753,666	540,539,838
New York	1,913,652,886	2,945,076,939	2,930,966,285
North Carolina	1,920,323,003	3,807,122,476	1,987,215,553
North Dakota	104,471,354	196,692,862	155,677,485
Ohio	1,943,219,472	2,559,991,647	2,316,111,261

Oklahoma	1,092,725,518	1,979,633,480	808,573,919
Oregon	1,189,581,207	1,424,797,763	1,039,902,679
Pennsylvania	1,587,947,134	2,809,224,066	2,193,636,664
Rhode Island	213,687,912	273,101,382	225,710,295
South Carolina	573,416,486	2,136,143,859	1,045,378,196
South Dakota	141,577,121	269,962,308	328,674,664
Tennessee	1,186,655,405	2,264,376,807	1,393,180,607
Texas	4,830,668,093	8,640,089,190	4,345,103,485
Utah	382,765,261	553,529,722	405,189,301
Vermont	125,840,458	156,124,355	130,726,833
Virginia	2,279,663,349	3,661,160,167	1,443,669,250
Washington	1,021,791,092	2,462,388,119	1,202,932,472
West Virginia	405,154,128	772,741,986	716,201,564
Wisconsin	754,692,678	1,285,635,125	1,263,430,484
Wyoming	88,420,963	170,004,630	205,409,953

Imputation Procedure

Except Medical care benefits, we follow a similar two-step procedure like SSI imputation. First, we add up the individual weight in the recipient pool to reach the administrative level for each state. Second, we impute and get the adjust ratio for benefits amount to match the dollar benefit total.

Step Ⅰ: impute recipient
A basic linear regression model is built up for analyzing the likelihood of being a recipient. Following VB rules and CPS available information, the independent variables contain age, gender, earned income, whether disabled and whether on active.

According to the eligibility of Disability Compensation, a major type of VB, the degrees of disability will affect the amount of benefits receive. CPS provides 6 kinds of disability information for each individual. In order to detect the level of disability, the 6 types of disability are separately applied as control variables.

Because VB is an exclusive welfare for veterans and relevant dependents, we include whether being an active soldier a dummy variable.

Some of the variables we choose may not be the same as what USVA officially uses, but they are good proxies. For instance, CPS does not cover the sorts of disability such as PTSD. But existing types are fair estimations.

$$VB\ indicator = \alpha + \beta_1 * age + \beta_2 * gender + \beta_3 * income + \beta_4 * disability_1 + \qquad \beta_5 * disability_2 + \beta_6 * disability_3 +$$

We run the model on a subset of CPS dataset. Because only previous soldiers and their dependents may be eligible for welfare, we limit our regression model to veterans and their family members.

Then we rank all recipients by their fitted probability. For each state's sub-group, we sum-up their weights until the weights reach administrative level. For the state whose pre-imputation weights are bigger than administrative data, we skip this step and do a direct shrink in following step.

Step Ⅱ:
For each imputed recipient, we assign the average benefit amount for correspondent state. Then we calculate the total dollar benefits again for each state, and compare the new dollar benefits with VB administrative data. Conditions vary among states, and we can get the adjustment ratios by dividing administrative benefits to imputed benefits. Most adjustment ratios nearly equal to 1. We use the adjustment ratios to augment or shrink each household's benefits.

For Medical Care imputation, CPS does not contain any relevant information. We follow a simple assumption that makes an evenly distribution of official benefits to current VB recipients. In other words, among each state, a same amount of Medical Care benefits is added to CPS VB welfare.

Appendix

Table 1: VB recipients' numbers by state

State	CPS total recipients	Administrative total recipients
Alabama	55,991	119,975
Alaska	11,456	19,453
Arizona	94,511	113,899
Arkansas	49,004	59,772
California	326,386	428,720
Colorado	93,203	104,931
Connecticut	34,980	31,052
Delaware	12,848	13,969
District of Columbia	4,609	6,482
Florida	248,072	385,967
Georgia	141,883	201,363
Hawaii	19,864	27,519
Idaho	25,523	29,919
Illinois	115,399	113,659
Indiana	77,677	97,817
Iowa	26,688	45,598
Kansas	35,325	43,905
Kentucky	58,340	78,984
Louisiana	43,353	75,406
Maine	31,165	31,021
Maryland	84,577	88,470
Massachusetts	51,510	73,297
Michigan	76,135	123,568
Minnesota	87,231	102,267
Mississippi	38,295	52,949
Missouri	82,554	108,454
Montana	20,056	24,633

Nebraska	38,753	46,218
Nevada	53,554	51,861
New Hampshire	17,279	21,521
New Jersey	60,929	66,182
New Mexico	45,868	43,579
New York	130,161	157,041
North Carolina	123,592	207,221
North Dakota	9,664	14,035
Ohio	130,588	159,345
Oklahoma	77,866	105,569
Oregon	68,276	79,309
Pennsylvania	109,362	153,418
Rhode Island	16,074	14,686
South Carolina	56,411	114,576
South Dakota	8,705	18,220
Tennessee	97,590	129,587
Texas	299,556	467,365
Utah	21,753	30,436
Vermont	6,962	8,734
Virginia	145,864	197,441
Washington	86,066	144,742
West Virginia	25,687	40,883
Wisconsin	67,107	80,774
Wyoming	6,366	12,073

Table 2: VB average benefits by state, without Medical Care

State	Average annual benefit
Alabama	17,507
Alaska	16,407
Arizona	18,229
Arkansas	19,256
California	19,184

Colorado	17,406
Connecticut	17,357
Delaware	17,028
District of Columbia	19,357
Florida	17,262
Georgia	17,548
Hawaii	20,203
Idaho	15,369
Illinois	17,858
Indiana	14,363
Iowa	14,720
Kansas	16,993
Kentucky	17,867
Louisiana	18,012
Maine	18,945
Maryland	18,008
Massachusetts	18,667
Michigan	17,933
Minnesota	12,692
Mississippi	16,566
Missouri	17,161
Montana	15,315
Nebraska	13,588
Nevada	17,072
New Hampshire	17,165
New Jersey	19,056
New Mexico	20,050
New York	18,754
North Carolina	18,372
North Dakota	14,014
Ohio	16,066
Oklahoma	18,752
Oregon	17,965
Pennsylvania	18,311
Rhode Island	18,596
South Carolina	18,644
South Dakota	14,817
Tennessee	17,474
Texas	18,487
Utah	18,187
Vermont	17,875
Virginia	18,543
Washington	17,012
West Virginia	18,901
Wisconsin	15,916
Wyoming	14,081

Table 3: Adjustment ratios by state

State	Imputed benefits	Admin benefits	Adjust ratio
Alabama	1,685,142,531	2,100,415,963	1.2464
Alaska	323,631,614	319,167,679	0.9862
Arizona	1,904,945,143	2,076,211,334	1.0899
Arkansas	789,660,212	1,150,998,996	1.4576
California	6,934,947,044	8,224,416,627	1.1859
Colorado	1,896,712,618	1,826,463,088	0.9630
Connecticut	507,944,055	538,980,032	1.0611
Delaware	179,561,037	237,857,966	1.3247
District of Columbia	91,325,767	125,472,016	1.3739
Florida	4,858,138,050	6,662,401,370	1.3714
Georgia	3,632,774,576	3,533,617,453	0.9727
Hawaii	505,648,849	555,979,428	1.0995
Idaho	475,288,090	459,823,187	0.9675
Illinois	2,222,394,376	2,029,701,338	0.9133
Indiana	1,328,684,387	1,404,980,698	1.0574
Iowa	366,045,671	671,201,478	1.8337
Kansas	886,304,155	746,070,934	0.8418
Kentucky	1,285,697,182	1,411,203,197	1.0976
Louisiana	979,708,438	1,358,221,972	1.3864
Maine	439,246,001	587,677,853	1.3379
Maryland	1,290,116,365	1,593,195,764	1.2349
Massachusetts	1,041,016,241	1,368,270,349	1.3144
Michigan	2,174,073,847	2,215,964,286	1.0193
Minnesota	1,111,068,626	1,297,971,519	1.1682
Mississippi	862,758,460	877,145,223	1.0167
Missouri	1,435,953,663	1,861,181,348	1.2961
Montana	395,759,177	377,258,990	0.9533
Nebraska	626,830,186	627,994,356	1.0019
Nevada	833,876,609	885,350,225	1.0617
New Hampshire	185,517,590	369,414,649	1.9913
New Jersey	790,801,958	1,261,165,632	1.5948
New Mexico	735,415,613	873,753,666	1.1881
New York	3,221,039,933	2,945,076,939	0.9143
North Carolina	3,341,572,594	3,807,122,476	1.1393
North Dakota	135,687,417	196,692,862	1.4496
Ohio	2,755,925,908	2,559,991,647	0.9289
Oklahoma	1,961,306,675	1,979,633,480	1.0093
Oregon	1,199,360,106	1,424,797,763	1.1880
Pennsylvania	2,374,934,556	2,809,224,066	1.1829
Rhode Island	241,694,453	273,101,382	1.1299
South Carolina	2,333,033,917	2,136,143,859	0.9156
South Dakota	224,602,013	269,962,308	1.2020
Tennessee	1,962,490,353	2,264,376,807	1.1538
Texas	7,472,462,315	8,640,089,190	1.1563

Utah	505,809,254	553,529,722	1.0943
Vermont	164,145,807	156,124,355	0.9511
Virginia	3,589,625,360	3,661,160,167	1.0199
Washington	1,948,805,663	2,462,388,119	1.2635
West Virginia	632,083,267	772,741,986	1.2225
Wisconsin	1,061,960,989	1,285,635,125	1.2106
Wyoming	146,209,355	170,004,630	1.1627

Table 4: Medical Care Amount for each recipient

State	Medical care average
Alabama	14,789.70
Alaska	16,110.27
Arizona	21,494.38
Arkansas	20,473.26
California	18,559.36
Colorado	20,332.14
Connecticut	28,618.24
Delaware	13,629.73
District of Columbia	56,043.71
Florida	16,401.24
Georgia	9,931.47
Hawaii	14,094.28
Idaho	21,486.14
Illinois	24,099.30
Indiana	18,325.78
Iowa	16,586.96
Kansas	25,448.91
Kentucky	17,056.87
Louisiana	25,736.58
Maine	13,203.31
Maryland	20,240.13
Massachusetts	32,606.93
Michigan	12,207.89
Minnesota	16,344.01
Mississippi	23,152.38
Missouri	20,727.10
Montana	18,199.76
Nebraska	11,578.58
Nevada	20,959.78
New Hampshire	15,494.59
New Jersey	15,746.39
New Mexico	14,537.07
New York	15,312.71
North Carolina	15,787.14
North Dakota	17,131.87
Ohio	25,036.62

Oklahoma	14,194.35
Oregon	12,617.73
Pennsylvania	30,746.64
Rhode Island	13,399.56
South Carolina	19,694.50
South Dakota	28,090.05
Tennessee	15,204.81
Texas	11,421.42
Utah	23,600.41
Vermont	18,629.06
Virginia	11,931.65
Washington	8,352.67
West Virginia	34,358.57
Wisconsin	24,421.17
Wyoming	18,091.08