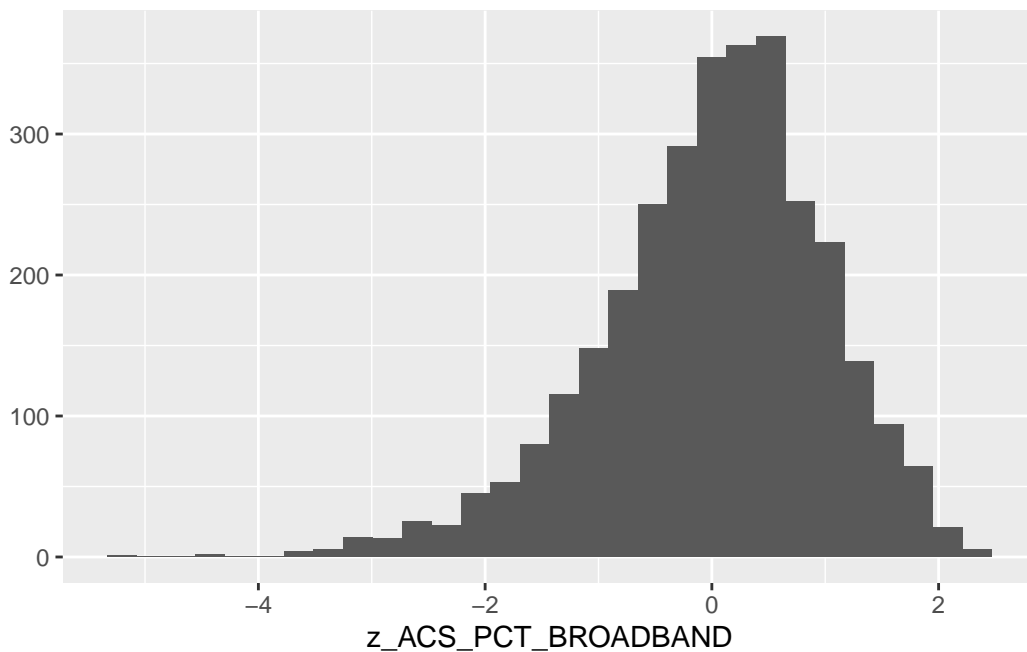


Infrastructure Model

S.Kelly

DV Histogram (Broadband)

```
ggplot(data = Z_and_Final_Variables_10.28.22, mapping = aes(x = z_ACS_PCT_BROADBAND)) +  
  geom_histogram() + labs(y = NULL)
```



```
summary(Z_and_Final_Variables_10.28.22$ACS_PCT_BROADBAND)
```

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
25.65	67.43	73.57	72.69	78.79	95.51

```
options(scipen = 990) #turning off scientific notation for coefficients
```

Infrastructure Model Groupings

IV: Demographics (9 variables), DV: Broadband

```
z_bb_just_demos <- lm(formula = z_ACS_PCT_BROADBAND ~ z_ACS_PCT_BLACK +
  z_ACS_PCT_HISPAN + z_SVI_RPL_THEME1_SOCIECO + z_SVI_RPL_THEME2_HH_DISB +
  z_SVI_RPL_THEME3_MINO + z_SVI_RPL_THEME4_HH_TRANS + z_ACS_PCT_ENGL_NOT_WELL +
  z_ACS_PCT_NON_CITIZEN + z_ACS_MEDIAN_AGE, data = Z_and_Final_Variables_10.28.22)
summary(z_bb_just_demos)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_ACS_PCT_BLACK + z_ACS_PCT_HISPAN +
  z_SVI_RPL_THEME1_SOCIECO + z_SVI_RPL_THEME2_HH_DISB + z_SVI_RPL_THEME3_MINO +
  z_SVI_RPL_THEME4_HH_TRANS + z_ACS_PCT_ENGL_NOT_WELL + z_ACS_PCT_NON_CITIZEN +
  z_ACS_MEDIAN_AGE, data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-4.4496	-0.3385	0.0678	0.4291	1.6833

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.0005465	0.0115555	0.047	0.962
z_ACS_PCT_BLACK	-0.2094188	0.0155848	-13.437	< 0.00000000000000002
z_ACS_PCT_HISPAN	-0.1878035	0.0208245	-9.018	< 0.00000000000000002
z_SVI_RPL_THEME1_SOCIECO	-0.5889010	0.0186520	-31.573	< 0.00000000000000002
z_SVI_RPL_THEME2_HH_DISB	-0.0749303	0.0158309	-4.733	0.000002309
z_SVI_RPL_THEME3_MINO	0.2371591	0.0209542	11.318	< 0.00000000000000002
z_SVI_RPL_THEME4_HH_TRANS	0.0143331	0.0153964	0.931	0.352
z_ACS_PCT_ENGL_NOT_WELL	-0.1725060	0.0329589	-5.234	0.000000177
z_ACS_PCT_NON_CITIZEN	0.2597486	0.0298253	8.709	< 0.00000000000000002
z_ACS_MEDIAN_AGE	-0.1888626	0.0138262	-13.660	< 0.00000000000000002

(Intercept)

z_ACS_PCT_BLACK ***

```

z_ACS_PCT_HISPAN      ***
z_SVI_RPL_THEME1_SOCIECO ***
z_SVI_RPL_THEME2_HH_DISB ***
z_SVI_RPL_THEME3_MINO ***
z_SVI_RPL_THEME4_HH_TRANS
z_ACS_PCT_ENGL_NOT_WELL ***
z_ACS_PCT_NON_CITIZEN ***
z_ACS_MEDIAN_AGE      ***

```

```
---
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.6475 on 3130 degrees of freedom

(1 observation deleted due to missingness)

Multiple R-squared: 0.5814, Adjusted R-squared: 0.5802

F-statistic: 483 on 9 and 3130 DF, p-value: < 0.00000000000000022

Confidence Intervals for Demographic IVs

```
confint(z_bb_just_demos)
```

	2.5 %	97.5 %
(Intercept)	-0.02211055	0.02320360
z_ACS_PCT_BLACK	-0.23997621	-0.17886134
z_ACS_PCT_HISPAN	-0.22863466	-0.14697235
z_SVI_RPL_THEME1_SOCIECO	-0.62547244	-0.55232966
z_SVI_RPL_THEME2_HH_DISB	-0.10597027	-0.04389027
z_SVI_RPL_THEME3_MINO	0.19607364	0.27824455
z_SVI_RPL_THEME4_HH_TRANS	-0.01585491	0.04452109
z_ACS_PCT_ENGL_NOT_WELL	-0.23712932	-0.10788270
z_ACS_PCT_NON_CITIZEN	0.20126945	0.31822785
z_ACS_MEDIAN_AGE	-0.21597188	-0.16175339

VIF for Demographic IVs

```
vif(z_bb_just_demos)
```

z_ACS_PCT_BLACK	z_ACS_PCT_HISPAN	z_SVI_RPL_THEME1_SOCIECO
1.818786	3.226749	2.604590

z_SVI_RPL_THEME2_HH_DISB	1.875876	z_SVI_RPL_THEME3_MINO	3.286010	z_SVI_RPL_THEME4_HH_TRANS	1.775255
z_ACS_PCT_ENGL_NOT_WELL	8.135213	z_ACS_PCT_NON_CITIZEN	6.661849	z_ACS_MEDIAN_AGE	1.431619

IV: Food & Housing (14 variables), DV: Broadband

```
z_bb_just_foodhouse <- lm(formula = z_ACS_PCT_BROADBAND ~ z_food_afford +
  z_fd_enviro_indx + z_fi_percent + z_ACS_PCT_FOOD_STAMP +
  z_childelig_lunch_perc + z_shp_percent + z_shcb_percent +
  z_ACS_PCT_NO_VEH + z_ACS_PCT_RENTER_HH_CHILD + z_ACS_PCT_RENT_COST_30PCT +
  z_ACS_PCT_MOBILE_HOME + z_ACS_PCT_OWNED_HH + z_ACS_PCT_OWNER_HH_CHILD +
  z_ACS_MEDIAN_HOME_VALUE, data = Z_and_Final_Variables_10.28.22)
summary(z_bb_just_foodhouse)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_food_afford + z_fd_enviro_indx +
  z_fi_percent + z_ACS_PCT_FOOD_STAMP + z_childelig_lunch_perc +
  z_shp_percent + z_shcb_percent + z_ACS_PCT_NO_VEH + z_ACS_PCT_RENTER_HH_CHILD +
  z_ACS_PCT_RENT_COST_30PCT + z_ACS_PCT_MOBILE_HOME + z_ACS_PCT_OWNED_HH +
  z_ACS_PCT_OWNER_HH_CHILD + z_ACS_MEDIAN_HOME_VALUE, data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-2.9795	-0.3011	0.0549	0.3613	3.2690

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.017909	0.010988	1.630	0.10323
z_food_afford	-0.305351	0.017277	-17.673	< 0.0000000000000002 ***
z_fd_enviro_indx	0.021469	0.018994	1.130	0.25846
z_fi_percent	-0.071075	0.022313	-3.185	0.00146 **
z_ACS_PCT_FOOD_STAMP	0.012905	0.021193	0.609	0.54264
z_childelig_lunch_perc	-0.198582	0.019500	-10.184	< 0.0000000000000002 ***
z_shp_percent	0.051305	0.019945	2.572	0.01015 *
z_shcb_percent	0.069305	0.021856	3.171	0.00154 **
z_ACS_PCT_NO_VEH	-0.121732	0.015052	-8.088	0.0000000000000009 ***
z_ACS_PCT_RENTER_HH_CHILD	-0.003632	0.013218	-0.275	0.78350
z_ACS_PCT_RENT_COST_30PCT	0.020621	0.015748	1.309	0.19050

```

z_ACS_PCT_MOBILE_HOME      -0.190954    0.015058  -12.681 < 0.00000000000000002 ***
z_ACS_PCT_OWNED_HH         -0.070983    0.015369   -4.619   0.0000040366975395 ***
z_ACS_PCT_OWNER_HH_CHILD    0.151136    0.012947   11.673 < 0.00000000000000002 ***
z_ACS_MEDIAN_HOME_VALUE     0.239520    0.016755   14.296 < 0.00000000000000002 ***
---

```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5725 on 2777 degrees of freedom

(349 observations deleted due to missingness)

Multiple R-squared: 0.683, Adjusted R-squared: 0.6814

F-statistic: 427.4 on 14 and 2777 DF, p-value: < 0.000000000000000022

Confidence Intervals for Food & Housing IVs

```
confint(z_bb_just_foodhouse)
```

	2.5 %	97.5 %
(Intercept)	-0.003635911	0.03945432
z_food_afford	-0.339229249	-0.27147353
z_fd_enviro_indx	-0.015775638	0.05871335
z_fi_percent	-0.114825708	-0.02732411
z_ACS_PCT_FOOD_STAMP	-0.028651901	0.05446127
z_childelig_lunch_perc	-0.236818410	-0.16034610
z_shp_percent	0.012197102	0.09041331
z_shcb_percent	0.026449119	0.11215997
z_ACS_PCT_NO_VEH	-0.151245411	-0.09221801
z_ACS_PCT_RENTER_HH_CHILD	-0.029549525	0.02228555
z_ACS_PCT_RENT_COST_30PCT	-0.010258057	0.05149930
z_ACS_PCT_MOBILE_HOME	-0.220480379	-0.16142764
z_ACS_PCT_OWNED_HH	-0.101118334	-0.04084835
z_ACS_PCT_OWNER_HH_CHILD	0.125749184	0.17652365
z_ACS_MEDIAN_HOME_VALUE	0.206667312	0.27237304

VIF for Food & Housing IVs

```
vif(z_bb_just_foodhouse)
```

z_food_afford	z_fd_enviro_indx	z_fi_percent
2.621112	3.130668	4.291634
z_ACS_PCT_FOOD_STAMP	z_childelig_lunch_perc	z_shp_percent
3.835126	2.604164	3.513064
z_shcb_percent	z_ACS_PCT_NO_VEH	z_ACS_PCT_RENTER_HH_CHILD
4.130954	2.031232	1.510216
z_ACS_PCT_RENT_COST_30PCT	z_ACS_PCT_MOBILE_HOME	z_ACS_PCT_OWNED_HH
2.111717	1.958472	1.985582
z_ACS_PCT_OWNER_HH_CHILD	z_ACS_MEDIAN_HOME_VALUE	
1.476876	2.335424	

IV: Education (3 variables), DV: Broadband

```
z_bb_just_ed <- lm(formula = z_ACS_PCT_BROADBAND ~ z_hsg_rate +
  z_sc_percent + z_ms_average, data = Z_and_Final_Variables_10.28.22)
summary(z_bb_just_ed)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_hsg_rate + z_sc_percent +
  z_ms_average, data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-3.2411	-0.3963	0.0696	0.4650	2.7379

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.003253	0.015148	-0.215	0.830
z_hsg_rate	0.019587	0.016555	1.183	0.237
z_sc_percent	0.688808	0.016192	42.540	< 0.0000000000000002 ***
z_ms_average	0.062770	0.015715	3.994	0.0000669 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7277 on 2323 degrees of freedom

(814 observations deleted due to missingness)

Multiple R-squared: 0.4737, Adjusted R-squared: 0.473

F-statistic: 697 on 3 and 2323 DF, p-value: < 0.00000000000000022

Confidence Intervals for Education IVs

```
confint(z_bb_just_ed)
```

		2.5 %	97.5 %
(Intercept)	-0.03295691	0.02645135	
z_hsg_rate	-0.01287647	0.05205137	
z_sc_percent	0.65705591	0.72056049	
z_ms_average	0.03195359	0.09358651	

VIF for Education IVs

```
vif(z_bb_just_ed)
```

z_hsg_rate	z_sc_percent	z_ms_average
1.022551	1.083295	1.098559

IV: Technology (2 variables), DV: Broadband

```
z_bb_just_tech <- lm(formula = z_ACS_PCT_BROADBAND ~ z_ACS_PCT_NO_PC +  
  z_ACS_PCT_SMARTPHONE, data = Z_and_Final_Variables_10.28.22)  
summary(z_bb_just_tech)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_ACS_PCT_NO_PC + z_ACS_PCT_SMARTPHONE,  
    data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-2.77959	-0.18062	0.04719	0.22725	1.56762

Coefficients:

	Estimate	Std. Error	t value
(Intercept)	0.000000000000000275	0.006313808623399291	0.00
z_ACS_PCT_NO_PC	-0.828010400949268033	0.007015150694798672	-118.03
z_ACS_PCT_SMARTPHONE	-0.204451831475379153	0.007015150694798676	-29.14

```

                                Pr(>|t|)
(Intercept)                                1
z_ACS_PCT_NO_PC      <0.0000000000000002 ***
z_ACS_PCT_SMARTPHONE <0.0000000000000002 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3539 on 3138 degrees of freedom
Multiple R-squared:  0.8749,    Adjusted R-squared:  0.8748
F-statistic: 1.097e+04 on 2 and 3138 DF,  p-value: < 0.00000000000000022

```

Confidence Intervals for Technology IVs

```
confint(z_bb_just_tech)
```

```

                2.5 %      97.5 %
(Intercept)    -0.01237961  0.01237961
z_ACS_PCT_NO_PC -0.84176515 -0.81425565
z_ACS_PCT_SMARTPHONE -0.21820658 -0.19069708

```

VIF for Technology IVs

```
vif(z_bb_just_tech)
```

```

z_ACS_PCT_NO_PC z_ACS_PCT_SMARTPHONE
      1.234107      1.234107

```

IV: HWCC (7 variables), DV: Broadband

```

z_bb_just_HWCC <- lm(formula = z_ACS_PCT_BROADBAND ~ z_pphd_avgnum +
  z_pmhd_avgnum + z_lbw_percent_lbw + z_pi_phy_inact + z_cip_perc +
  z_csph_perc + z_ACS_PCT_CHILD_DISAB, data = Z_and_Final_Variables_10.28.22)
summary(z_bb_just_HWCC)

```


Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_pphd_avgnum + z_pmhd_avgnum +  
    z_lbwl_percent_lbwl + z_pi_phy_inact + z_cip_perc + z_csph_perc +  
    z_ACS_PCT_CHILD_DISAB, data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-3.1516	-0.3543	0.0472	0.4080	2.0112

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.01145	0.01126	1.017	0.309150
z_pphd_avgnum	-0.29615	0.03696	-8.013	0.000000000000000159 ***
z_pmhd_avgnum	0.23196	0.03316	6.996	0.000000000000323655 ***
z_lbwl_percent_lbwl	0.02940	0.01498	1.962	0.049820 *
z_pi_phy_inact	-0.22720	0.01352	-16.807	< 0.00000000000000002 ***
z_cip_perc	-0.63233	0.02184	-28.954	< 0.00000000000000002 ***
z_csph_perc	0.06735	0.01674	4.024	0.00005861101315732 ***
z_ACS_PCT_CHILD_DISAB	0.04120	0.01250	3.296	0.000992 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.6189 on 3026 degrees of freedom

(107 observations deleted due to missingness)

Multiple R-squared: 0.6171, Adjusted R-squared: 0.6162

F-statistic: 696.6 on 7 and 3026 DF, p-value: < 0.000000000000000022

Confidence Intervals for HWCC IVs

```
confint(z_bb_just_HWCC)
```

	2.5 %	97.5 %
(Intercept)	-0.01062039361	0.03351819
z_pphd_avgnum	-0.36862224638	-0.22367984
z_pmhd_avgnum	0.16694702375	0.29697542
z_lbwl_percent_lbwl	0.00002308705	0.05877472
z_pi_phy_inact	-0.25371169177	-0.20069785
z_cip_perc	-0.67515112593	-0.58950813
z_csph_perc	0.03453469235	0.10017159
z_ACS_PCT_CHILD_DISAB	0.01669288164	0.06571474

VIF for HWCC IVs

```
vif(z_bb_just_HWCC)
```

z_pphd_avgnum	z_pmhd_avgnum	z_lbw_percent_lbw
10.749658	8.524377	1.777139
z_pi_phy_inact	z_cip_perc	z_csph_perc
1.467398	3.806888	2.125023
z_ACS_PCT_CHILD_DISAB		
1.164656		

IV: Health A (7 variables), DV: Broadband

```
z_bb_just_healthA <- lm(formula = z_ACS_PCT_BROADBAND ~ z_phys_per_cap +  
  z_mhp_per_cap + z_dents_per_cap + z_uninsur_perc + z_uc_percent +  
  z_opcp_rate + z_TeenBirths, data = Z_and_Final_Variables_10.28.22)  
summary(z_bb_just_healthA)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_phys_per_cap + z_mhp_per_cap +  
  z_dents_per_cap + z_uninsur_perc + z_uc_percent + z_opcp_rate +  
  z_TeenBirths, data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-4.4496	-0.4169	0.0663	0.5259	3.2622

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.01079	0.01473	-0.733	0.4637
z_phys_per_cap	0.17028	0.02087	8.158	0.000000000000000497 ***
z_mhp_per_cap	0.03921	0.01920	2.042	0.0412 *
z_dents_per_cap	0.32689	0.02023	16.162	< 0.00000000000000002 ***
z_uninsur_perc	-0.31147	0.01680	-18.545	< 0.00000000000000002 ***
z_uc_percent	0.13676	0.01627	8.406	< 0.00000000000000002 ***
z_opcp_rate	-0.13973	0.01685	-8.294	< 0.00000000000000002 ***
z_TeenBirths	0.10975	0.01536	7.144	0.000000000001138036 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8013 on 2956 degrees of freedom

(177 observations deleted due to missingness)

Multiple R-squared: 0.3722, Adjusted R-squared: 0.3707

F-statistic: 250.3 on 7 and 2956 DF, p-value: < 0.00000000000000022

Confidence Intervals for Health A IVs

```
confint(z_bb_just_healthA)
```

	2.5 %	97.5 %
(Intercept)	-0.039669801	0.01808310
z_phys_per_cap	0.129356282	0.21120658
z_mhp_per_cap	0.001560626	0.07686357
z_dents_per_cap	0.287230801	0.36654779
z_uninsur_perc	-0.344399518	-0.27853494
z_uc_percent	0.104858578	0.16865616
z_opcp_rate	-0.172766400	-0.10670050
z_TeenBirths	0.079624878	0.13986939

VIF for Health A IVs

```
vif(z_bb_just_healthA)
```

z_phys_per_cap	z_mhp_per_cap	z_dents_per_cap	z_uninsur_perc	z_uc_percent
2.001801	1.684706	1.907575	1.314715	1.225089
z_opcp_rate	z_TeenBirths			
1.331673	1.147645			

IV: Health B (5 variables), DV: Broadband

```
z_bb_just_healthB <- lm(formula = z_ACS_PCT_BROADBAND ~ z_phs_rate +  
  z_ms_perc_ann + z_AMFAR_AMATFAC + z_MP_PERCPEN + z_AHRF_RURAL_H_CLINIC,  
  data = Z_and_Final_Variables_10.28.22)  
summary(z_bb_just_healthB)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_phs_rate + z_ms_perc_ann +  
    z_AMFAR_AMATFAC + z_MP_PERCPEN + z_AHRF_RURAL_H_CLINIC, data = Z_and_Final_Variables_10.1)
```

Residuals:

Min	1Q	Median	3Q	Max
-4.5232	-0.5126	0.0766	0.5691	2.6969

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.00616	0.01588	0.388	0.698169
z_phs_rate	-0.30429	0.01662	-18.310	< 0.0000000000000002 ***
z_ms_perc_ann	0.26941	0.01682	16.022	< 0.0000000000000002 ***
z_AMFAR_AMATFAC	0.14072	0.01584	8.883	< 0.0000000000000002 ***
z_MP_PERCPEN	0.05686	0.01644	3.458	0.000551 ***
z_AHRF_RURAL_H_CLINIC	-0.05568	0.01591	-3.500	0.000472 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.874 on 3024 degrees of freedom

(111 observations deleted due to missingness)

Multiple R-squared: 0.2398, Adjusted R-squared: 0.2385

F-statistic: 190.8 on 5 and 3024 DF, p-value: < 0.00000000000000022

Confidence Intervals for Health B IVs

```
confint(z_bb_just_healthB)
```

	2.5 %	97.5 %
(Intercept)	-0.02498257	0.03730235
z_phs_rate	-0.33687575	-0.27170438
z_ms_perc_ann	0.23644020	0.30237989
z_AMFAR_AMATFAC	0.10966042	0.17178531
z_MP_PERCPEN	0.02462073	0.08908854
z_AHRF_RURAL_H_CLINIC	-0.08687332	-0.02448620

VIF for Health B IVs

```
vif(z_bb_just_healthB)
```

z_phs_rate	z_ms_perc_ann	z_AMFAR_AMATFAC
1.086643	1.082685	1.030124
z_MP_PERCPEN	z_AHRF_RURAL_H_CLINIC	
1.073504	1.026653	

IV: Business (4 variables), DV: Broadband

```
z_bb_just_bus <- lm(formula = z_ACS_PCT_BROADBAND ~ z_unemp_perc +  
  z_ACS_GINI_INDEX + z_ACS_MEDIAN_HH_INCOME + z_ACS_PCT_WORK_NO_CAR,  
  data = Z_and_Final_Variables_10.28.22)  
summary(z_bb_just_bus)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_unemp_perc + z_ACS_GINI_INDEX +  
  z_ACS_MEDIAN_HH_INCOME + z_ACS_PCT_WORK_NO_CAR, data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-3.8516	-0.3509	0.0848	0.4270	2.0331

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.001325	0.011662	0.114	0.9096
z_unemp_perc	-0.072382	0.013355	-5.420	0.0000000642 ***
z_ACS_GINI_INDEX	-0.028183	0.012827	-2.197	0.0281 *
z_ACS_MEDIAN_HH_INCOME	0.711314	0.013495	52.711	< 0.0000000000000002 ***
z_ACS_PCT_WORK_NO_CAR	-0.026035	0.012391	-2.101	0.0357 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.6534 on 3134 degrees of freedom

(2 observations deleted due to missingness)

Multiple R-squared: 0.5729, Adjusted R-squared: 0.5724

F-statistic: 1051 on 4 and 3134 DF, p-value: < 0.00000000000000022

Confidence Intervals for Business IVs

```
confint(z_bb_just_bus)
```

	2.5 %	97.5 %
(Intercept)	-0.02154170	0.024191473
z_unemp_perc	-0.09856802	-0.046196936
z_ACS_GINI_INDEX	-0.05333360	-0.003032267
z_ACS_MEDIAN_HH_INCOME	0.68485437	0.737773137
z_ACS_PCT_WORK_NO_CAR	-0.05032981	-0.001740552

VIF for Business IVs

```
vif(z_bb_just_bus)
```

	z_unemp_perc	z_ACS_GINI_INDEX	z_ACS_MEDIAN_HH_INCOME
	1.311143	1.207590	1.338686
z_ACS_PCT_WORK_NO_CAR	1.128109		

IV: Government (5 variables), DV: Broadband

```
z_bb_just_gov <- lm(formula = z_ACS_PCT_BROADBAND ~ z_soc_assoc_num +  
  z_aeo_perc_w_acc + z_dwv_presence + z_ACS_PCT_HH_PUB_ASSIST +  
  z_AHRF_TXC_SITE_NO_CNTRL, data = Z_and_Final_Variables_10.28.22)  
summary(z_bb_just_gov)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_soc_assoc_num + z_aeo_perc_w_acc +  
  z_dwv_presence + z_ACS_PCT_HH_PUB_ASSIST + z_AHRF_TXC_SITE_NO_CNTRL,  
  data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-5.1354	-0.4244	0.0962	0.5453	2.1765

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.0006845	0.0147156	0.047	0.963
z_soc_assoc_num	0.1368460	0.0160048	8.550	<0.0000000000000002 ***
z_aeo_perc_w_acc	0.4931844	0.0158888	31.040	<0.0000000000000002 ***
z_dwv_presence	0.0160104	0.0149332	1.072	0.284
z_ACS_PCT_HH_PUB_ASSIST	-0.1700766	0.0152156	-11.178	<0.0000000000000002 ***
z_AHRF_TXC_SITE_NO_CNTRL	0.0214847	0.0151363	1.419	0.156

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8179 on 3085 degrees of freedom

(50 observations deleted due to missingness)

Multiple R-squared: 0.3312, Adjusted R-squared: 0.3301

F-statistic: 305.6 on 5 and 3085 DF, p-value: < 0.00000000000000022

Confidence Intervals for Government IVs

```
confint(z_bb_just_gov)
```

	2.5 %	97.5 %
(Intercept)	-0.028168919	0.02953800
z_soc_assoc_num	0.105464853	0.16822724
z_aeo_perc_w_acc	0.462030640	0.52433806
z_dwv_presence	-0.013269656	0.04529039
z_ACS_PCT_HH_PUB_ASSIST	-0.199910388	-0.14024281
z_AHRF_TXC_SITE_NO_CNTRL	-0.008193434	0.05116293

VIF for Government IVs

```
vif(z_bb_just_gov)
```

z_soc_assoc_num	z_aeo_perc_w_acc	z_dwv_presence
1.197141	1.153198	1.029896
z_ACS_PCT_HH_PUB_ASSIST	z_AHRF_TXC_SITE_NO_CNTRL	
1.011419	1.063773	

Final Infrastructure Model

DV: Broadband, IVs: 53

```
z_bb_levels_12345678 <- lm(formula = z_ACS_PCT_BROADBAND ~ z_ACS_PCT_BLACK +  
  z_ACS_PCT_HISPAN + z_SVI_RPL_THEME1_SOCIECO + z_SVI_RPL_THEME2_HH_DISB +  
  z_SVI_RPL_THEME3_MINO + z_SVI_RPL_THEME4_HH_TRANS + z_ACS_PCT_ENGL_NOT_WELL +  
  z_ACS_PCT_NON_CITIZEN + z_ACS_MEDIAN_AGE + z_food_afford +  
  z_fd_enviro_indx + z_fi_percent + z_ACS_PCT_FOOD_STAMP +  
  z_childelig_lunch_perc + z_shp_percent + z_shcb_percent +  
  z_ACS_PCT_NO_VEH + z_ACS_PCT_RENTER_HH_CHILD + z_ACS_PCT_RENT_COST_30PCT +  
  z_ACS_PCT_MOBILE_HOME + z_ACS_PCT_OWNED_HH + z_ACS_PCT_OWNER_HH_CHILD +  
  z_ACS_MEDIAN_HOME_VALUE + z_hsg_rate + z_sc_percent + z_ms_average +  
  z_ACS_PCT_NO_PC + z_ACS_PCT_SMARTPHONE + z_pphd_avgnum +  
  z_pmhd_avgnum + z_lbwt_percent_lbwt + z_pi_phy_inact + z_cip_perc +  
  z_csph_perc + z_ACS_PCT_CHILD_DISAB + z_phys_per_cap + z_mhp_per_cap +  
  z_dents_per_cap + z_uninsur_perc + z_uc_percent + z_opcp_rate +  
  z_TeenBirths + z_phs_rate + z_ms_perc_ann + z_AMFAR_AMATFAC +  
  z_MP_PERCPEN + z_AHRF_RURAL_H_CLINIC + z_unemp_perc + z_ACS_GINI_INDEX +  
  z_ACS_MEDIAN_HH_INCOME + z_ACS_PCT_WORK_NO_CAR + z_soc_assoc_num +  
  z_aeo_perc_w_acc + z_dwv_presence + z_ACS_PCT_HH_PUB_ASSIST +  
  z_AHRF_TXC_SITE_NO_CNTRL, data = Z_and_Final_Variables_10.28.22)  
summary(z_bb_levels_12345678)
```

Call:

```
lm(formula = z_ACS_PCT_BROADBAND ~ z_ACS_PCT_BLACK + z_ACS_PCT_HISPAN +  
  z_SVI_RPL_THEME1_SOCIECO + z_SVI_RPL_THEME2_HH_DISB + z_SVI_RPL_THEME3_MINO +  
  z_SVI_RPL_THEME4_HH_TRANS + z_ACS_PCT_ENGL_NOT_WELL + z_ACS_PCT_NON_CITIZEN +  
  z_ACS_MEDIAN_AGE + z_food_afford + z_fd_enviro_indx + z_fi_percent +  
  z_ACS_PCT_FOOD_STAMP + z_childelig_lunch_perc + z_shp_percent +  
  z_shcb_percent + z_ACS_PCT_NO_VEH + z_ACS_PCT_RENTER_HH_CHILD +  
  z_ACS_PCT_RENT_COST_30PCT + z_ACS_PCT_MOBILE_HOME + z_ACS_PCT_OWNED_HH +  
  z_ACS_PCT_OWNER_HH_CHILD + z_ACS_MEDIAN_HOME_VALUE + z_hsg_rate +  
  z_sc_percent + z_ms_average + z_ACS_PCT_NO_PC + z_ACS_PCT_SMARTPHONE +  
  z_pphd_avgnum + z_pmhd_avgnum + z_lbwt_percent_lbwt + z_pi_phy_inact +  
  z_cip_perc + z_csph_perc + z_ACS_PCT_CHILD_DISAB + z_phys_per_cap +  
  z_mhp_per_cap + z_dents_per_cap + z_uninsur_perc + z_uc_percent +  
  z_opcp_rate + z_TeenBirths + z_phs_rate + z_ms_perc_ann +  
  z_AMFAR_AMATFAC + z_MP_PERCPEN + z_AHRF_RURAL_H_CLINIC +  
  z_unemp_perc + z_ACS_GINI_INDEX + z_ACS_MEDIAN_HH_INCOME +
```



```

z_ACS_PCT_WORK_NO_CAR + z_soc_assoc_num + z_aeo_perc_w_acc +
z_dwv_presence + z_ACS_PCT_HH_PUB_ASSIST + z_AHRF_TXC_SITE_NO_CNTRL,
data = Z_and_Final_Variables_10.28.22)

```

Residuals:

Min	1Q	Median	3Q	Max
-2.02979	-0.15812	0.02457	0.18355	1.14594

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.0036724	0.0086650	-0.424	0.671741
z_ACS_PCT_BLACK	-0.0353599	0.0172637	-2.048	0.040665
z_ACS_PCT_HISPAN	-0.0183556	0.0171361	-1.071	0.284221
z_SVI_RPL_THEME1_SOCIECO	-0.0082161	0.0232984	-0.353	0.724390
z_SVI_RPL_THEME2_HH_DISB	-0.0158114	0.0129002	-1.226	0.220465
z_SVI_RPL_THEME3_MINO	0.0358710	0.0157001	2.285	0.022429
z_SVI_RPL_THEME4_HH_TRANS	0.0002762	0.0124174	0.022	0.982257
z_ACS_PCT_ENGL_NOT_WELL	0.0011490	0.0245533	0.047	0.962679
z_ACS_PCT_NON_CITIZEN	0.0133351	0.0224248	0.595	0.552137
z_ACS_MEDIAN_AGE	0.0009632	0.0180366	0.053	0.957417
z_food_afford	-0.0119512	0.0145818	-0.820	0.412541
z_fd_enviro_indx	0.0229836	0.0163001	1.410	0.158684
z_fi_percent	0.0010236	0.0233020	0.044	0.964965
z_ACS_PCT_FOOD_STAMP	0.0547418	0.0196574	2.785	0.005406
z_childelig_lunch_perc	-0.0279524	0.0161263	-1.733	0.083187
z_shp_percent	-0.0350457	0.0191314	-1.832	0.067121
z_shcb_percent	-0.0141771	0.0181895	-0.779	0.435829
z_ACS_PCT_NO_VEH	0.0147255	0.0277991	0.530	0.596369
z_ACS_PCT_RENTER_HH_CHILD	0.0275328	0.0109986	2.503	0.012382
z_ACS_PCT_RENT_COST_30PCT	0.0031747	0.0119067	0.267	0.789780
z_ACS_PCT_MOBILE_HOME	-0.0302162	0.0123501	-2.447	0.014503
z_ACS_PCT_OWNED_HH	-0.0480415	0.0160539	-2.993	0.002800
z_ACS_PCT_OWNER_HH_CHILD	-0.0061075	0.0160234	-0.381	0.703123
z_ACS_MEDIAN_HOME_VALUE	-0.0276852	0.0199256	-1.389	0.164853
z_hsg_rate	0.0109215	0.0095554	1.143	0.253185
z_sc_percent	0.0050614	0.0143777	0.352	0.724853
z_ms_average	-0.0223422	0.0164257	-1.360	0.173917
z_ACS_PCT_NO_PC	-0.7428901	0.0151688	-48.975	< 0.00000000000000002
z_ACS_PCT_SMARTPHONE	-0.1813124	0.0111235	-16.300	< 0.00000000000000002
z_pphd_avgnum	-0.0215183	0.0279975	-0.769	0.442232
z_pmhd_avgnum	0.0318620	0.0245775	1.296	0.194988
z_lbw_percent_lbw	0.0216634	0.0128636	1.684	0.092319
z_pi_phy_inact	0.0045721	0.0106706	0.428	0.668346

z_cip_perc	0.0131351	0.0216658	0.606	0.544408
z_csph_perc	-0.0221209	0.0152027	-1.455	0.145807
z_ACS_PCT_CHILD_DISAB	0.0080655	0.0086103	0.937	0.349011
z_phys_per_cap	0.0084944	0.0126893	0.669	0.503310
z_mhp_per_cap	-0.0149438	0.0111127	-1.345	0.178857
z_dents_per_cap	0.0339646	0.0126217	2.691	0.007183
z_uninsur_perc	-0.0220730	0.0221280	-0.998	0.318634
z_uc_percent	-0.0165410	0.0322008	-0.514	0.607531
z_opcp_rate	0.0058595	0.0099069	0.591	0.554280
z_TeenBirths	-0.0169886	0.0253479	-0.670	0.502795
z_phs_rate	0.0125423	0.0091237	1.375	0.169379
z_ms_perc_ann	0.0190587	0.0106238	1.794	0.072966
z_AMFAR_AMATFAC	-0.0056007	0.0108285	-0.517	0.605057
z_MP_PERCPEN	0.0148339	0.0084961	1.746	0.080968
z_AHRF_RURAL_H_CLINIC	0.0070369	0.0074411	0.946	0.344421
z_unemp_perc	0.0207757	0.0125532	1.655	0.098075
z_ACS_GINI_INDEX	0.0073363	0.0113065	0.649	0.516505
z_ACS_MEDIAN_HH_INCOME	0.1035067	0.0266381	3.886	0.000105
z_ACS_PCT_WORK_NO_CAR	0.0120435	0.0234203	0.514	0.607145
z_soc_assoc_num	0.0297495	0.0285280	1.043	0.297156
z_aeo_perc_w_acc	0.0081504	0.0106487	0.765	0.444126
z_dwv_presence	0.0046248	0.0077284	0.598	0.549624
z_ACS_PCT_HH_PUB_ASSIST	-0.0084650	0.0102020	-0.830	0.406783
z_AHRF_TXC_SITE_NO_CNTRL	0.0032637	0.0079395	0.411	0.681067

(Intercept)

z_ACS_PCT_BLACK	*
z_ACS_PCT_HISPAN	
z_SVI_RPL_THEME1_SOCIECO	
z_SVI_RPL_THEME2_HH_DISB	
z_SVI_RPL_THEME3_MINO	*
z_SVI_RPL_THEME4_HH_TRANS	
z_ACS_PCT_ENGL_NOT_WELL	
z_ACS_PCT_NON_CITIZEN	
z_ACS_MEDIAN_AGE	
z_food_afford	
z_fd_enviro_indx	
z_fi_percent	
z_ACS_PCT_FOOD_STAMP	**
z_childelig_lunch_perc	.
z_shp_percent	.
z_shcb_percent	
z_ACS_PCT_NO_VEH	

```

z_ACS_PCT_RENTER_HH_CHILD *
z_ACS_PCT_RENT_COST_30PCT
z_ACS_PCT_MOBILE_HOME *
z_ACS_PCT_OWNED_HH **
z_ACS_PCT_OWNER_HH_CHILD
z_ACS_MEDIAN_HOME_VALUE
z_hsg_rate
z_sc_percent
z_ms_average
z_ACS_PCT_NO_PC ***
z_ACS_PCT_SMARTPHONE ***
z_pphd_avgnum
z_pmhd_avgnum
z_lbwt_percent_lbwt .
z_pi_phy_inact
z_cip_perc
z_csph_perc
z_ACS_PCT_CHILD_DISAB
z_phys_per_cap
z_mhp_per_cap
z_dents_per_cap **
z_uninsur_perc
z_uc_percent
z_opcp_rate
z_TeenBirths
z_phs_rate
z_ms_perc_ann .
z_AMFAR_AMATFAC
z_MP_PERCPEN .
z_AHRF_RURAL_H_CLINIC
z_unemp_perc .
z_ACS_GINI_INDEX
z_ACS_MEDIAN_HH_INCOME ***
z_ACS_PCT_WORK_NO_CAR
z_soc_assoc_num
z_aeo_perc_w_acc
z_dwt_presence
z_ACS_PCT_HH_PUB_ASSIST
z_AHRF_TXC_SITE_NO_CNTRL
---
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3217 on 2043 degrees of freedom

(1041 observations deleted due to missingness)
Multiple R-squared: 0.9006, Adjusted R-squared: 0.8979
F-statistic: 330.6 on 56 and 2043 DF, p-value: < 0.000000000000000022

Confidence Intervals for Final Model

```
confint(z_bb_levels_12345678)
```

	2.5 %	97.5 %
(Intercept)	-0.020665672	0.013320817
z_ACS_PCT_BLACK	-0.069216090	-0.001503658
z_ACS_PCT_HISPAN	-0.051961715	0.015250423
z_SVI_RPL_THEME1_SOCIECO	-0.053907140	0.037474975
z_SVI_RPL_THEME2_HH_DISB	-0.041110290	0.009487561
z_SVI_RPL_THEME3_MINO	0.005081048	0.066660876
z_SVI_RPL_THEME4_HH_TRANS	-0.024075823	0.024628189
z_ACS_PCT_ENGL_NOT_WELL	-0.047003147	0.049301240
z_ACS_PCT_NON_CITIZEN	-0.030642805	0.057313081
z_ACS_MEDIAN_AGE	-0.034408845	0.036335199
z_food_afford	-0.040547873	0.016645516
z_fd_enviro_indx	-0.008982966	0.054950185
z_fi_percent	-0.044674555	0.046721828
z_ACS_PCT_FOOD_STAMP	0.016191209	0.093292399
z_childelig_lunch_perc	-0.059578179	0.003673398
z_shp_percent	-0.072564809	0.002473396
z_shcb_percent	-0.049848932	0.021494802
z_ACS_PCT_NO_VEH	-0.039792038	0.069243127
z_ACS_PCT_RENTER_HH_CHILD	0.005963172	0.049102394
z_ACS_PCT_RENT_COST_30PCT	-0.020175806	0.026525193
z_ACS_PCT_MOBILE_HOME	-0.054436306	-0.005996124
z_ACS_PCT_OWNED_HH	-0.079525206	-0.016557700
z_ACS_PCT_OWNER_HH_CHILD	-0.037531310	0.025316318
z_ACS_MEDIAN_HOME_VALUE	-0.066761801	0.011391350
z_hsg_rate	-0.007817799	0.029660843
z_sc_percent	-0.023135086	0.033257819
z_ms_average	-0.054555037	0.009870658
z_ACS_PCT_NO_PC	-0.772637937	-0.713142175
z_ACS_PCT_SMARTPHONE	-0.203127086	-0.159497729
z_pphd_avgnum	-0.076424912	0.033388309
z_pmhd_avgnum	-0.016337534	0.080061453
z_lbw_percent_lbw	-0.003563822	0.046890589

z_pi_phy_inact	-0.016354184	0.025498476
z_cip_perc	-0.029354214	0.055624491
z_csph_perc	-0.051935346	0.007693609
z_ACS_PCT_CHILD_DISAB	-0.008820399	0.024951364
z_phys_per_cap	-0.016391010	0.033379741
z_mhp_per_cap	-0.036737211	0.006849670
z_dents_per_cap	0.009211815	0.058717362
z_uninsur_perc	-0.065468824	0.021322868
z_uc_percent	-0.079690864	0.046608954
z_opcp_rate	-0.013569181	0.025288207
z_TeenBirths	-0.066699019	0.032721832
z_phs_rate	-0.005350479	0.030435020
z_ms_perc_ann	-0.001775859	0.039893220
z_AMFAR_AMATFAC	-0.026836792	0.015635302
z_MP_PERCPEN	-0.001828079	0.031495860
z_AHRF_RURAL_H_CLINIC	-0.007555959	0.021629778
z_unemp_perc	-0.003842693	0.045394158
z_ACS_GINI_INDEX	-0.014837247	0.029509871
z_ACS_MEDIAN_HH_INCOME	0.051266087	0.155747232
z_ACS_PCT_WORK_NO_CAR	-0.033886667	0.057973649
z_soc_assoc_num	-0.026197471	0.085696447
z_aeo_perc_w_acc	-0.012732958	0.029033808
z_dwv_presence	-0.010531488	0.019781163
z_ACS_PCT_HH_PUB_ASSIST	-0.028472271	0.011542358
z_AHRF_TXC_SITE_NO_CNTRL	-0.012306685	0.018833996

VIF for Final Model

```
vif(z_bb_levels_12345678)
```

z_ACS_PCT_BLACK	z_ACS_PCT_HISPAN	z_SVI_RPL_THEME1_SOCIECO
7.066201	5.922204	11.038466
z_SVI_RPL_THEME2_HH_DISB	z_SVI_RPL_THEME3_MINO	z_SVI_RPL_THEME4_HH_TRANS
3.266169	4.695902	2.960470
z_ACS_PCT_ENGL_NOT_WELL	z_ACS_PCT_NON_CITIZEN	z_ACS_MEDIAN_AGE
11.402832	9.137839	5.891749
z_food_afford	z_fd_enviro_indx	z_fi_percent
4.130960	4.540442	11.087546
z_ACS_PCT_FOOD_STAMP	z_childelig_lunch_perc	z_shp_percent
7.006306	4.047630	4.659668
z_shcb_percent	z_ACS_PCT_NO_VEH	z_ACS_PCT_RENTER_HH_CHILD

5.468502	6.838908	2.250284
z_ACS_PCT_RENT_COST_30PCT	z_ACS_PCT_MOBILE_HOME	z_ACS_PCT_OWNED_HH
2.277112	3.241182	4.387670
z_ACS_PCT_OWNER_HH_CHILD	z_ACS_MEDIAN_HOME_VALUE	z_hsg_rate
4.721049	5.505502	1.570329
z_sc_percent	z_ms_average	z_ACS_PCT_NO_PC
3.899427	1.831098	4.704381
z_ACS_PCT_SMARTPHONE	z_pphd_avgnum	z_pmhd_avgnum
2.548003	15.858144	12.044795
z_lbw_percent_lbw	z_pi_phy_inact	z_cip_perc
3.438822	2.350020	9.979977
z_csph_perc	z_ACS_PCT_CHILD_DISAB	z_phys_per_cap
4.514579	1.376191	2.685699
z_mhp_per_cap	z_dents_per_cap	z_uninsur_perc
2.047085	2.555905	10.384411
z_uc_percent	z_opcp_rate	z_TeenBirths
7.736235	1.776794	14.466575
z_phs_rate	z_ms_perc_ann	z_AMFAR_AMATFAC
1.641167	2.180109	1.848914
z_MP_PERCPEN	z_AHRF_RURAL_H_CLINIC	z_unemp_perc
1.381158	1.201130	2.540253
z_ACS_GINI_INDEX	z_ACS_MEDIAN_HH_INCOME	z_ACS_PCT_WORK_NO_CAR
2.495103	12.837882	3.202615
z_soc_assoc_num	z_aeo_perc_w_acc	z_dwv_presence
15.984826	2.095936	1.181594
z_ACS_PCT_HH_PUB_ASSIST	z_AHRF_TXC_SITE_NO_CNTRL	
1.500392	1.069241	