

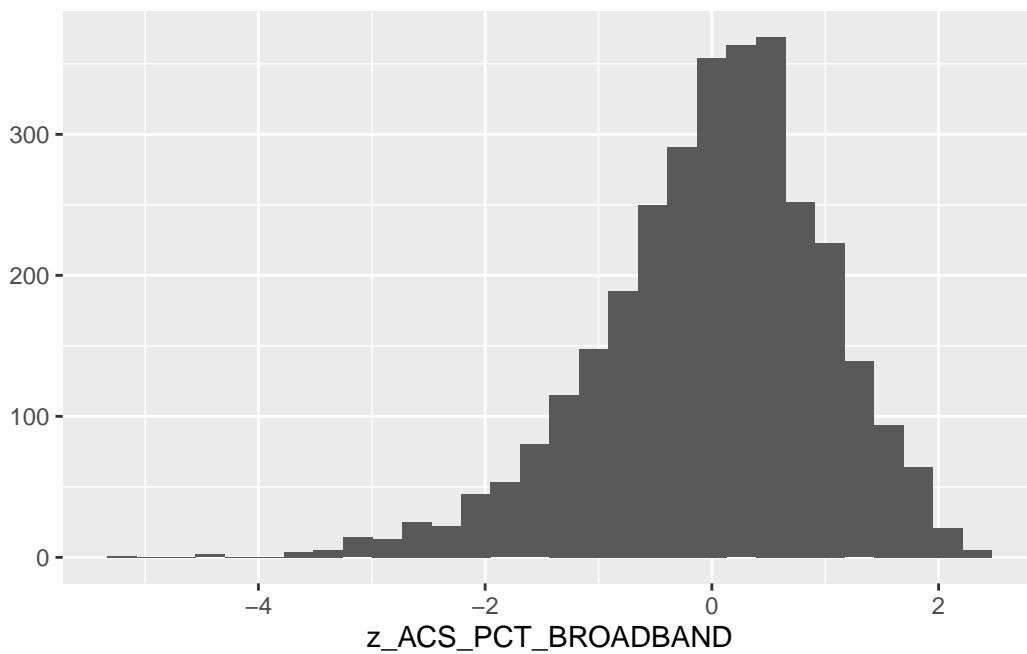
Infrastructure Model

S.Kelly

Updated 11-9-23; Change made: removed *z_uc_percent*

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	z_SVI_RPL_THEME3_MINO	z_SVI_RPL_THEME4_HH_TRANS
1.875876	3.286010	1.775255
z_ACS_PCT_ENGL_NOT_WELL	z_ACS_PCT_NON_CITIZEN	z_ACS_MEDIAN_AGE
8.135213	6.661849	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	< 0.0000000000000002	***
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	< 0.0000000000000002	***
z_ACS_MEDIAN_HOME_VALUE	0.239520	0.016755	14.296	< 0.0000000000000002	***

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: < 0.00000000000000022

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_lbwt_percent_lbwt + 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_lbwt_percent_lbwt + 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	0.00000000000000159 ***
z_pmhd_avgnum	0.23196	0.03316	6.996	0.000000000000323655 ***
z_lbwt_percent_lbwt	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_lbw_percent_lbw	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 (6 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_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_opcp_rate + z_TeenBirths,
  data = Z_and_Final_Variables_10.28.22)
```

Residuals:

Min	1Q	Median	3Q	Max
-4.5250	-0.4178	0.0661	0.5215	3.2943

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.01157	0.01472	-0.786	0.432
z_phys_per_cap	0.17264	0.02087	8.270	< 0.0000000000000002 ***
z_mhp_per_cap	0.02990	0.01925	1.553	0.121
z_dents_per_cap	0.32804	0.02025	16.198	< 0.0000000000000002 ***
z_uninsur_perc	-0.25524	0.01529	-16.697	< 0.0000000000000002 ***
z_opcp_rate	-0.14182	0.01694	-8.370	< 0.0000000000000002 ***
z_TeenBirths	0.11218	0.01548	7.245	0.000000000000546 ***

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

Residual standard error: 0.8079 on 3008 degrees of freedom

(126 observations deleted due to missingness)

Multiple R-squared: 0.356, Adjusted R-squared: 0.3547

F-statistic: 277.1 on 6 and 3008 DF, p-value: < 0.00000000000000022

Confidence Intervals for Health A IVs

```
confint(z_bb_just_healthA)
```

	2.5 %	97.5 %
(Intercept)	-0.040429631	0.01728573
z_phys_per_cap	0.131710021	0.21356876
z_mhp_per_cap	-0.007849597	0.06764801
z_dents_per_cap	0.288331682	0.36775026
z_uninsur_perc	-0.285210170	-0.22526317
z_opcp_rate	-0.175043647	-0.10859703
z_TeenBirths	0.081821957	0.14253996

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_opcp_rate
1.991970	1.674408	1.900274	1.092448	1.325353
z_TeenBirths				
1.148256				

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_10.28.22)
```

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: < 0.0000000000000002

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: 55

```
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_lbvw_percent_lbvw + 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_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_lbw_percent_lbw + 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_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
-2.02639	-0.15993	0.02413	0.18159	1.14602

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.0020324	0.0080539	-0.252	0.80080
z_ACS_PCT_BLACK	-0.0333348	0.0168045	-1.984	0.04742
z_ACS_PCT_HISPAN	-0.0189402	0.0170952	-1.108	0.26802
z_SVI_RPL_THEME1_SOCIECO	-0.0072905	0.0232244	-0.314	0.75362
z_SVI_RPL_THEME2_HH_DISB	-0.0158442	0.0128977	-1.228	0.21942
z_SVI_RPL_THEME3_MINO	0.0362292	0.0156818	2.310	0.02097
z_SVI_RPL_THEME4_HH_TRANS	0.0001211	0.0124115	0.010	0.99222
z_ACS_PCT_ENGL_NOT_WELL	0.0008694	0.0245429	0.035	0.97174
z_ACS_PCT_NON_CITIZEN	0.0135133	0.0224181	0.603	0.54672
z_ACS_MEDIAN_AGE	0.0011445	0.0180299	0.063	0.94939
z_food_afford	-0.0109440	0.0144467	-0.758	0.44881
z_fd_enviro_indx	0.0230225	0.0162970	1.413	0.15790
z_fi_percent	-0.0014164	0.0228086	-0.062	0.95049
z_ACS_PCT_FOOD_STAMP	0.0555212	0.0195952	2.833	0.00465
z_childelig_lunch_perc	-0.0272544	0.0160661	-1.696	0.08996
z_shp_percent	-0.0344132	0.0190883	-1.803	0.07156
z_shcb_percent	-0.0148547	0.0181383	-0.819	0.41290
z_ACS_PCT_NO_VEH	0.0138166	0.0277378	0.498	0.61846
z_ACS_PCT_RENTER_HH_CHILD	0.0275150	0.0109966	2.502	0.01242
z_ACS_PCT_RENT_COST_30PCT	0.0036242	0.0118723	0.305	0.76020
z_ACS_PCT_MOBILE_HOME	-0.0298014	0.0123214	-2.419	0.01566
z_ACS_PCT_OWNED_HH	-0.0485508	0.0160204	-3.031	0.00247

z_ACS_PCT_OWNER_HH_CHILD	-0.0055933	0.0159892	-0.350	0.72651
z_ACS_MEDIAN_HOME_VALUE	-0.0267534	0.0198393	-1.349	0.17764
z_hsg_rate	0.0104250	0.0095047	1.097	0.27284
z_sc_percent	0.0060852	0.0142363	0.427	0.66910
z_ms_average	-0.0227841	0.0164002	-1.389	0.16491
z_ACS_PCT_NO_PC	-0.7430277	0.0151637	-49.000	< 0.0000000000000002
z_ACS_PCT_SMARTPHONE	-0.1807171	0.0110610	-16.338	< 0.0000000000000002
z_pphd_avgnum	-0.0200945	0.0278549	-0.721	0.47075
z_pmhd_avgnum	0.0318225	0.0245729	1.295	0.19546
z_lbw_percent_lbw	0.0219252	0.0128512	1.706	0.08815
z_pi_phy_inact	0.0050174	0.0106334	0.472	0.63708
z_cip_perc	0.0130030	0.0216604	0.600	0.54837
z_csph_perc	-0.0219286	0.0151954	-1.443	0.14914
z_ACS_PCT_CHILD_DISAB	0.0081225	0.0086080	0.944	0.34549
z_phys_per_cap	0.0087861	0.0126743	0.693	0.48825
z_mhp_per_cap	-0.0146355	0.0110945	-1.319	0.18726
z_dents_per_cap	0.0341403	0.0126148	2.706	0.00686
z_uninsur_perc	-0.0309746	0.0137581	-2.251	0.02447
z_opcp_rate	0.0055524	0.0098871	0.562	0.57446
z_TeenBirths	-0.0171942	0.0253402	-0.679	0.49751
z_phs_rate	0.0124685	0.0091209	1.367	0.17177
z_ms_perc_ann	0.0196212	0.0105653	1.857	0.06343
z_AMFAR_AMATFAC	-0.0057069	0.0108246	-0.527	0.59810
z_MP_PERCPEN	0.0148713	0.0084943	1.751	0.08014
z_AHRF_RURAL_H_CLINIC	0.0072329	0.0074299	0.973	0.33043
z_unemp_perc	0.0204661	0.0125365	1.633	0.10272
z_ACS_GINI_INDEX	0.0070954	0.0112948	0.628	0.52994
z_ACS_MEDIAN_HH_INCOME	0.1019049	0.0264502	3.853	0.00012
z_ACS_PCT_WORK_NO_CAR	0.0106059	0.0232483	0.456	0.64829
z_soc_assoc_num	0.0302409	0.0285068	1.061	0.28889
z_aeo_perc_w_acc	0.0089384	0.0105357	0.848	0.39632
z_dwv_presence	0.0045710	0.0077263	0.592	0.55417
z_ACS_PCT_HH_PUB_ASSIST	-0.0083327	0.0101969	-0.817	0.41392
z_AHRF_TXC_SITE_NO_CNTRL	0.0032922	0.0079379	0.415	0.67837

(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_lbw_percent_lbw	.
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_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

```

```
---
```

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

Residual standard error: 0.3216 on 2044 degrees of freedom

(1041 observations deleted due to missingness)

Multiple R-squared: 0.9006, Adjusted R-squared: 0.8979

F-statistic: 336.7 on 55 and 2044 DF, p-value: < 0.00000000000000022

Confidence Intervals for Final Model

```
confint(z_bb_levels_12345678)
```

	2.5 %	97.5 %
(Intercept)	-0.017827162	0.0137624169
z_ACS_PCT_BLACK	-0.066290428	-0.0003790935
z_ACS_PCT_HISPAN	-0.052466055	0.0145856083
z_SVI_RPL_THEME1_SOCIECO	-0.052836455	0.0382555102
z_SVI_RPL_THEME2_HH_DISB	-0.041138295	0.0094498066
z_SVI_RPL_THEME3_MINO	0.005475185	0.0669831458
z_SVI_RPL_THEME4_HH_TRANS	-0.024219351	0.0244614742
z_ACS_PCT_ENGL_NOT_WELL	-0.047262248	0.0490011023
z_ACS_PCT_NON_CITIZEN	-0.030451470	0.0574780330
z_ACS_MEDIAN_AGE	-0.034214412	0.0365033307
z_food_afford	-0.039275813	0.0173879083
z_fd_enviro_indx	-0.008937930	0.0549829972
z_fi_percent	-0.046146954	0.0433142368
z_ACS_PCT_FOOD_STAMP	0.017092602	0.0939498848
z_childelig_lunch_perc	-0.058762078	0.0042532159
z_shp_percent	-0.071847772	0.0030213516
z_shcb_percent	-0.050426185	0.0207168648
z_ACS_PCT_NO_VEH	-0.040580582	0.0682138696
z_ACS_PCT_RENTER_HH_CHILD	0.005949367	0.0490805937
z_ACS_PCT_RENT_COST_30PCT	-0.019659014	0.0269073163
z_ACS_PCT_MOBILE_HOME	-0.053965309	-0.0056375053
z_ACS_PCT_OWNED_HH	-0.079968748	-0.0171327833
z_ACS_PCT_OWNER_HH_CHILD	-0.036950061	0.0257634892

z_ACS_MEDIAN_HOME_VALUE	-0.065660644	0.0121539005
z_hsg_rate	-0.008214811	0.0290648855
z_sc_percent	-0.021833947	0.0340043777
z_ms_average	-0.054946920	0.0093787532
z_ACS_PCT_NO_PC	-0.772765589	-0.7132898439
z_ACS_PCT_SMARTPHONE	-0.202409145	-0.1590250500
z_pphd_avgnum	-0.074721540	0.0345325121
z_pmhd_avgnum	-0.016368066	0.0800130620
z_lbw_percent_lbw	-0.003277659	0.0471280414
z_pi_phy_inact	-0.015835952	0.0258708419
z_cip_perc	-0.029475727	0.0554816575
z_csph_perc	-0.051728682	0.0078714481
z_ACS_PCT_CHILD_DISAB	-0.008758973	0.0250038961
z_phys_per_cap	-0.016069885	0.0336420331
z_mhp_per_cap	-0.036393176	0.0071222381
z_dents_per_cap	0.009401090	0.0588795256
z_uninsur_perc	-0.057955938	-0.0039932197
z_opcp_rate	-0.013837370	0.0249422064
z_TeenBirths	-0.066889456	0.0325010685
z_phs_rate	-0.005418849	0.0303557568
z_ms_perc_ann	-0.001098617	0.0403410236
z_AMFAR_AMATFAC	-0.026935252	0.0155214468
z_MP_PERCPEN	-0.001787059	0.0315296458
z_AHRF_RURAL_H_CLINIC	-0.007338095	0.0218039764
z_unemp_perc	-0.004119498	0.0450516855
z_ACS_GINI_INDEX	-0.015055070	0.0292458922
z_ACS_MEDIAN_HH_INCOME	0.050032828	0.1537769432
z_ACS_PCT_WORK_NO_CAR	-0.034986949	0.0561986942
z_soc_assoc_num	-0.025664470	0.0861463366
z_aeo_perc_w_acc	-0.011723434	0.0296002413
z_dwv_presence	-0.010581217	0.0197231766
z_ACS_PCT_HH_PUB_ASSIST	-0.028330013	0.0116646518
z_AHRF_TXC_SITE_NO_CNTRL	-0.012274944	0.0188593567

VIF for Final Model

```
vif(z_bb_levels_12345678)
```

z_ACS_PCT_BLACK	z_ACS_PCT_HISPAN	z_SVI_RPL_THEME1_SOCIECO
6.697706	5.896085	10.972438
z_SVI_RPL_THEME2_HH_DISB	z_SVI_RPL_THEME3_MINO	z_SVI_RPL_THEME4_HH_TRANS

3.266089	4.686639	2.958719
z_ACS_PCT_ENGL_NOT_WELL	z_ACS_PCT_NON_CITIZEN	z_ACS_MEDIAN_AGE
11.397228	9.135654	5.889493
z_food_afford	z_fd_enviro_indx	z_fi_percent
4.056264	4.540344	10.626823
z_ACS_PCT_FOOD_STAMP	z_childelig_lunch_perc	z_shp_percent
6.964560	4.018896	4.640367
z_shcb_percent	z_ACS_PCT_NO_VEH	z_ACS_PCT_RENTER_HH_CHILD
5.439742	6.811203	2.250262
z_ACS_PCT_RENT_COST_30PCT	z_ACS_PCT_MOBILE_HOME	z_ACS_PCT_OWNED_HH
2.264815	3.227325	4.370934
z_ACS_PCT_OWNER_HH_CHILD	z_ACS_MEDIAN_HOME_VALUE	z_hsg_rate
4.702623	5.459869	1.554262
z_sc_percent	z_ms_average	z_ACS_PCT_NO_PC
3.824488	1.826075	4.702913
z_ACS_PCT_SMARTPHONE	z_pphd_avgnum	z_pmhd_avgnum
2.520346	15.702720	12.044677
z_lbw_percent_lbw	z_pi_phy_inact	z_cip_perc
3.433424	2.334510	9.978569
z_csph_perc	z_ACS_PCT_CHILD_DISAB	z_phys_per_cap
4.511843	1.375962	2.680320
z_mhp_per_cap	z_dents_per_cap	z_uninsur_perc
2.041114	2.554027	4.015780
z_opcp_rate	z_TeenBirths	z_phs_rate
1.770324	14.462968	1.640760
z_ms_perc_ann	z_AMFAR_AMATFAC	z_MP_PERCPEN
2.156945	1.848241	1.381057
z_AHRF_RURAL_H_CLINIC	z_unemp_perc	z_ACS_GINI_INDEX
1.197971	2.534396	2.490811
z_ACS_MEDIAN_HH_INCOME	z_ACS_PCT_WORK_NO_CAR	z_soc_assoc_num
12.661967	3.156883	15.966848
z_aeo_perc_w_acc	z_dvw_presence	z_ACS_PCT_HH_PUB_ASSIST
2.052442	1.181376	1.499436
z_AHRF_TXC_SITE_NO_CNTRL		
1.069188		