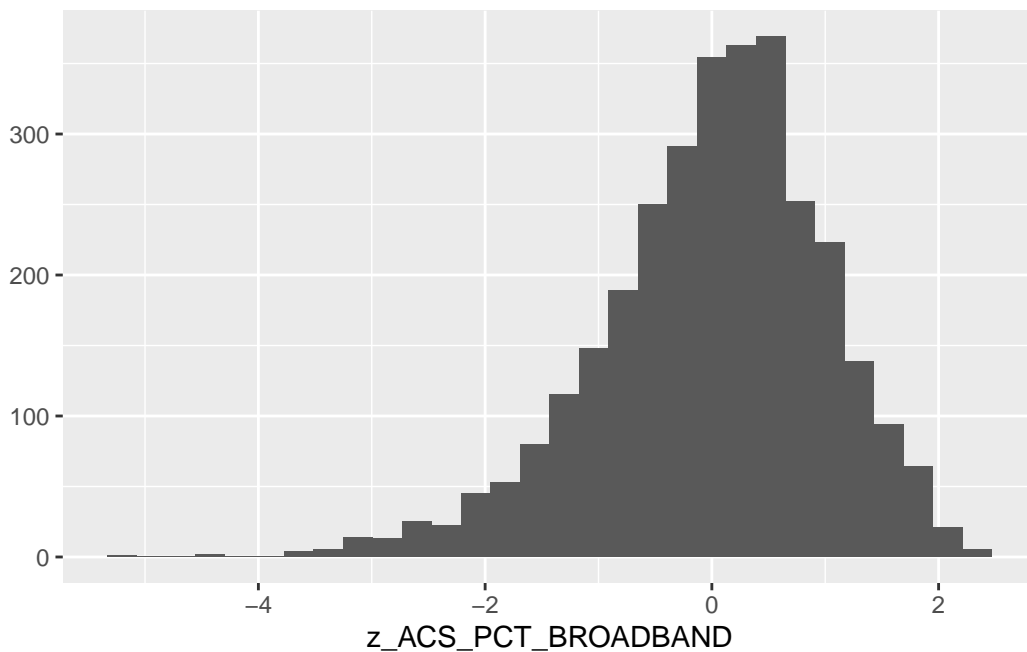


# Infrastructure Model

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: 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)	0.00000000000000275	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_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)
```

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_lbw_percent_lbw	0.02940	0.01498	1.962	0.049820	*
z_pi_phy_inact	-0.22720	0.01352	-16.807	< 0.0000000000000002	***
z_cip_perc	-0.63233	0.02184	-28.954	< 0.0000000000000002	***
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: < 0.00000000000000022

## 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	10.749658	z_pmhd_avgnum	8.524377	z_lbw_percent_lbw	1.777139
z_pi_phy_inact	1.467398	z_cip_perc	3.806888	z_csph_perc	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: < 0.000000000000000022

#### 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_10.28.22)
```

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: < 0.00000000000000022

## 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_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_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_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_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
-2.02913	-0.15744	0.02505	0.18013	1.18254

Coefficients:

Estimate	Std. Error	t value	Pr(> t )
----------	------------	---------	----------

(Intercept)	-0.0050809	0.0069871	-0.727	0.467184
z_ACS_PCT_BLACK	-0.0276465	0.0146665	-1.885	0.059542
z_ACS_PCT_HISPAN	-0.0064827	0.0136235	-0.476	0.634223
z_SVI_RPL_THEME1_SOCIECO	0.0054812	0.0198844	0.276	0.782837
z_SVI_RPL_THEME2_HH_DISB	-0.0200599	0.0115495	-1.737	0.082531
z_SVI_RPL_THEME3_MINO	0.0313149	0.0135064	2.319	0.020500
z_SVI_RPL_THEME4_HH_TRANS	0.0009013	0.0106956	0.084	0.932853
z_ACS_PCT_ENGL_NOT_WELL	0.0088848	0.0207485	0.428	0.668533
z_ACS_PCT_NON_CITIZEN	0.0141472	0.0192357	0.735	0.462125
z_ACS_MEDIAN_AGE	0.0069226	0.0156753	0.442	0.658799
z_food_afford	-0.0200097	0.0129256	-1.548	0.121732
z_fd_enviro_indx	0.0343706	0.0137674	2.497	0.012605
z_fi_percent	0.0097793	0.0194572	0.503	0.615283
z_ACS_PCT_FOOD_STAMP	0.0680292	0.0168076	4.048	0.00005331
z_childelig_lunch_perc	-0.0334392	0.0143356	-2.333	0.019747
z_shp_percent	-0.0588228	0.0159139	-3.696	0.000223
z_shcb_percent	-0.0057733	0.0154598	-0.373	0.708851
z_ACS_PCT_NO_VEH	0.0298786	0.0236972	1.261	0.207479
z_ACS_PCT_RENTER_HH_CHILD	0.0262984	0.0096288	2.731	0.006354
z_ACS_PCT_RENT_COST_30PCT	0.0040525	0.0104316	0.388	0.697691
z_ACS_PCT_MOBILE_HOME	-0.0412903	0.0107866	-3.828	0.000132
z_ACS_PCT_OWNED_HH	-0.0497378	0.0139152	-3.574	0.000358
z_ACS_PCT_OWNER_HH_CHILD	-0.0176768	0.0139428	-1.268	0.204983
z_ACS_MEDIAN_HOME_VALUE	-0.0146099	0.0154794	-0.944	0.345348
z_ACS_PCT_NO_PC	-0.7447816	0.0131600	-56.594	< 0.00000000000000002
z_ACS_PCT_SMARTPHONE	-0.1750856	0.0098213	-17.827	< 0.00000000000000002
z_pphd_avgnum	-0.0060566	0.0240219	-0.252	0.800961
z_pmhd_avgnum	0.0239915	0.0208828	1.149	0.250721
z_lbw_percent_lbw	0.0180740	0.0105005	1.721	0.085328
z_pi_phy_inact	0.0018147	0.0094004	0.193	0.846936
z_cip_perc	-0.0061912	0.0189417	-0.327	0.743806
z_csph_perc	-0.0217939	0.0129388	-1.684	0.092231
z_ACS_PCT_CHILD_DISAB	0.0037458	0.0076829	0.488	0.625909
z_phys_per_cap	0.0005176	0.0110228	0.047	0.962550
z_mhp_per_cap	-0.0166450	0.0098658	-1.687	0.091697
z_dents_per_cap	0.0394102	0.0107550	3.664	0.000253
z_uninsur_perc	-0.0081327	0.0185198	-0.439	0.660600
z_uc_percent	-0.0453970	0.0264880	-1.714	0.086675
z_opcp_rate	0.0079134	0.0088541	0.894	0.371537
z_TeenBirths	-0.0067074	0.0207482	-0.323	0.746512
z_phs_rate	0.0192259	0.0080665	2.383	0.017225
z_ms_perc_ann	0.0172192	0.0092655	1.858	0.063226
z_AMFAR_AMATFAC	-0.0102849	0.0088736	-1.159	0.246548



z_MP_PERCPEN	0.0139110	0.0073363	1.896	0.058050
z_AHRF_RURAL_H_CLINIC	0.0089267	0.0065136	1.370	0.170660
z_unemp_perc	0.0161937	0.0101290	1.599	0.110001
z_ACS_GINI_INDEX	0.0074099	0.0097999	0.756	0.449646
z_ACS_MEDIAN_HH_INCOME	0.1026006	0.0212633	4.825	0.00000148
z_ACS_PCT_WORK_NO_CAR	-0.0136601	0.0195239	-0.700	0.484203
z_soc_assoc_num	0.0167936	0.0231143	0.727	0.467571
z_aeo_perc_w_acc	-0.0015574	0.0093832	-0.166	0.868189
z_dwv_presence	0.0074189	0.0066641	1.113	0.265701
z_ACS_PCT_HH_PUB_ASSIST	-0.0080850	0.0089830	-0.900	0.368183
z_AHRF_TXC_SITE_NO_CNTRL	0.0021640	0.0062900	0.344	0.730840

(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_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
---
```

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

Residual standard error: 0.3156 on 2539 degrees of freedom

(548 observations deleted due to missingness)

Multiple R-squared: 0.9047, Adjusted R-squared: 0.9027

F-statistic: 454.8 on 53 and 2539 DF, p-value: < 0.000000000000000022

## Confidence Intervals for Final Model

```
confint(z_bb_levels_12345678)
```

	2.5 %	97.5 %
(Intercept)	-0.0187819116	0.008620159
z_ACS_PCT_BLACK	-0.0564060611	0.001112998
z_ACS_PCT_HISPAN	-0.0331970636	0.020231610
z_SVI_RPL_THEME1_SOCIECO	-0.0335100787	0.044472468
z_SVI_RPL_THEME2_HH_DISB	-0.0427072716	0.002587420

z_SVI_RPL_THEME3_MINO	0.0048302611	0.057799443
z_SVI_RPL_THEME4_HH_TRANS	-0.0200718234	0.021874337
z_ACS_PCT_ENGL_NOT_WELL	-0.0318009436	0.049570469
z_ACS_PCT_NON_CITIZEN	-0.0235720686	0.051866369
z_ACS_MEDIAN_AGE	-0.0238150555	0.037660202
z_food_afford	-0.0453554852	0.005336159
z_fd_enviro_indx	0.0073740180	0.061367159
z_fi_percent	-0.0283741700	0.047932834
z_ACS_PCT_FOOD_STAMP	0.0350712574	0.100987159
z_childelig_lunch_perc	-0.0615498659	-0.005328574
z_shp_percent	-0.0900283602	-0.027617152
z_shcb_percent	-0.0360883873	0.024541752
z_ACS_PCT_NO_VEH	-0.0165892595	0.076346486
z_ACS_PCT_RENTER_HH_CHILD	0.0074172648	0.045179593
z_ACS_PCT_RENT_COST_30PCT	-0.0164027760	0.024507779
z_ACS_PCT_MOBILE_HOME	-0.0624416779	-0.020138989
z_ACS_PCT_OWNED_HH	-0.0770239568	-0.022451554
z_ACS_PCT_OWNER_HH_CHILD	-0.0450173507	0.009663679
z_ACS_MEDIAN_HOME_VALUE	-0.0449634746	0.015743694
z_ACS_PCT_NO_PC	-0.7705870201	-0.718976135
z_ACS_PCT_SMARTPHONE	-0.1943442357	-0.155826936
z_pphd_avgnum	-0.0531611443	0.041047851
z_pmhd_avgnum	-0.0169575666	0.064940492
z_lbw_percent_lbw	-0.0025164681	0.038664510
z_pi_phy_inact	-0.0166185340	0.020248018
z_cip_perc	-0.0433340041	0.030951686
z_csph_perc	-0.0471656694	0.003577811
z_ACS_PCT_CHILD_DISAB	-0.0113195567	0.018811185
z_phys_per_cap	-0.0210969915	0.022132206
z_mhp_per_cap	-0.0359908036	0.002700742
z_dents_per_cap	0.0183207738	0.060499662
z_uninsur_perc	-0.0444481936	0.028182766
z_uc_percent	-0.0973372826	0.006543301
z_opcp_rate	-0.0094485363	0.025275297
z_TeenBirths	-0.0473926255	0.033977759
z_phs_rate	0.0034083620	0.035043408
z_ms_perc_ann	-0.0009495651	0.035387878
z_AMFAR_AMATFAC	-0.0276850630	0.007115348
z_MP_PERCPEN	-0.0004748129	0.028296739
z_AHRF_RURAL_H_CLINIC	-0.0038457593	0.021699118
z_unemp_perc	-0.0036682171	0.036055715
z_ACS_GINI_INDEX	-0.0118066304	0.026626415
z_ACS_MEDIAN_HH_INCOME	0.0609054180	0.144295760

z_ACS_PCT_WORK_NO_CAR	-0.0519445974	0.024624299
z_soc_assoc_num	-0.0285312714	0.062118515
z_aeo_perc_w_acc	-0.0199569303	0.016842156
z_dwv_presence	-0.0056487328	0.020486509
z_ACS_PCT_HH_PUB_ASSIST	-0.0256997100	0.009529624
z_AHRF_TXC_SITE_NO_CNTRL	-0.0101699386	0.014498015

## VIF for Final Model

```
vif(z_bb_levels_12345678)
```

z_ACS_PCT_BLACK	z_ACS_PCT_HISPAN	z_SVI_RPL_THEME1_SOCIECO
5.976329	5.115584	10.241682
z_SVI_RPL_THEME2_HH_DISB	z_SVI_RPL_THEME3_MINO	z_SVI_RPL_THEME4_HH_TRANS
3.450138	4.624873	2.830540
z_ACS_PCT_ENGL_NOT_WELL	z_ACS_PCT_NON_CITIZEN	z_ACS_MEDIAN_AGE
11.174713	9.094759	6.015016
z_food_afford	z_fd_enviro_indx	z_fi_percent
4.075887	4.382182	9.815708
z_ACS_PCT_FOOD_STAMP	z_childelig_lunch_perc	z_shp_percent
6.614010	4.065407	5.100021
z_shcb_percent	z_ACS_PCT_NO_VEH	z_ACS_PCT_RENTER_HH_CHILD
5.857204	9.496820	2.230456
z_ACS_PCT_RENT_COST_30PCT	z_ACS_PCT_MOBILE_HOME	z_ACS_PCT_OWNED_HH
2.370368	3.034972	4.511534
z_ACS_PCT_OWNER_HH_CHILD	z_ACS_MEDIAN_HOME_VALUE	z_ACS_PCT_NO_PC
4.666461	6.013543	4.540047
z_ACS_PCT_SMARTPHONE	z_pphd_avgnum	z_pmhd_avgnum
2.529109	15.377165	11.431190
z_lbw_percent_lbw	z_pi_phy_inact	z_cip_perc
2.919439	2.453417	9.655306
z_csph_perc	z_ACS_PCT_CHILD_DISAB	z_phys_per_cap
4.145736	1.391037	2.658819
z_mhp_per_cap	z_dents_per_cap	z_uninsur_perc
2.234339	2.616351	8.953733
z_uc_percent	z_opcp_rate	z_TeenBirths
6.811620	1.764155	12.072858
z_phs_rate	z_ms_perc_ann	z_AMFAR_AMATFAC
1.707474	2.177171	2.168869
z_MP_PERCPEN	z_AHRF_RURAL_H_CLINIC	z_unemp_perc
1.404504	1.183126	2.412610

z_ACS_GINI_INDEX	z_ACS_MEDIAN_HH_INCOME	z_ACS_PCT_WORK_NO_CAR
2.322067	11.718974	5.667422
z_soc_assoc_num	z_aeo_perc_w_acc	z_dwv_presence
13.946984	2.105541	1.174635
z_ACS_PCT_HH_PUB_ASSIST	z_AHRF_TXC_SITE_NO_CNTRL	
1.527585	1.103615	