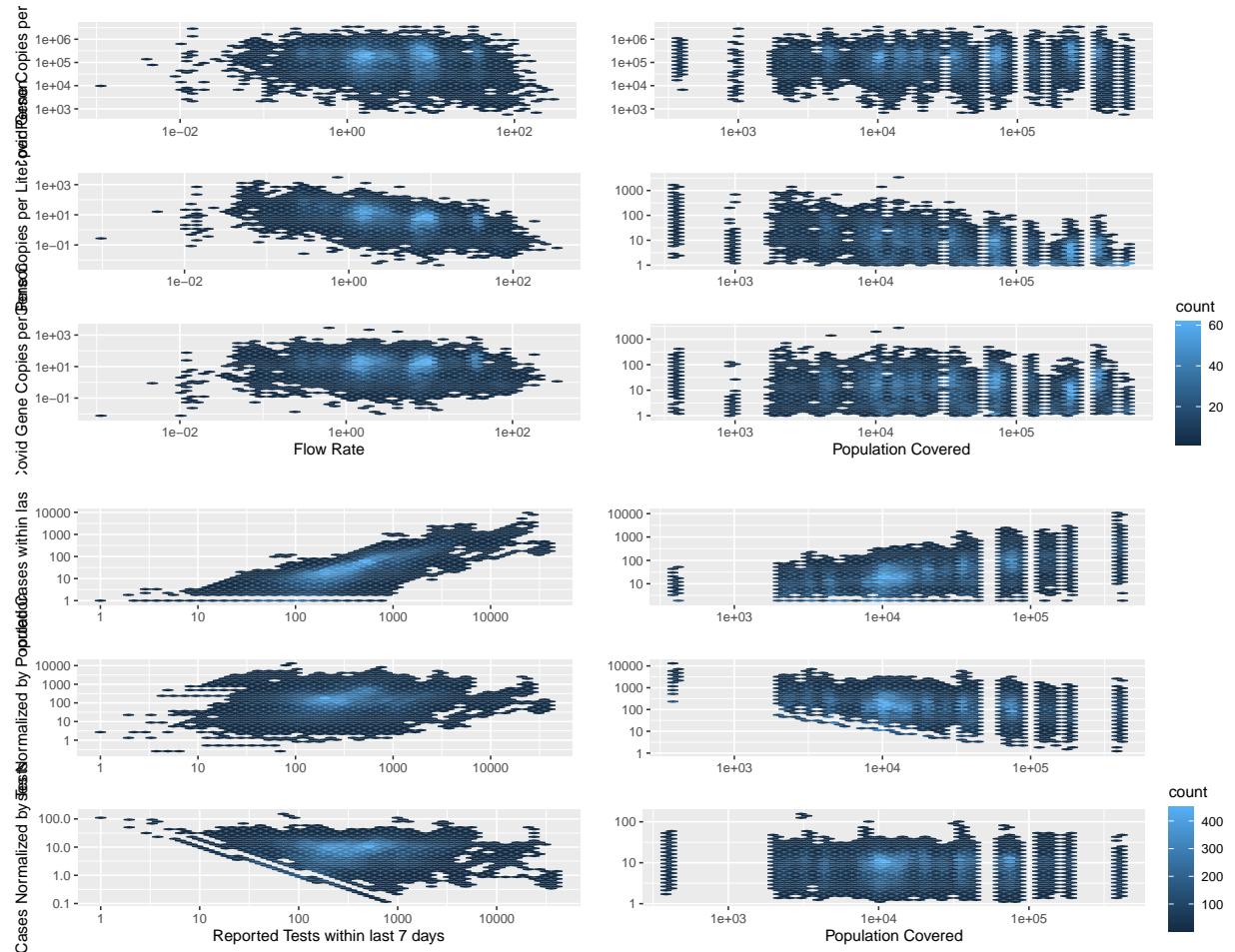
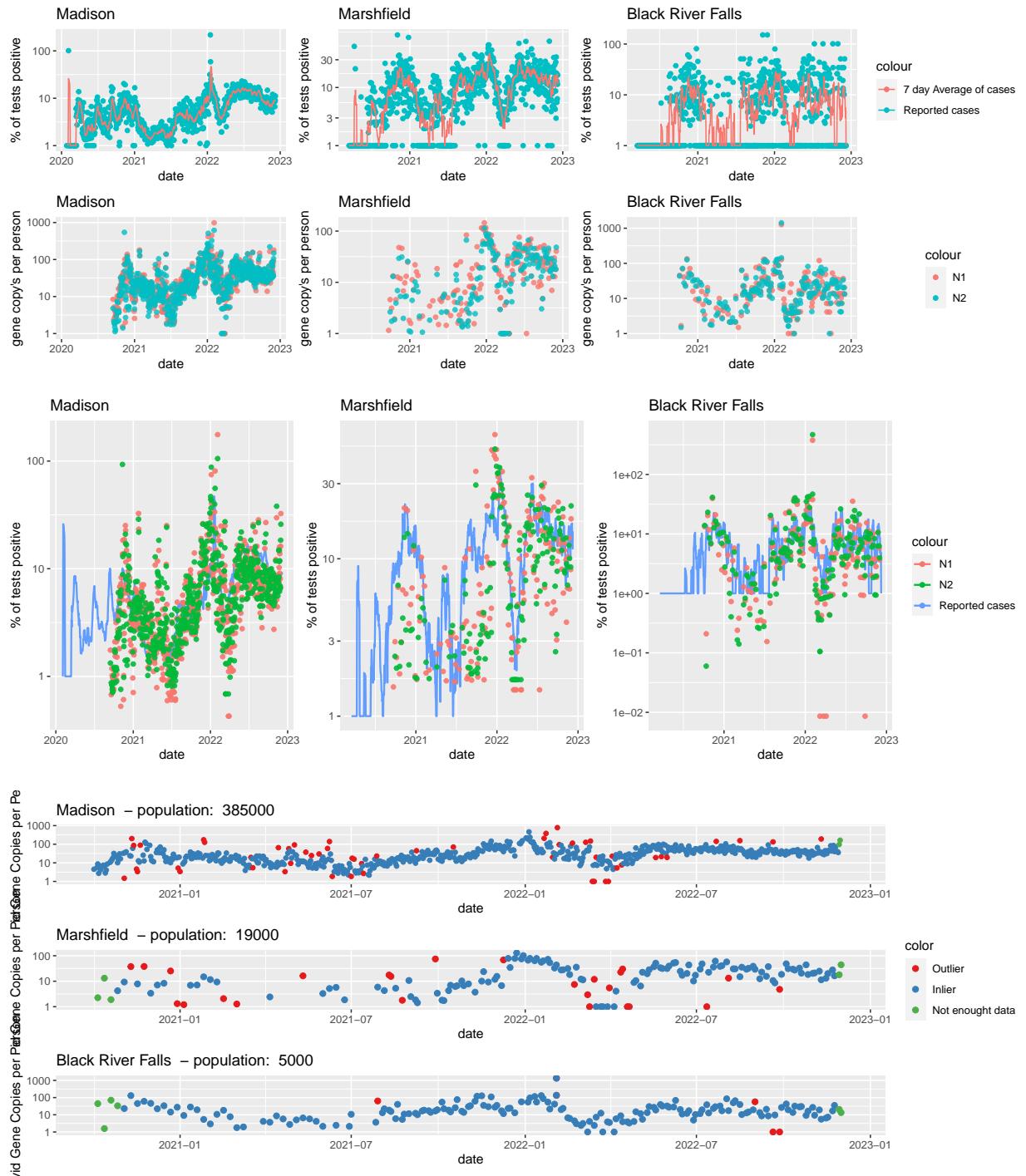


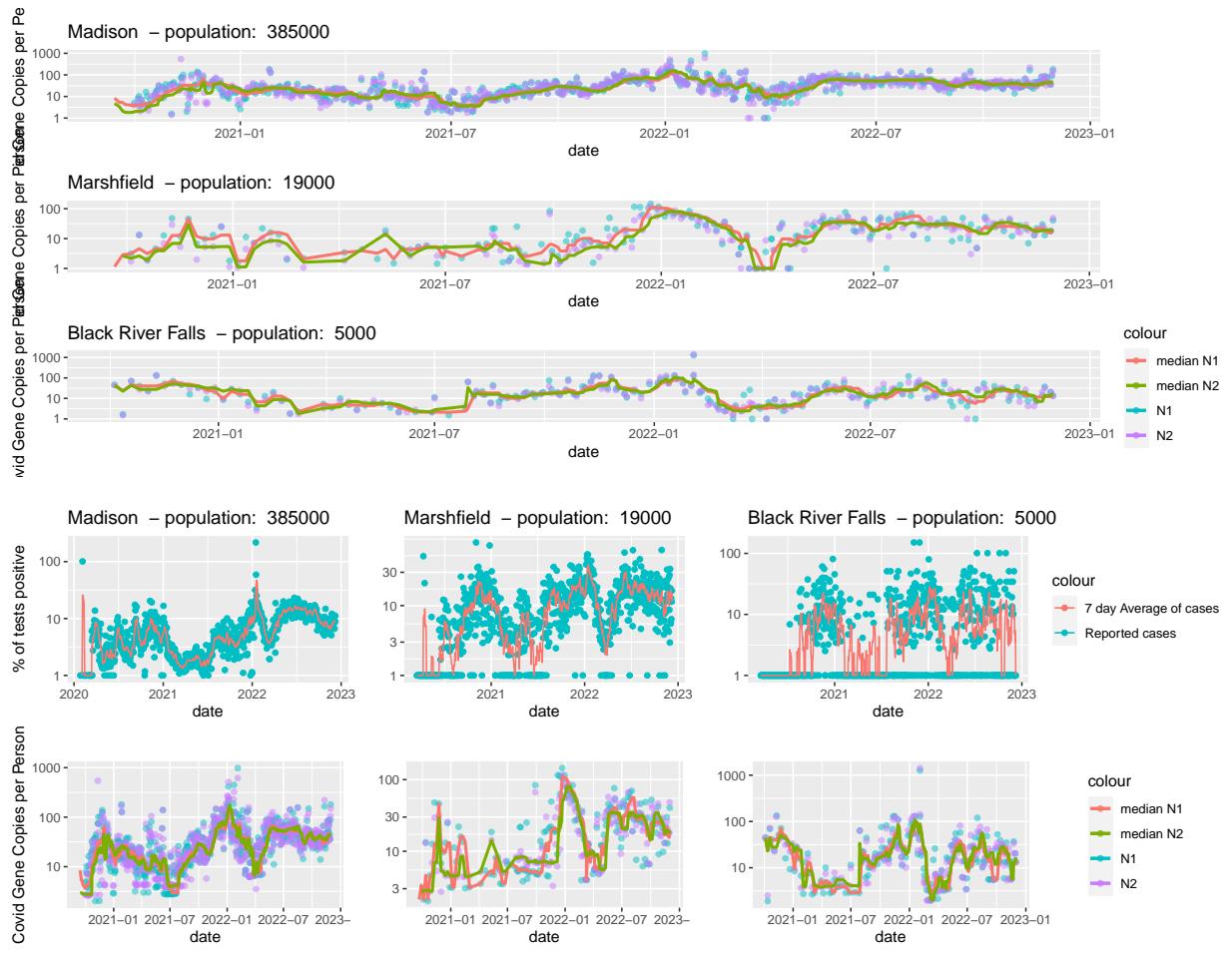
# Final Wastewater

Marlin

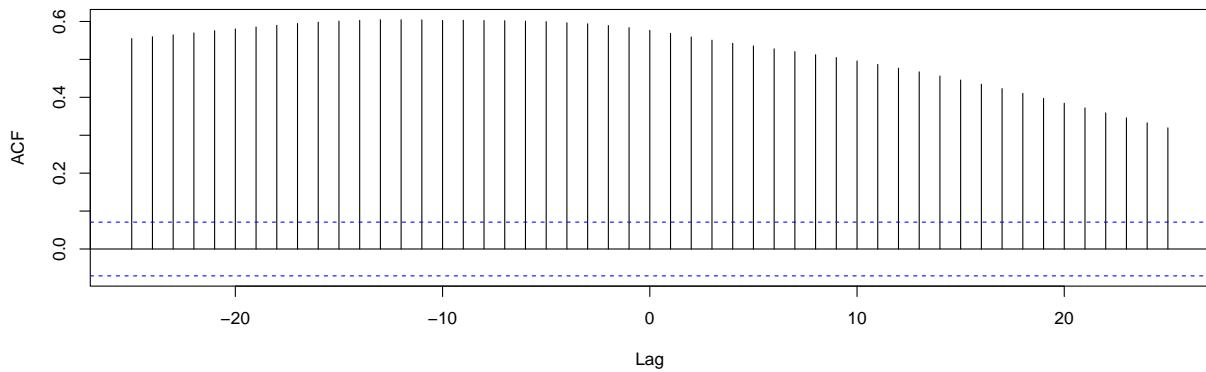
2023-04-25

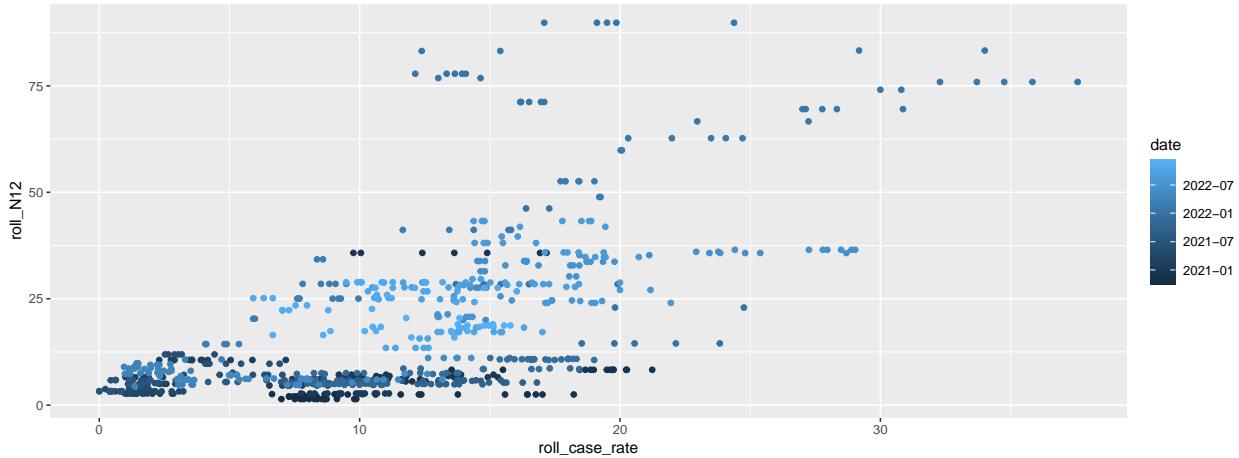




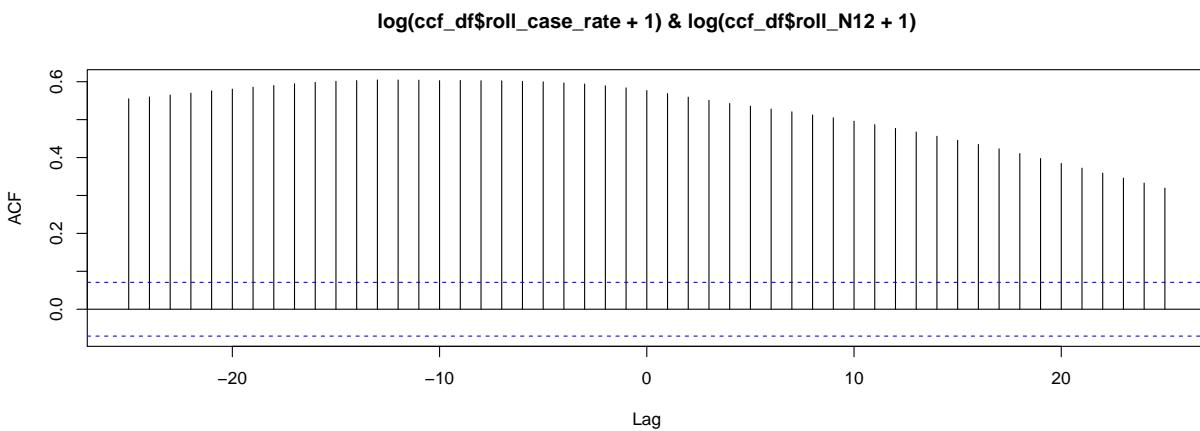


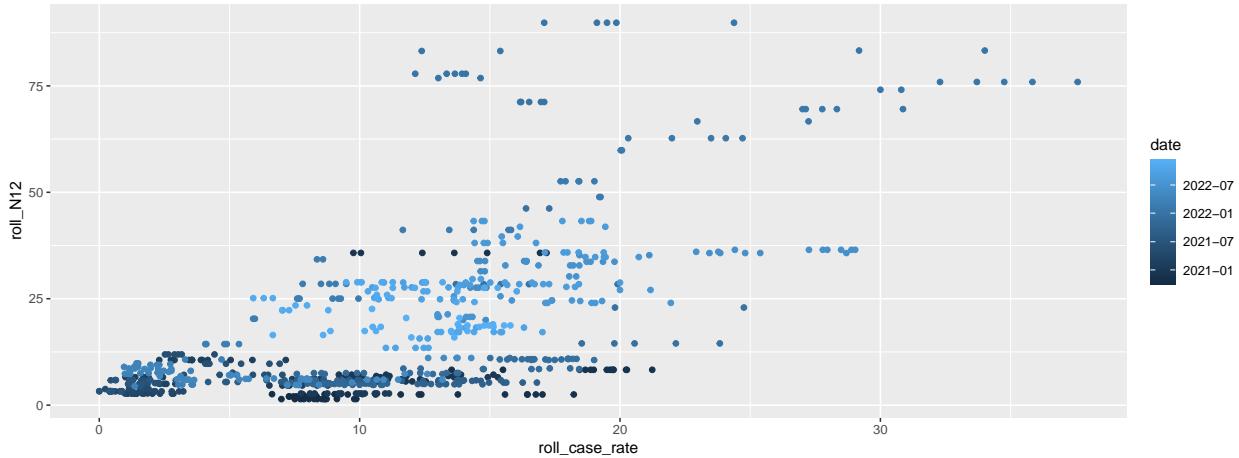
$\log(ccf\_df$roll\_case\_rate + 1) \& \log(ccf\_df$roll\_N12 + 1)$



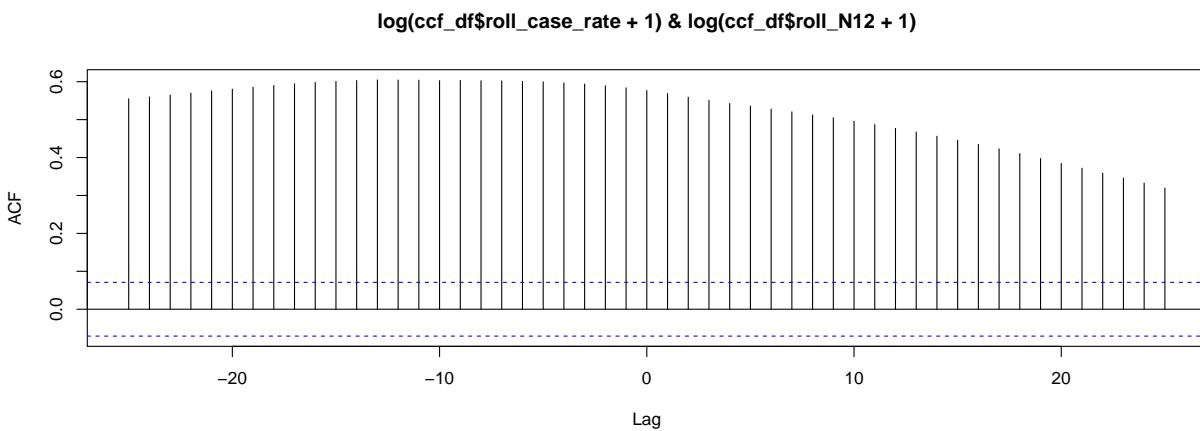


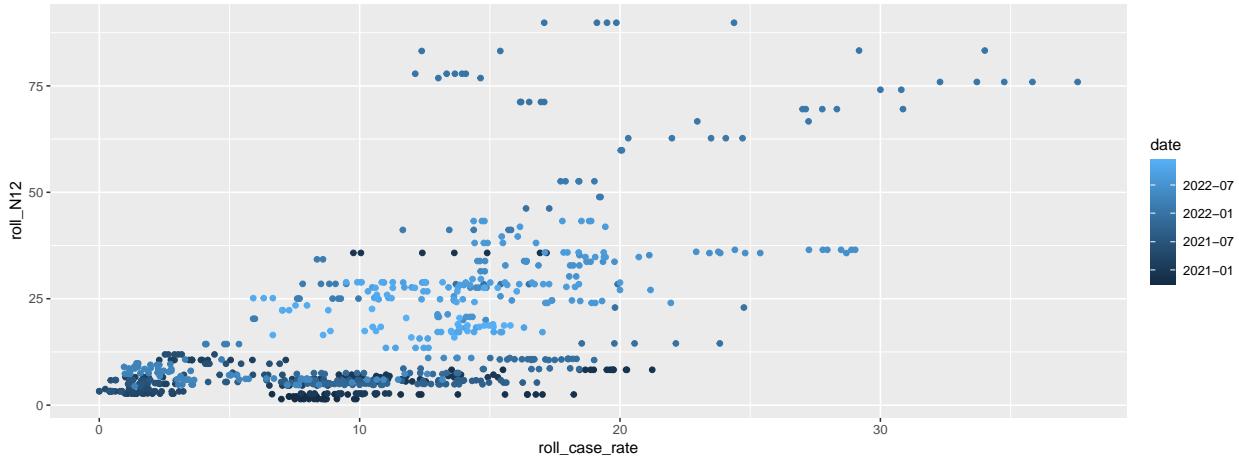
```
##
## Call:
## lm(formula = log(roll_case_rate + 1) ~ log(roll_N12 + 1), data = .)
##
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -1.7554 -0.4098  0.1554  0.4466  1.2966 
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 1.04864   0.06605 15.88 <2e-16 ***
## log(roll_N12 + 1) 0.48685   0.02497 19.50 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6107 on 763 degrees of freedom
## Multiple R-squared:  0.3326, Adjusted R-squared:  0.3317 
## F-statistic: 380.2 on 1 and 763 DF,  p-value: < 2.2e-16
```





```
##
## Call:
## lm(formula = log(roll_case_rate + 1) ~ log(roll_N12 + 1), data = .)
##
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -1.7554 -0.4098  0.1554  0.4466  1.2966 
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 1.04864   0.06605 15.88 <2e-16 ***
## log(roll_N12 + 1) 0.48685   0.02497 19.50 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.6107 on 763 degrees of freedom
## Multiple R-squared:  0.3326, Adjusted R-squared:  0.3317 
## F-statistic: 380.2 on 1 and 763 DF,  p-value: < 2.2e-16
```





```

## 
## Call:
## lm(formula = log(roll_case_rate + 1) ~ log(roll_N12 + 1), data = .)
## 
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -1.7554 -0.4098  0.1554  0.4466  1.2966 
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 1.04864   0.06605 15.88 <2e-16 ***
## log(roll_N12 + 1) 0.48685   0.02497 19.50 <2e-16 ***  
## ---      
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.6107 on 763 degrees of freedom
## Multiple R-squared:  0.3326, Adjusted R-squared:  0.3317 
## F-statistic: 380.2 on 1 and 763 DF,  p-value: < 2.2e-16 

## 
## Call:
## lm(formula = roll_case_rate ~ roll_N12:site, data = .)
## 
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -33.703  -3.703  -0.984   2.790 145.859 
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 5.585904  0.038217 146.161 < 2e-16 ***
## roll_N12:siteAlgoma 0.016911  0.008143  2.077  0.03784 *  
## roll_N12:siteAppleton 0.189435  0.009194 20.605 < 2e-16 *** 
## roll_N12:siteAshland  0.064735  0.006479  9.992 < 2e-16 *** 
## roll_N12:siteBaraboo  0.087932  0.003493 25.175 < 2e-16 *** 
## roll_N12:siteBeloit  0.155784  0.014702 10.596 < 2e-16 *** 
## roll_N12:siteBerlin  0.140060  0.007354 19.045 < 2e-16 *** 
## roll_N12:siteBlack River Falls 0.118558  0.007527 15.752 < 2e-16 *** 
## roll_N12:siteBurlington 1.251385  0.131445  9.520 < 2e-16 ***

```

## roll_N12:siteCedarburg	0.258324	0.055890	4.622	3.81e-06	***
## roll_N12:siteChippewa Falls	0.048640	0.009404	5.172	2.32e-07	***
## roll_N12:siteClintonville	0.132974	0.003741	35.542	< 2e-16	***
## roll_N12:siteColumbus	0.189150	0.007115	26.583	< 2e-16	***
## roll_N12:siteDe Pere	0.327029	0.017614	18.566	< 2e-16	***
## roll_N12:siteEau Claire	0.149647	0.005511	27.153	< 2e-16	***
## roll_N12:siteGrafton	2.618409	0.233430	11.217	< 2e-16	***
## roll_N12:siteGreen Bay	0.598710	0.022310	26.836	< 2e-16	***
## roll_N12:siteHartford	0.183224	0.005187	35.324	< 2e-16	***
## roll_N12:siteHayward	0.070787	0.002659	26.617	< 2e-16	***
## roll_N12:siteHudson	0.250381	0.006986	35.842	< 2e-16	***
## roll_N12:siteJanesville	0.119512	0.004490	26.620	< 2e-16	***
## roll_N12:siteKenosha	0.095362	0.004155	22.951	< 2e-16	***
## roll_N12:siteLa Crosse	0.145224	0.006582	22.064	< 2e-16	***
## roll_N12:siteLac du Flambeau	0.492791	0.019843	24.834	< 2e-16	***
## roll_N12:siteLake Geneva	0.081780	0.005251	15.573	< 2e-16	***
## roll_N12:siteLodi	0.150795	0.007393	20.398	< 2e-16	***
## roll_N12:siteMadison	0.065367	0.005054	12.934	< 2e-16	***
## roll_N12:siteManitowoc	0.114786	0.004043	28.395	< 2e-16	***
## roll_N12:siteMarinette	0.040272	0.002304	17.475	< 2e-16	***
## roll_N12:siteMarshfield	0.275396	0.008217	33.515	< 2e-16	***
## roll_N12:siteMauston	0.211159	0.010424	20.258	< 2e-16	***
## roll_N12:siteMenomonie	0.163476	0.006019	27.162	< 2e-16	***
## roll_N12:siteMerrill	0.132145	0.005411	24.420	< 2e-16	***
## roll_N12:siteMonroe	0.211438	0.007981	26.494	< 2e-16	***
## roll_N12:siteNew Richmond	0.088699	0.017528	5.060	4.21e-07	***
## roll_N12:siteOconomowoc	0.185095	0.006194	29.885	< 2e-16	***
## roll_N12:siteOshkosh	0.074687	0.003678	20.307	< 2e-16	***
## roll_N12:sitePeshtigo	0.055904	0.007966	7.018	2.30e-12	***
## roll_N12:sitePlatteville	0.263154	0.011471	22.941	< 2e-16	***
## roll_N12:sitePlymouth	0.128875	0.005010	25.722	< 2e-16	***
## roll_N12:sitePort Washington	2.799018	0.229013	12.222	< 2e-16	***
## roll_N12:sitePortage	0.076929	0.004145	18.560	< 2e-16	***
## roll_N12:siteRacine	0.556609	0.019588	28.416	< 2e-16	***
## roll_N12:siteRhineland	0.067745	0.005379	12.595	< 2e-16	***
## roll_N12:siteRib Lake	0.131040	0.003391	38.649	< 2e-16	***
## roll_N12:siteRib Mountain	0.385249	0.019127	20.142	< 2e-16	***
## roll_N12:siteRiver Falls	0.166155	0.006167	26.942	< 2e-16	***
## roll_N12:siteSheboygan	0.131294	0.004750	27.640	< 2e-16	***
## roll_N12:siteSouth Milwaukee	2.223635	0.200293	11.102	< 2e-16	***
## roll_N12:siteSparta	0.145318	0.022094	6.577	4.86e-11	***
## roll_N12:siteSpencer	0.163161	0.004255	38.345	< 2e-16	***
## roll_N12:siteSpooner	0.049087	0.015915	3.084	0.00204	**
## roll_N12:siteStevens Point	0.194387	0.006739	28.847	< 2e-16	***
## roll_N12:siteSturgeon Bay	0.084298	0.019981	4.219	2.46e-05	***
## roll_N12:siteSun Prairie	0.093006	0.004431	20.991	< 2e-16	***
## roll_N12:siteSuperior	0.053117	0.005131	10.352	< 2e-16	***
## roll_N12:siteViroqua	0.070616	0.006235	11.326	< 2e-16	***
## roll_N12:siteWashburn	0.027021	0.021385	1.264	0.20640	
## roll_N12:siteWatertown	0.122935	0.005791	21.229	< 2e-16	***
## roll_N12:siteWaukesha	1.253580	0.051673	24.260	< 2e-16	***
## roll_N12:siteWaupaca	0.014380	0.011329	1.269	0.20431	
## roll_N12:siteWausau	0.155850	0.005909	26.375	< 2e-16	***
## roll_N12:siteWhitewater	0.118854	0.009284	12.802	< 2e-16	***

```

## roll_N12:siteWisconsin Rapids  0.098507   0.003893  25.301  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.628 on 38767 degrees of freedom
##   (25531 observations deleted due to missingness)
## Multiple R-squared:  0.3301, Adjusted R-squared:  0.329
## F-statistic: 303.2 on 63 and 38767 DF, p-value: < 2.2e-16

##
## Call:
## lm(formula = log(roll_case_rate) ~ log(roll_N12), data = .)
##
## Residuals:
##    Min      1Q  Median      3Q     Max
## -3.2333 -0.3879  0.0914  0.4742  2.7351
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 1.131905  0.016185 69.94   <2e-16 ***
## log(roll_N12) 0.306458  0.005756 53.24   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7409 on 8588 degrees of freedom
## Multiple R-squared:  0.2481, Adjusted R-squared:  0.248
## F-statistic:  2834 on 1 and 8588 DF, p-value: < 2.2e-16

##
## Call:
## lm(formula = log(roll_case_rate + 1) ~ log(roll_N12 + 1), data = .)
##
## Residuals:
##    Min      1Q  Median      3Q     Max
## -2.58044 -0.37265  0.05058  0.42980  2.95859
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 1.167384  0.007334 159.2   <2e-16 ***
## log(roll_N12 + 1) 0.340039  0.002643 128.7   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6455 on 38829 degrees of freedom
##   (25531 observations deleted due to missingness)
## Multiple R-squared:  0.2989, Adjusted R-squared:  0.2989
## F-statistic: 1.655e+04 on 1 and 38829 DF, p-value: < 2.2e-16

##
## Call:
## lm(formula = log(roll_case_rate + 1) ~ log(roll_N12 + 1), data = .)
##
## Residuals:

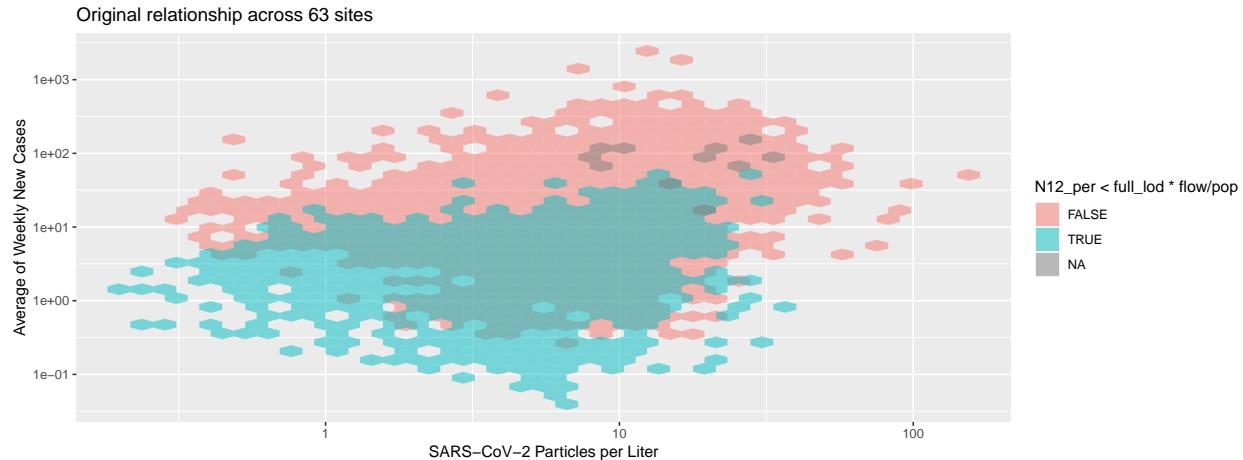
```

```

##      Min      1Q   Median      3Q     Max
## -2.59510 -0.36855  0.05229  0.42708  2.97020
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)           1.111519  0.007773 143.0 <2e-16 ***
## log(roll_N12 + 1) 0.357010  0.002795 127.8 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6469 on 38829 degrees of freedom
## (25531 observations deleted due to missingness)
## Multiple R-squared:  0.2959, Adjusted R-squared:  0.2959
## F-statistic: 1.632e+04 on 1 and 38829 DF, p-value: < 2.2e-16

## # A tibble: 3 x 3
##   site       `case freq` `waste freq`
##   <chr>        <dbl>         <dbl>
## 1 Madison        7            6
## 2 Marshfield     7            2
## 3 Black River Falls 7            2

```



GOALS: data consistency

