Economic Output and Risk Factors

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What is the relationship between health risk concentrations and economic output?

Calculate correlations between environmental exposures and farm sales (and/or other econ. variables) to understand economic linkages. A p-value of 0 reflects that it is statistically impossible to reach these results under a true null hypothesis.

Correlation Coefficients between predictor X and Crop Total Sales (\$)

```
## # A tibble: 7 x 4
     predictor
                                                    correlation p value significance
##
##
     <chr>
                                                          <dbl>
                                                                  <dbl> <lgl>
                                                          0.907
                                                                      O TRUE
## 1 commodity_totals_sales_measured_in_$
## 2 commodity_totals_sales_measured_in_$_operati~
                                                          0.745
                                                                      0 TRUE
## 3 income_farmrelated_operations_with_receipts
                                                          0.751
                                                                      O TRUE
                                                                      0 TRUE
## 4 income_farmrelated_receipts_measured_in_$
                                                          0.803
## 5 income_net_cash_farm_of_operations_net_incom~
                                                          0.867
                                                                      O TRUE
## 6 income_net_cash_farm_of_operations_net_incom~
                                                          0.718
                                                                      0 TRUE
## 7 income_net_cash_farm_of_operations_operation~
                                                          0.443
                                                                      O TRUE
## # A tibble: 7 x 4
##
     predictor
                                    correlation p_value significance
     <chr>>
                                          <dbl>
                                                  <dbl> <lgl>
## 1 farm_sales_(less_than_2500_$)
                                         0.211
                                                 0.0003 TRUE
## 2 farm_sales_(5000_to_9999_$)
                                        0.0146 0.807
                                                       FALSE
## 3 farm_sales_(50000_to_99999_$)
                                        0.383
                                                 0
                                                        TRUE
## 4 farm_sales_(2500_to_4999_$)
                                        -0.0594 0.32
                                                        FALSE
## 5 farm_sales_(25000_to_49999_$)
                                        0.346
                                                 0
                                                        TRUE
## 6 farm sales (10000 to 24999 $)
                                        0.126
                                                 0.0344 TRUE
## 7 farm sales (100000 or more $)
                                        0.830
                                                        TRUE
## # A tibble: 53 x 4
##
      predictor
                                                    correlation p_value significance
##
      <chr>
                                                          <dbl>
                                                                  <dbl> <lgl>
   1 barley_acres_harvested
                                                          0.529
                                                                      0 TRUE
   2 barley_operations_with_area_harvested
                                                                      O TRUE
                                                          0.510
   3 barley_production_measured_in_bu
                                                          0.536
                                                                      O TRUE
   4 beans_dry_edible_(excl_chickpeas_&_lima)_ac~
                                                          0.568
                                                                      O TRUE
  5 beans_dry_edible_(excl_chickpeas_&_lima)_op~
                                                                      0 TRUE
                                                          0.510
   6 beans_dry_edible_(excl_chickpeas_&_lima)_pr~
                                                          0.580
                                                                      O TRUE
  7 corn_grain_acres_harvested
                                                          0.761
                                                                      O TRUE
  8 corn_grain_operations_with_area_harvested
                                                          0.802
                                                                      O TRUE
   9 corn_grain_production_measured_in_bu
                                                          0.776
                                                                      O TRUE
## 10 corn_silage_acres_harvested
                                                          0.346
                                                                      0 TRUE
## # i 43 more rows
## # A tibble: 19 x 4
```

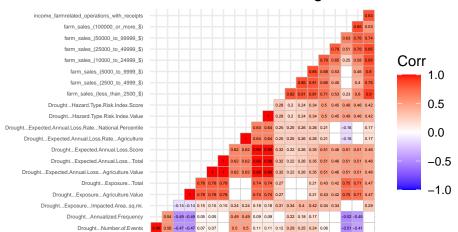
```
##
      predictor
                                                    correlation p_value significance
##
      <chr>
                                                                  <dbl> <lgl>
                                                          <dbl>
##
  1 animal totals incl products sales measured ~
                                                        0.378
                                                                        TRUE
## 2 cattle_cows_beef_inventory
                                                                 0.880 FALSE
                                                        0.0106
## 3 cattle_cows_beef_operations_with_inventory
                                                        0.153
                                                                 0.0098 TRUE
## 4 cattle cows milk inventory
                                                        0.495
                                                                        TRUE
## 5 cattle cows milk operations with inventory
                                                        0.0297
                                                                 0.643 FALSE
## 6 cattle_incl_calves_inventory
                                                        0.239
                                                                 0
                                                                        TRUE
## 7 cattle_incl_calves_operations_with_inventory
                                                        0.145
                                                                 0.0142 TRUE
## 8 cattle_incl_calves_operations_with_sales
                                                        0.178
                                                                 0.0026 TRUE
## 9 cattle_incl_calves_sales_measured_in_head
                                                        0.221
                                                                 0.0002 TRUE
## 10 chickens_broilers_operations_with_sales
                                                                 0.854 FALSE
                                                       -0.0143
## 11 chickens_broilers_sales_measured_in_head
                                                        0.245
                                                                 0.0368 TRUE
## 12 chickens_layers_inventory
                                                                 0.974 FALSE
                                                        0.00204
## 13 chickens_layers_operations_with_inventory
                                                       -0.190
                                                                 0.0013 TRUE
## 14 hogs_inventory
                                                        0.596
                                                                 0
                                                                        TRUE
                                                                 0.670 FALSE
## 15 hogs_operations_with_inventory
                                                       -0.0266
## 16 hogs operations with sales
                                                        0.0394
                                                                 0.526 FALSE
                                                                        TRUE
## 17 hogs_sales_measured_in_head
                                                        0.595
## 18 sheep_incl_lambs_inventory
                                                       -0.148
                                                                 0.0201 TRUE
## 19 sheep_incl_lambs_operations_with_inventory
                                                       -0.0744
                                                                 0.219 FALSE
## # A tibble: 8 x 4
##
    predictor
                                                    correlation p value significance
##
     <chr>>
                                                                  <dbl> <lgl>
                                                          <dbl>
## 1 ag land cropland acres
                                                         0.829
                                                                  0
                                                                        TRUE
## 2 ag_land_cropland_number_of_operations
                                                         0.627
                                                                  0
                                                                        TRUF.
## 3 ag_land_cropland_harvested_number_of_operati~
                                                         0.601
                                                                  0
                                                                        TRUE
                                                                  0
                                                                        TRUE
## 4 ag_land_incl_buildings_operations_with_asset~
                                                         0.443
## 5 ag_land_incl_buildings_asset_value_measured_~
                                                         0.356
                                                                  0
                                                                        TRUE
                                                                        TRUE
## 6 ag_land_irrigated_number_of_operations
                                                        -0.291
                                                                  0
## 7 ag_land_incl_buildings_asset_value_measured_~
                                                         0.265
                                                                        TRUE
                                                                  0.162 FALSE
## 8 ag_land_irrigated_acres
                                                        -0.0869
## # A tibble: 8 x 4
##
     predictor
                                                    correlation p_value significance
##
     <chr>>
                                                          <dbl>
                                                                  <dbl> <lgl>
## 1 area operated (1.0 to 9.9 acres)
                                                        -0.118
                                                                 0.0507 FALSE
## 2 area_operated_(10.0_to_49.9_acres)
                                                         0.0600
                                                                 0.313 FALSE
## 3 area_operated_(50_to_179_acres)
                                                         0.378
                                                                 0
                                                                        TRUE
## 4 area_operated_(180_to_499_acres)
                                                                 0
                                                                        TRUE
                                                         0.572
## 5 area operated (500 to 999 acres)
                                                         0.699
                                                                        TRUE
## 6 area_operated_(1000_or_more_acres)
                                                         0.567
                                                                 0
                                                                        TRUE
## 7 farm_operations_area_operated_measured_in_ac~
                                                        -0.0312
                                                                 0.600 FALSE
## 8 farm_operations_area_operated_measured_in_ac~
                                                         0.285
                                                                 0
                                                                        TRUE
## # A tibble: 242 x 4
##
      predictor
                                                    correlation p_value significance
##
      <chr>
                                                          <dbl>
                                                                  <dbl> <lgl>
  1 Avalanche...Annualized.Frequency
                                                         0.0495
                                                                 0.642 FALSE
   2 Avalanche...Expected.Annual.Loss...Building~
                                                         0.0146
                                                                 0.890 FALSE
   3 Avalanche...Expected.Annual.Loss...Populati~
                                                         0.119
                                                                 0.262 FALSE
## 4 Avalanche...Expected.Annual.Loss...Populati~
                                                                 0.262 FALSE
                                                         0.119
## 5 Avalanche...Expected.Annual.Loss...Total
                                                         0.119
                                                                 0.260 FALSE
## 6 Avalanche...Expected.Annual.Loss.Rate...Bui~
                                                        -0.230
                                                                 0.0281 TRUE
```

```
## 7 Avalanche...Expected.Annual.Loss.Rate...Nat~
                                                        -0.293
                                                                 0.0049 TRUE
## 8 Avalanche...Expected.Annual.Loss.Rate...Pop~
                                                        -0.292
                                                                 0.0049 TRUE
## 9 Avalanche...Expected.Annual.Loss.Score
                                                         0.119
                                                                 0.260 FALSE
## 10 Avalanche...Exposure...Impacted.Area..sq.mi.
                                                         0.160
                                                                 0.131 FALSE
## # i 232 more rows
## # A tibble: 2 x 4
##
    predictor
                                                    correlation p_value significance
##
     <chr>
                                                          <dbl>
                                                                  <dbl> <lgl>
## 1 expense_totals_operating_expense_measured_in~
                                                          0.908
                                                                      0 TRUE
## 2 expense_totals_operating_expense_measured_in~
                                                          0.750
                                                                      O TRUE
## # A tibble: 11 x 4
##
      predictor
                                                    correlation p_value significance
##
                                                                  <dbl> <lgl>
      <chr>
                                                          <dbl>
##
   1 Expected.Annual.Loss...Agriculture.Value...~
                                                         0.757
                                                                 0
                                                                        TRUE
   2 Expected.Annual.Loss.Rate...Agriculture...C~
                                                         0.322
                                                                 0
                                                                        TRUE
   3 Expected.Annual.Loss...Score...Composite
                                                                 0
                                                                        TRUE
                                                         0.286
  4 Expected.Annual.Loss...Total...Composite
                                                         0.286
                                                                        TRUE
## 5 Expected.Annual.Loss.Rate...Population...Co~
                                                         0.254
                                                                        TRUE
                                                                 0
## 6 Expected.Annual.Loss.Rate...National.Percen~
                                                         0.247
                                                                        TRUE
## 7 Expected.Annual.Loss...State.Percentile...C~
                                                         0.220
                                                                 0.0002 TRUE
## 8 Expected.Annual.Loss...Building.Value...Com~
                                                         0.216
                                                                 0.0002 TRUE
## 9 Expected.Annual.Loss.Rate...Building...Comp~
                                                         0.215
                                                                 0.0003 TRUE
## 10 Expected.Annual.Loss...Population...Composi~
                                                         0.0882
                                                                 0.137 FALSE
## 11 Expected.Annual.Loss...Population.Equivalen~
                                                         0.0882 0.137 FALSE
## # A tibble: 2 x 4
##
     predictor
                                           correlation p_value significance
##
     <chr>
                                                 <dbl>
                                                         <dbl> <lgl>
## 1 farm_operations_number_of_operations
                                                 0.443
                                                               TRUE
## 2 farm_operations_acres_operated
                                                 0.213 0.0003 TRUE
## # A tibble: 3 x 4
##
     predictor
                                                    correlation p_value significance
##
     <chr>>
                                                          <dbl>
                                                                  <dbl> <lgl>
## 1 National.Risk.Index...Value...Composite
                                                          0.270 0
                                                                        TRUE
## 2 National.Risk.Index...Score...Composite
                                                          0.270 0
                                                                        TRUE
## 3 National.Risk.Index...State.Percentile...Com~
                                                          0.211 0.0003 TRUE
## # A tibble: 7 x 4
                                                   correlation p_value significance
##
    predictor
##
     <chr>>
                                                         <dbl>
                                                                 <dbl> <lgl>
## 1 Community.Resilience...Score
                                                        0.369
                                                                       TRUE
                                                                0
## 2 Community.Resilience...State.Percentile
                                                                0.0025 TRUE
                                                        0.179
## 3 Community.Resilience...Value
                                                        0.369
                                                                       TRUE
## 4 Community.Risk.Factor...Value
                                                       -0.0762 0.200
                                                                       FALSE
## 5 Social.Vulnerability...Score
                                                       -0.0627
                                                                0.292 FALSE
## 6 Social. Vulnerability... State. Percentile
                                                        0.0616 0.300 FALSE
## 7 Social.Vulnerability.ExpectedLossRate.Adjust
                                                        0.231
                                                                0.0001 TRUE
## # A tibble: 10 x 4
##
      predictor
                                                    correlation p_value significance
##
                                                                  <dbl> <lgl>
      <chr>
                                                          <dbl>
  1 machinery totals asset value measured in $
                                                         0.918
                                                                 0
                                                                        TRUE
## 2 Agriculture. Value....
                                                         0.907
                                                                 0
                                                                        TRUE
## 3 govt_programs_federal_operations_with_recei~
                                                         0.826
                                                                 0
                                                                        TRUE
```

```
## 4 machinery_totals_asset_value_measured_in_$_~
                                                                       TRUE
                                                        0.751
## 5 govt_programs_federal_receipts_measured_in_$
                                                        0.746
                                                                0
                                                                       TRUE
## 6 Shape Length
                                                       -0.255
                                                                0
                                                                       TRUE
                                                       -0.241
## 7 Area..sq.mi.
                                                                       TRUE
                                                                0
## 8 Shape__Area
                                                       -0.184
                                                                0.0018 TRUE
## 9 Building. Value....
                                                        0.108
                                                                0.0684 FALSE
## 10 Population..2020.
                                                       -0.0447 0.453 FALSE
## Count of Significant (True) and Non-Significant (False) Correlations (p < 0.05)
##
## FALSE TRUE
          298
##
     80
## # A tibble: 299 x 2
     predictor
                                                                 p_value
##
      <chr>
                                                                   <dbl>
##
  1 ag_land_cropland_acres
                                                                       0
## 2 ag_land_cropland_number_of_operations
                                                                       0
## 3 ag_land_cropland_harvested_number_of_operations
                                                                       0
## 4 ag_land_incl_buildings_operations_with_asset_value
                                                                       0
## 5 ag_land_incl_buildings_asset_value_measured_in_$_operation
                                                                       0
## 6 ag_land_irrigated_number_of_operations
                                                                       0
## 7 ag_land_incl_buildings_asset_value_measured_in_$_acre
                                                                       0
## 8 hogs sales measured in head
                                                                       0
## 9 hogs_inventory
                                                                       0
## 10 cattle_cows_milk_inventory
                                                                       0
## # i 289 more rows
```

Below are a series of correlation plots between variables of economic output and different weather and natural disaster predictors.

Correlation Plot: drought

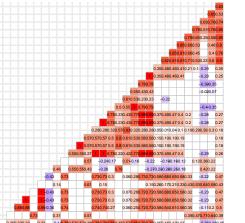


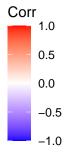
Drought...Exposure...Agriculture.Value Drought...Expected.Annual.Loss...Agriculture.Value Drought...Expected.Annual.Loss...Total Expected.Annual.Loss.Rate...Agriculture

Drought...Exposure...Impacted.Area..sq.mi. Drought...Exposure...

Correlation Plot: wildfire





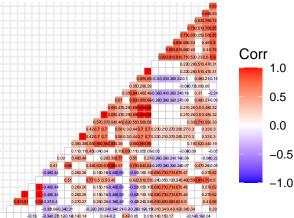


Wildrine... Exposure... Impacted Area...sq.rml
Wildrine... Exposure... Population
Wildrine... Exposure... Population
Wildrine... Exposure... Application Equivalence
Wildrine... Exposured Annual Loss... Budding Value
Wildrine... Exposured Annual Loss... Total and
Wildrine... Exposured Annual Loss... Total annual Loss...

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Correlation Plot: winter.weather

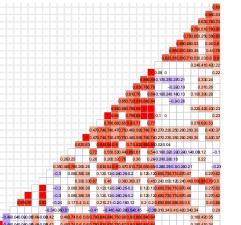


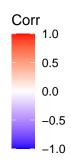


Winter/Weather. Exposure. Budding Alue again.
Winter/Weather. Exposure. Budding Alue again.
Winter/Weather. Exposure. Budding Alue again.
Winter/Weather. Exposure. Application Equivalence of the again.
Winter/Weather. Exposure. Application Equivalence of the again.
Winter/Weather. Historic Loss Ratio. Judicing Male Winter/Weather. Historic Loss Ratio. Judicing Male Winter/Weather. Historic Loss Ratio. Judicing Male Winter/Weather. Exposured Annual Loss. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Budding Male Winter/Weather. Exposured Annual Loss Ratio. Budding Male Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application of the again.
Winter/Weather. Exposured Annual Loss Ratio. Application.
W

Correlation Plot: hail

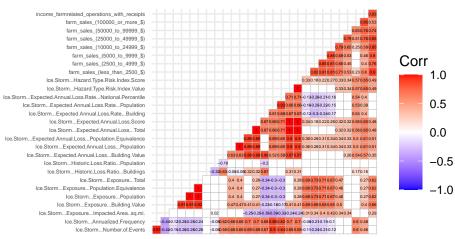






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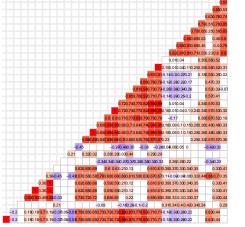
Correlation Plot: ice.storm



farm; saleb). (2000). 2008. [farm; saleb). (2000). 2008. [farm; saleb). (2000). 2009. [farm; saleb). (2000). 2009. [farm; saleb). (2000). (2000). [farm; saleb). (2000). (2

Correlation Plot: Cold.Wave

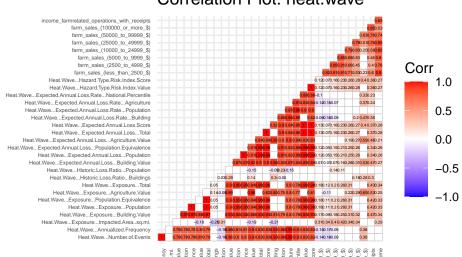






Codt Wave. Exposure. Laplating value
Codt Wave. Exposure. Population
Codt Wave. Exposure. Population
Codt Wave. Exposure. Population
Codt Wave. Exposure. Exposure. Exposure
Codt Wave. Exposure. Application
Codt Wave. Heteroft. Loss Ratio. Population
Codt Wave. Heteroft. Loss Ratio. Approxime
Codt Wave. Heteroft. Loss Ratio. Approxime
Codt Wave. Exposured Annual Loss. Buildings
Wave. Exposured Annual Loss. Building
Codt Wave. Exposured Annual Loss Bate. Building
Codt Wave. Exposured Annual Loss Rate. Spulding
Codt Wave. Exposured Annual Loss Rate. Population
Codt Wave. Exposured Annual Loss Rate. Apprinture
Codt Wave. Hazzard Loss Rate. Maximal Pros. Population
Codt Wave. Exposured Annual Loss Rate. Apprinture
Codt Wave. Exposured Annual Loss Rate. Spulding
Codt Wave. Exposured Annual Loss Rat

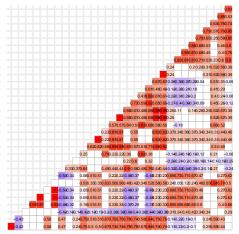
Correlation Plot: heat.wave

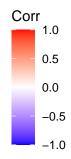


Heat Wave ... Annualized Frequency
Heat Wave ... Exposure... Englands ... Englands ... Annualized Frequency
Heat Wave ... Exposure... Englands ... Exposure... Building, Males
Heat Wave ... Exposure... Exposure... Exposure... Exposure... Exposure... Exposure... Total
Heat Wave ... Exposure... Exposure... Exposure... Total
Heat Wave ... Exposure... Advancation Estaviation to the Heat Wave ... Exposure... Advancation Estaviation Estaviation Heat Wave ... Exposure Annual Loss ... Propulation Estaviation Estaviation Heat Wave ... Exposed Annual Loss ... Propulation Estaviation Estaviation Estaviation Estaviation Heat Wave ... Exposed Annual Loss ... Propulation Estaviation Heat Wave ... Exposed Annual Loss Rate ... Building ... Heat Wave ... Exposed Annual Loss Rate ... Building ... Exposed Annual ... Exposed ..

Correlation Plot: strong.wind



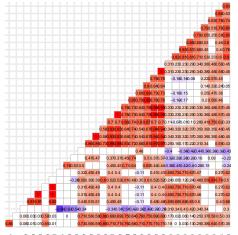


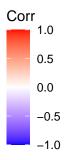


Strong Wind. Exposure...Impacted Area s.g.mi.
Strong Wind. Exposure...Impacted Area s.g.mi.
Strong Wind. Exposure...Buding Mallie
Strong Wind. Exposure...Agriculture Niele
Strong Wind. Historic Loss Ratio...Buding
Strong Wind. Exposure Agriculture
Strong Wind...Exposured Armal Loss...Buding
Strong Wind...Exposured Armal Loss Ratio...Buding

Correlation Plot: tornado



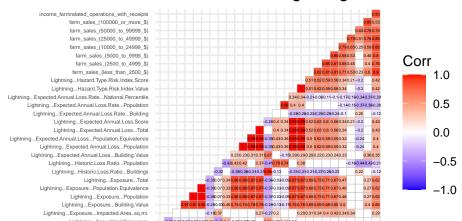


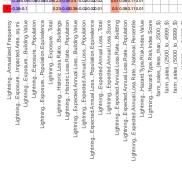


Tondoo, Exposure, magneted Anea, sqr ni Tonnado, Exposure, Building Wale Tonnado, Exposure, Building Ville Tonnado, Exposure, Agriullan Ville Tonnado, Exposure, Agriullan Ville Tonnado, Exposure, Agriullan Ville Tonnado, Exposure, Exposure, Tonnado, Harontzo Assagane, Tonnado, Exposure, Tonnado, Exposure, Tonnado, Harontzo Assagane, Buildings Tonnado, Harontzo Rando, Asputalion

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Correlation Plot: lightning





Lightning...Annualized.Frequency Lightning...Number.of.Events

Correlation Plot: avalanche

