Obesity drives COVID-19 mortality rates between countries after accounting for economic and demographic variables

**Research Question**
How does the prevalence of specific comorbidities within a country affect COVID-19 mortality per 100,000 people given differences in public health infrastructure and government responses to the pandemic?

**Introduction**
- Past research has shown comorbidities such as obesity, diabetes, cardiovascular disease, and respiratory disease are linked to a greater probability of mortality from COVID-19.
- Despite the same disease, mortality rates varied drastically between countries.
- Understanding the drivers of mortality rates between countries can help inform the allocation of resources and the successful application of policy.

**Methods**
- Independent variables: Measures of comorbidities, demographics, and economic factors (See Results table)
- Dependent variable: COVID-19 deaths per 100,000 people
- Data Collection
  - Compiled data from WHO, World Data Bank, Oxford’s Policy Tracker, John Hopkins, & Harvard, 3, 4
- Data Cleaning
  - Removed any countries missing 3+ variables (n=49)
  - COVID-19 mortality & vaccination data from 03/13/22
  - We gathered the most recent observation between 2015-2019 for our other independent variables
- Log transformed GDP, population above 65, & population density
- Analysis
  - Performed a PCA analysis to identify latent variables
  - Performed several linear regressions with varying combinations of the independent variables to identify model with largest adjusted R^2

**Results**
- 4 latent variables, Dimension 1: Access to healthcare resources, Dimension 2: Longevity & comorbidity prevalence
- Linear regression
  - Comorbidities: Obesity & respiratory disease lead to significant increases in mortality rate
  - Demographic & economic variables: Population above 65, GDP, Mortality rate varies with region, decreases with GDP and increases with government response index and population above 65

**Discussion & Conclusion**
- Obesity prevalence, respiratory disease, & age have a significant effect on COVID-19 mortality across the globe.
- The combination of both GDP and Region suggest a strong effect of seasonality on COVID-19 mortality.
- Vaccines were likely not significant because timing of data.

**Acknowledgements**
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**Table 1**
<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>-1.42</td>
<td>700</td>
<td>-1.035</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Asia</td>
<td>-1.54</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Australia</td>
<td>-1.74</td>
<td>320</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>-1.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North America</td>
<td>-0.90</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>South America</td>
<td>2.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP per capita (log transformed)</td>
<td>8.610</td>
<td>1.439</td>
<td>-10.035</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Population above 65</td>
<td>10.527</td>
<td>1.943</td>
<td>6.56^*</td>
<td>0.035</td>
</tr>
<tr>
<td>Population density (log transformed)</td>
<td>4.200</td>
<td>1.353</td>
<td>-11.706</td>
<td>0.322</td>
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<tr>
<td>GDP health expenditure</td>
<td>6.450</td>
<td>2.925</td>
<td>2.407</td>
<td>0.104</td>
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<tr>
<td>Diabetes prevalence</td>
<td>7.684</td>
<td>4.300</td>
<td>1.787</td>
<td>0.552</td>
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<td>Respiratory deaths</td>
<td>36.162</td>
<td>66.099</td>
<td>-989.94</td>
<td>0.021</td>
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<tr>
<td>Obesity prevalence</td>
<td>16.956</td>
<td>9.405</td>
<td>-233.31</td>
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<td>Cardiovascular disease prevalence</td>
<td>250.648</td>
<td>123.274</td>
<td>0.981</td>
<td>0.325</td>
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<td>Ethnic diversity index</td>
<td>0.465</td>
<td>0.248</td>
<td>0.784</td>
<td>0.427</td>
</tr>
</tbody>
</table>

**Citations**