



# Analyzing the Connections between Lifestyle and Well-being during COVID-19





# Roadmap

Introduction

1

Data Sources

3

Limitations

5

Research  
Question

2

Results

4

Future Work

6



A decorative graphic on the left side of the slide consists of a cluster of hexagons in various shades of blue and cyan. Some hexagons contain white icons: a lightbulb, a thumbs-up, a smartphone, a magnifying glass, and a gear. A large cyan hexagon in the center of this cluster contains the white number '1'.

# 1

## Introduction

- Motivations
- Research Question
- Hypothesis
- Relevance



# Introduction: Motivations

## Effects of the COVID-19 Pandemic on...

### MENTAL HEALTH

- Job instability
- Rapid lifestyle changes
- Isolation

### PHYSICAL HEALTH

- Rapid decline in activity levels from stagnancy
- Rise of grocery delivery services
- Increase popularity of food delivery services



# Research Question

How do lifestyle factors and well-being during the COVID-19 pandemic correlate across approximately 60 countries?





# Hypothesis

Lifestyle factors of diet and exercise are positively correlated with measures of well-being (i.e. mental health statistics and happiness scores).





# Relevance

- ◇ COVID-19 has had a major **global** impact this year
- ◇ Personally relevant in making active efforts to living happier lives!



A decorative graphic on the left side of the slide consists of a large cyan hexagon with the number '2' inside. Surrounding this central hexagon are several smaller hexagons of varying shades of blue and cyan. Some of these smaller hexagons contain white icons: a lightbulb, a thumbs-up, a smartphone, a magnifying glass, and a gear. There is also a network-like icon with a central node and several connecting lines.

## 2

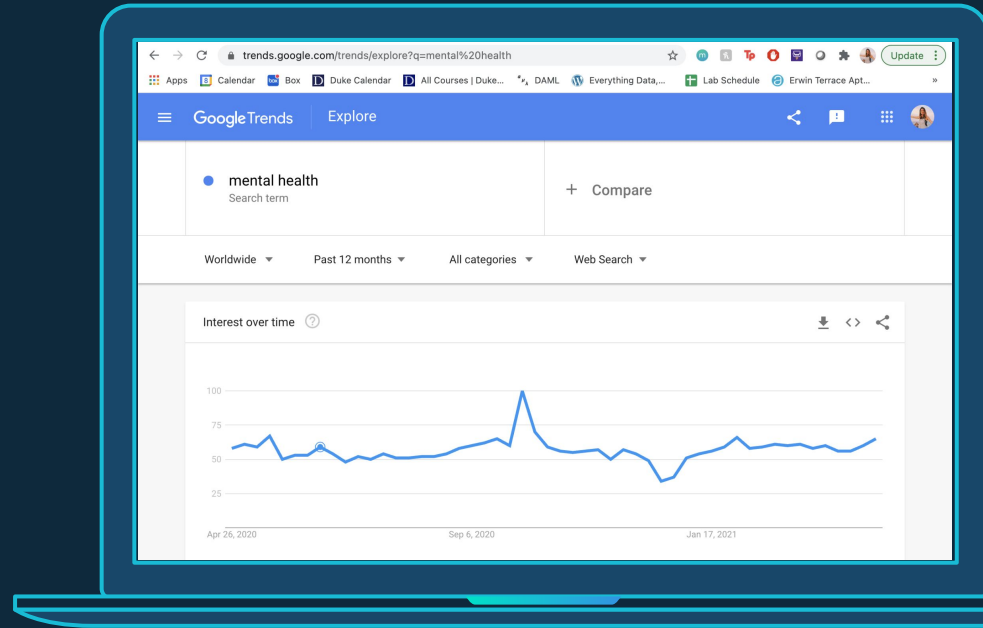
# Data Sources

- Mental health keywords from Google Trends
- “COVID-19 Healthy Diet Dataset”
- “World Happiness Report 2021”
- “Prevalence of Insufficient Physical Activity Among Adults Aged 18+ Years”



## Mental Health Keywords (Google Trends)

- Keywords: “depression”, “anxiety”, “mental health”, “panic attack”, “OCD”, “insomnia”, “counseling” “psychiatrist”
- 60 countries
- Search frequency score: 0-100
- Aggregate score per country





## “COVID-19 Healthy Diet Dataset” (Kaggle)

- ◆ Column = food group
- ◆ Row = country
- ◆ Values = percentage of kcal intake from that food group
- ◆ From the past year (2020)


Country name	Alcoholic Beverages	Animal Products	Animal fats	Aquatic Products	Cereals - Excl Eggs	Fish, Seafood	Fruits - Excl Meat	Milk - Excl Dairy	Miscellaneous	Offals	Other	
Afghanistan	0	4.7774	0.8504	0	37.1186	0.1501	0	1.4757	1.2006	2.4512	0.025	0.1251
Albania	0.912	16.093	1.0591	0	16.2107	0.8091	0.1471	3.8982	3.8688	9.9441	0.0588	0.2648
Algeria	0.0896	6.0326	0.1941	0	25.0112	0.4181	0.1195	3.1805	1.2543	3.9869	0.1045	0.0597
Angola	1.9388	4.6927	0.2644	0	18.3521	0.0441	0.8372	2.3133	2.9302	0.5067	0.0661	0.1102
Antigua and Barbuda	2.3041	15.3672	1.5429	0	13.7215	0.2057	1.728	3.6824	7.0356	4.6904	0.3086	0.1646
Argentina	1.4354	14.9869	1.065	0	16.7927	0.8643	0.2006	1.4663	9.4459	3.1641	0	0.2624
Armenia	0.2274	12.833	1.7706	0	19.2658	0.731	0.1787	2.5341	4.2235	5.6368	0.1137	0.2924
Australia	1.9783	15.6146	1.9027	0	11.643	0.4681	0.604	1.6611	7.4902	4.8022	0.2114	0.3473
Austria	2.8161	15.6106	5.2532	0	12.3748	0.7853	0.4062	1.5976	5.0095	4.0482	0	0.1083
Azerbaijan	2.2555	8.1682	1.305	0	28.7417	0.5478	0.0967	1.6111	2.9322	3.1738	0.0322	0.1128
Bahamas	2.9145	14.793	1.4205	0	10.7274	0.6613	1.2491	4.4575	8.1803	2.988	1.0776	0.2694
Bangladesh	0	2.3695	0.1541	0	37.5265	0.2312	0.8284	0.655	0.3468	0.7706	0.0193	0.0385
Barbados	1.1224	12.0877	1.157	0	15.3514	0.5871	1.416	1.934	5.664	3.1428	0.8979	0.1036
Belarus	3.2979	12.2644	2.6748	0	14.2705	0.8511	0.4863	1.3982	5.7143	2.1884	0.1672	0.3495
Belgium	2.3089	14.1587	4.7771	0	13.0441	0.69	0.5971	1.38	3.2776	4.6311	0	0.1858
Belize	1.5199	9.1752	2.6135	0	18.9064	0.2966	0.3707	2.5209	3.9481	1.8906	0.519	0.0371
Benin	1.7604	2.4864	0.0907	0	18.4755	0.0544	0.5263	0.7623	1.1978	0.5263	0.0544	0.0726
Bolivia	0.7859	10.0255	0.9133	0	21.644	0.5523	0.1062	2.4214	6.7545	1.6355	0.1274	0.085
Bosnia and Herzegovina	3.8856	9.0561	0.5507	0	21.233	0.2907	0.1836	1.8969	3.0289	4.8799	0.1989	0.1071
Botswana	1.5598	8.1197	1.047	0	22.3932	0.1068	0.1923	1.0256	1.8803	4.6795	0.4487	0.2137
Brazil	1.4314	13.2061	1.5238	0	14.5913	0.4464	0.2309	1.7239	7.1571	3.7402	0	0.1077
Bulgaria	3.6782	12.29	2.458	0	17.931	0.5836	0.2829	1.7683	4.3148	4.3855	0.0884	0.2653
Burkina Faso	2.5188	2.7946	0.1287	0	31.6051	0.1471	0.2574	0.1471	1.1583	1.0112	0.0368	0.0919
Cabo Verde	1.2525	8.5288	1.0537	0	23.8171	0.338	0.3976	1.4513	3.4394	3.2207	0.4374	0.0795
Cameroon	1.4153	4.0437	0.1011	0	33.0166	0.1011	1.7792	0.647	1.7792	0.2022	0.182	0.0809
Canada	1.5263	2.1669	0.1507	0	20.5201	0.0188	0.5464	3.5048	0.9987	0.4145	0.0565	0.0565
Central Africa	0.5402	7.3927	0.7393	0	13.0279	0.7731	0.5297	1.8182	4.796	2.6109	0.2577	0.0143
Chad	0.1436	6.9411	0.7659	0	27.8124	0.0239	0.4787	0.3112	3.0158	2.0345	0.0239	0.5984
Chile	1.5942	12.3547	1.3783	0	19.5782	0.631	0.3985	1.2786	7.4228	2.4909	0.083	0.0332
China	1.2768	16.1844	1.1773	0.0209	17.3827	1.2349	1.2872	1.2924	9.8896	1.889	0.5128	0.6698
Colombia	0.9856	8.8544	0.4363	0	15.3337	0.7433	0.2424	4.6857	4.0717	3.2477	0.0485	0.1293
Congo	1.6241	4.9805	0.065	0	12.6462	0.0433	1.1693	1.8839	3.1832	0.2815	0.1083	0.2382



## “World Happiness Report 2021”

- ◇ Row = country
- ◇ Column = GDP, life expectancy, generosity
- ◇ Ladder score = measures overall happiness

Country name	Regional	Ladder score	Standard error	upperwhisk	lowerwhisk	Logged GDI	Social support	Healthy life expectancy	Freedom to choose	Generosity	Perceptions	Ladder score	Explained	Explained
Finland	Western Ei	7.842	0.032	7.904	7.780	10.775	0.954	72.000	0.949	-0.098	0.186	2.430	1.446	1.106
Denmark	Western Ei	7.620	0.035	7.687	7.552	10.933	0.954	72.700	0.946	0.030	0.179	2.430	1.502	1.108
Switzerland	Western Ei	7.571	0.036	7.643	7.500	11.117	0.942	74.400	0.919	0.025	0.292	2.430	1.566	1.079
Iceland	Western Ei	7.554	0.059	7.670	7.438	10.878	0.983	73.000	0.955	0.160	0.873	2.430	1.482	1.172
Netherlands	Western Ei	7.464	0.027	7.518	7.410	10.932	0.942	72.400	0.913	0.175	0.338	2.430	1.501	1.079
Norway	Western Ei	7.392	0.035	7.462	7.323	11.053	0.954	73.300	0.960	0.093	0.270	2.430	1.543	1.108
Sweden	Western Ei	7.353	0.036	7.433	7.293	10.867	0.934	72.700	0.945	-0.085	0.237	2.430	1.478	1.062
Luxembourg	Western Ei	7.324	0.037	7.396	7.252	11.647	0.908	72.600	0.907	-0.034	0.386	2.430	1.751	1.003
New Zealand	North Ame	7.277	0.040	7.355	7.198	10.643	0.948	73.400	0.929	0.134	0.242	2.430	1.400	1.094
Austria	Western Ei	7.268	0.036	7.337	7.198	10.906	0.934	73.300	0.908	0.042	0.481	2.430	1.492	1.062
Australia	North Ame	7.183	0.041	7.265	7.102	10.796	0.940	73.900	0.914	0.159	0.442	2.430	1.453	1.076
Israel	Middle Eas	7.157	0.034	7.224	7.090	10.575	0.939	73.503	0.800	0.031	0.753	2.430	1.376	1.074
Germany	Western Ei	7.155	0.040	7.232	7.077	10.873	0.903	72.500	0.875	0.011	0.460	2.430	1.480	0.993
Canada	North Ame	7.103	0.042	7.185	7.021	10.776	0.926	73.800	0.915	0.089	0.415	2.430	1.447	1.044
Ireland	Western Ei	7.085	0.040	7.164	7.006	11.342	0.947	72.400	0.879	0.077	0.363	2.430	1.644	1.092
Costa Rica	Latin Amer	7.069	0.056	7.179	6.960	9.880	0.891	71.400	0.934	-0.126	0.809	2.430	1.134	0.966
United Kingdom	Western Ei	7.064	0.038	7.138	6.990	10.707	0.934	72.500	0.859	0.233	0.459	2.430	1.423	1.062
Czech Republic	Central an	6.965	0.049	7.062	6.868	10.566	0.947	70.807	0.856	-0.208	0.868	2.430	1.370	1.090
United States	North Ame	6.951	0.049	7.047	6.856	11.023	0.920	68.200	0.837	0.098	0.698	2.430	1.533	1.030
Belgium	Western Ei	6.834	0.034	6.901	6.767	10.823	0.906	72.199	0.783	-0.153	0.646	2.430	1.463	0.998
France	Western Ei	6.690	0.037	6.762	6.618	10.704	0.942	74.000	0.822	-0.147	0.571	2.430	1.421	1.081
Bahrain	Middle Eas	6.647	0.068	6.779	6.514	10.669	0.862	69.495	0.925	0.089	0.722	2.430	1.409	0.899
Malta	Western Ei	6.602	0.044	6.688	6.516	10.674	0.931	72.200	0.927	0.133	0.653	2.430	1.411	1.055
Taiwan Province of China	East Asia	6.584	0.038	6.659	6.510	10.871	0.898	69.600	0.784	-0.070	0.721	2.430	1.480	0.982
United Arab Emirates	Middle Eas	6.561	0.039	6.637	6.484	11.085	0.844	67.333	0.932	0.074	0.589	2.430	1.555	0.860
Saudi Arabia	Middle Eas	6.494	0.056	6.604	6.384	10.743	0.891	66.603	0.877	-0.149	0.684	2.430	1.435	0.964
Spain	Western Ei	6.491	0.042	6.574	6.408	10.571	0.932	74.700	0.761	-0.081	0.745	2.430	1.375	1.057
Italy	Western Ei	6.483	0.045	6.572	6.395	10.623	0.890	73.803	0.893	-0.084	0.868	2.430	1.393	0.940
Slovenia	Central an	6.461	0.043	6.546	6.376	10.529	0.948	71.400	0.949	-0.101	0.806	2.430	1.360	1.093
Guatemala	Latin Amer	6.435	0.073	6.577	6.292	9.053	0.813	64.958	0.906	-0.308	0.775	2.430	0.945	0.790
Uruguay	Latin Amer	6.431	0.046	6.521	6.341	9.966	0.925	69.100	0.896	-0.092	0.990	2.430	1.164	1.042
Singapore	Southeast	6.377	0.043	6.460	6.293	11.488	0.915	76.953	0.927	-0.018	0.882	2.430	1.695	1.019
Kosovo	Central an	6.372	0.059	6.487	6.257	9.318	0.821	63.813	0.869	0.257	0.917	2.430	0.937	0.807
Slovakia	Central an	6.331	0.041	6.411	6.251	10.369	0.936	68.201	0.766	-0.124	0.911	2.430	1.304	1.068
Brazil	Latin Amer	6.330	0.043	6.416	6.245	9.577	0.862	66.601	0.804	-0.071	0.756	2.430	1.028	0.944
Mexico	Latin Amer	6.317	0.053	6.420	6.213	9.859	0.831	68.597	0.862	-0.147	0.799	2.430	1.126	0.830
Jamaica	Latin Amer	6.309	0.156	6.615	6.004	9.186	0.877	67.500	0.890	-0.137	0.884	2.430	0.891	0.932
Lithuania	Central an	6.255	0.045	6.344	6.167	10.499	0.935	67.906	0.773	-0.203	0.826	2.430	1.350	1.065
Cyprus	Western Ei	6.223	0.049	6.319	6.128	10.576	0.802	73.898	0.763	-0.015	0.844	2.430	1.377	0.765
Estonia	Central an	6.189	0.038	6.263	6.115	10.481	0.941	68.800	0.909	-0.108	0.527	2.430	1.344	1.079
Central an	Central an	6.180	0.073	6.323	6.036	10.350	0.906	69.652	0.892	0.872	-0.066	2.430	0.976	0.697
Commonwe	Commonwe	6.179	0.068	6.312	6.045	8.836	0.918	65.255	0.970	0.311	0.515	2.430	0.769	1.027
Chile	Latin Amer	6.172	0.046	6.262	6.081	10.071	0.882	70.000	0.742	-0.044	0.830	2.430	1.200	0.946
Poland	Central an	6.166	0.040	6.245	6.087	10.382	0.898	69.702	0.841	-0.165	0.735	2.430	1.209	0.982
Kazakhstan	Commonwe	6.152	0.047	6.243	6.060	10.155	0.902	66.200	0.853	-0.069	0.733	2.430	1.103	0.927



## “Prevalence of Insufficient Physical Activity Among Adults Aged 18+ Years”

- ◇ WHO
- ◇ Adults 18+
- ◇ Row = country
- ◇ Column = Percentage of those with insufficient exercise
- ◇ Data is from 2016



Country name	Insufficient Activity (%)
Algeria	33.58
Andorra	38.4
Argentina	41.58
Armenia	22.64
Australia	30.37
Austria	30.09
Bahamas	43.26
Bangladesh	27.76
Barbados	42.9
Belarus	14.08
Belgium	35.75
Benin	15.89
Bhutan	22.98
Bosnia and Herzegovina	25.45
Botswana	21.74
Brazil	47.02
Brunei Darussalam	27.34
Bulgaria	38.63
Burkina Faso	20.3
Cabo Verde	19.68
Cambodia	10.51
Cameroon	28.51
Canada	28.6
Central African Republic	14.31
Chad	23.3
Chile	26.58
China	14.11
Colombia	44.01

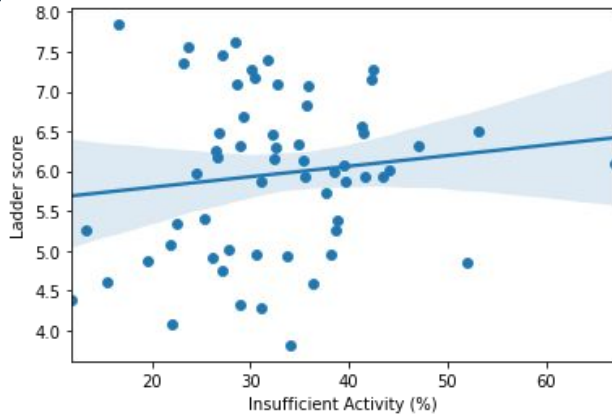


A decorative pattern of hexagons in various shades of blue and teal. Some hexagons contain icons: a lightbulb, a thumbs up, a smartphone, a magnifying glass, a gear, and a speech bubble. A large teal hexagon in the center-left contains the number 3.

# 3

## Results

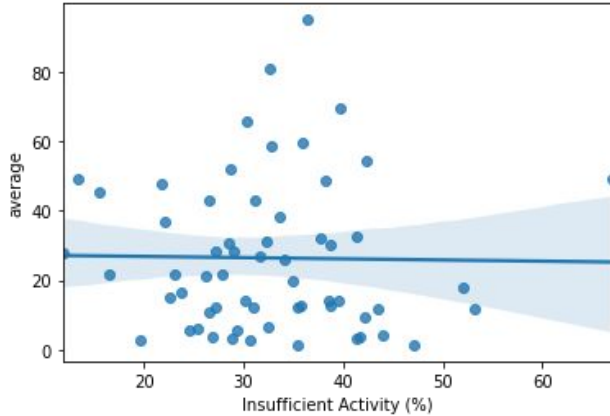
- Physical Activity vs. Happiness
- Physical Activity vs. Mental Health
- Diet vs. Mental Health
- Diet vs. Happiness
  - Calories from meat vs. Happiness



## Physical Activity vs. Happiness

- ◇ Extremely weak correlation
- ◇ No clear pattern





## Physical Activity vs. Mental Health

- ◇ Extremely weak correlation
- ◇ No clear pattern





# Diet Measures

## DIET VS HAPPINESS

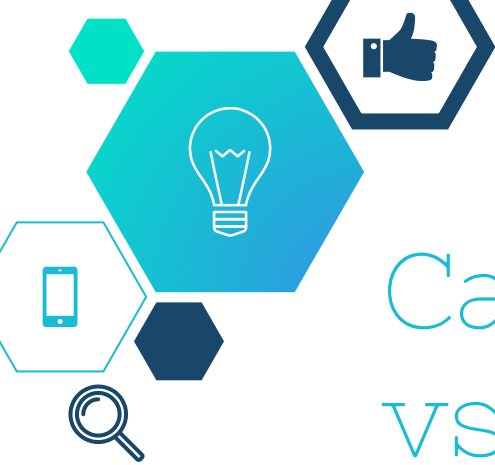
- $r^2 = 0.75$
- Moderately strong, positive
- $MSE = 0.25$  (low)

## DIET VS MENTAL HEALTH

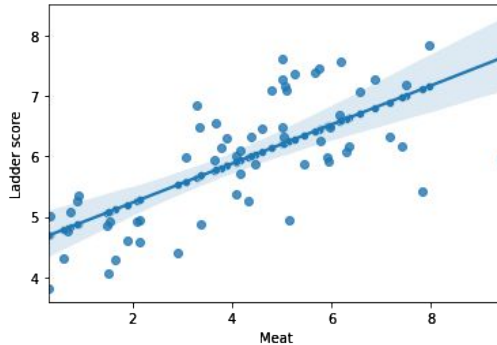
- $r^2 = 0.23$
- Weak, positive correlation
- $MSE = 352$  (very large)

Diet seems to be a better predictor of happiness than mental health.

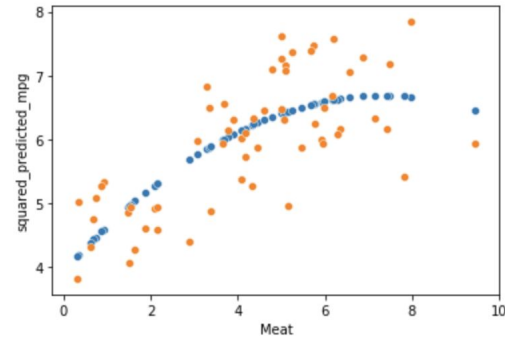




# Calories from Meat vs. Happiness

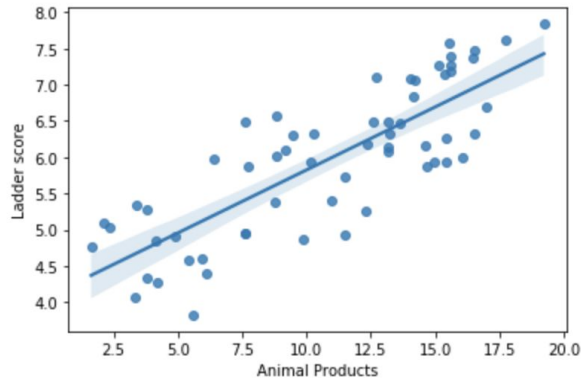


- ◇ Linear Regression
- ◇ MSE = 5.05
- ◇  $R^2 = 0.48$



- ◇ Nonlinear regression (quadratic)
- ◇ MSE = 0.44
- ◇  $R^2 = 0.56$





# Calories from Animal Products vs. Happiness

- ◇ Linear regression
- ◇ Moderate, positive correlation
- ◇  $MSE = 5.32$
- ◇  $r^2 = 0.66$
- ◇ Overfitting in higher order models





# Results Summary

- Moderate correlations found between
  - Animal product consumption and happiness
    - Linear Regression
  - Meat consumption and happiness
    - Nonlinear Regression (Quadratic)
- No significant correlations between
  - Exercise and happiness
  - Exercise and mental health
  - Diet and mental health



A decorative pattern of hexagons in various shades of blue and cyan. Some hexagons contain icons: a lightbulb, a thumbs up, a smartphone, a magnifying glass, and a gear. A large cyan hexagon in the center-left contains the number 4.

# 4

## Conclusion

- Limitations
- Future Work



# Conclusion

## LIMITATIONS

1. Google Trends biased to countries with better access to internet
2. Inconsistencies of language translation of mental health search terms
3. Exercise data was from 2016
4. Not all countries were included

## FUTURE WORK

1. Different measures of mental health to supplement
2. Look for exercise data from 2020-2021
3. Run logistic models
4. Linear regression models for specific food or mental health terms.



# Thanks!

**Any questions?**

