Increasing Your Country's Happiness

An online app that facilitates fundamental policy decisions

Objectives

1. Present an R-Shiny app that helps country officials facilitate policy decisions related to happiness of their people.

2. Illustrate the use of the app with a fictitious "case study".

Brief intro to "Development & Happiness of Countries" app

Tab 1: About the App:

Brief intro; tabs on the left reflect the suggested "workflow".

© GfK October 24, 2017 | Increasing Your Country's Happiness

Tab 2: Happiness World Map

Explore the world map where country color corresponds to its happiness score:
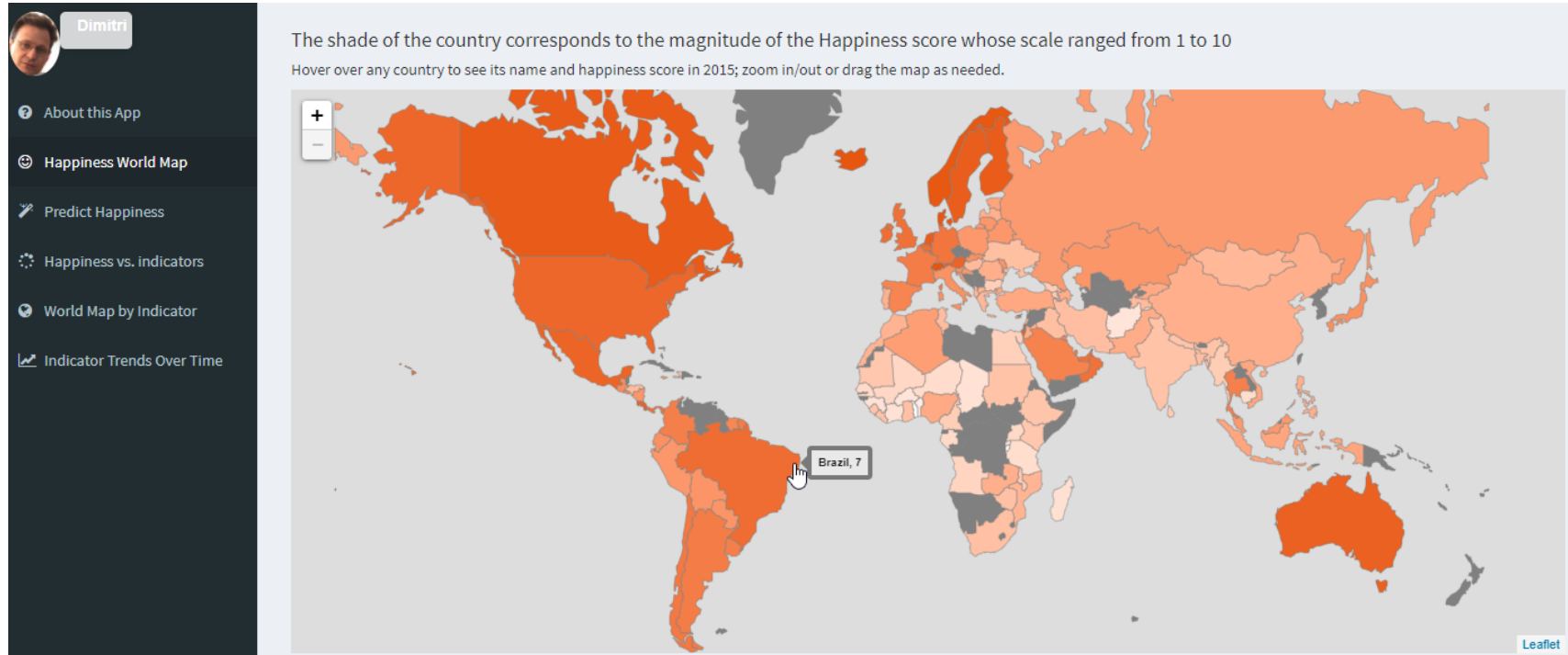
Tab 3: Predict Happiness

(a) Run a model predicting Happiness based on socio-economic indicators of your choice;
(b) Explore the relative importance of predictors you used.

Tab 4: Happiness vs. Indicators

Assess and visualize the bivariate relationship between any indicator and Happiness:

Tab 5: World Map by Indicator

Pick an indicator and explore how it changed over time for countries around the world.
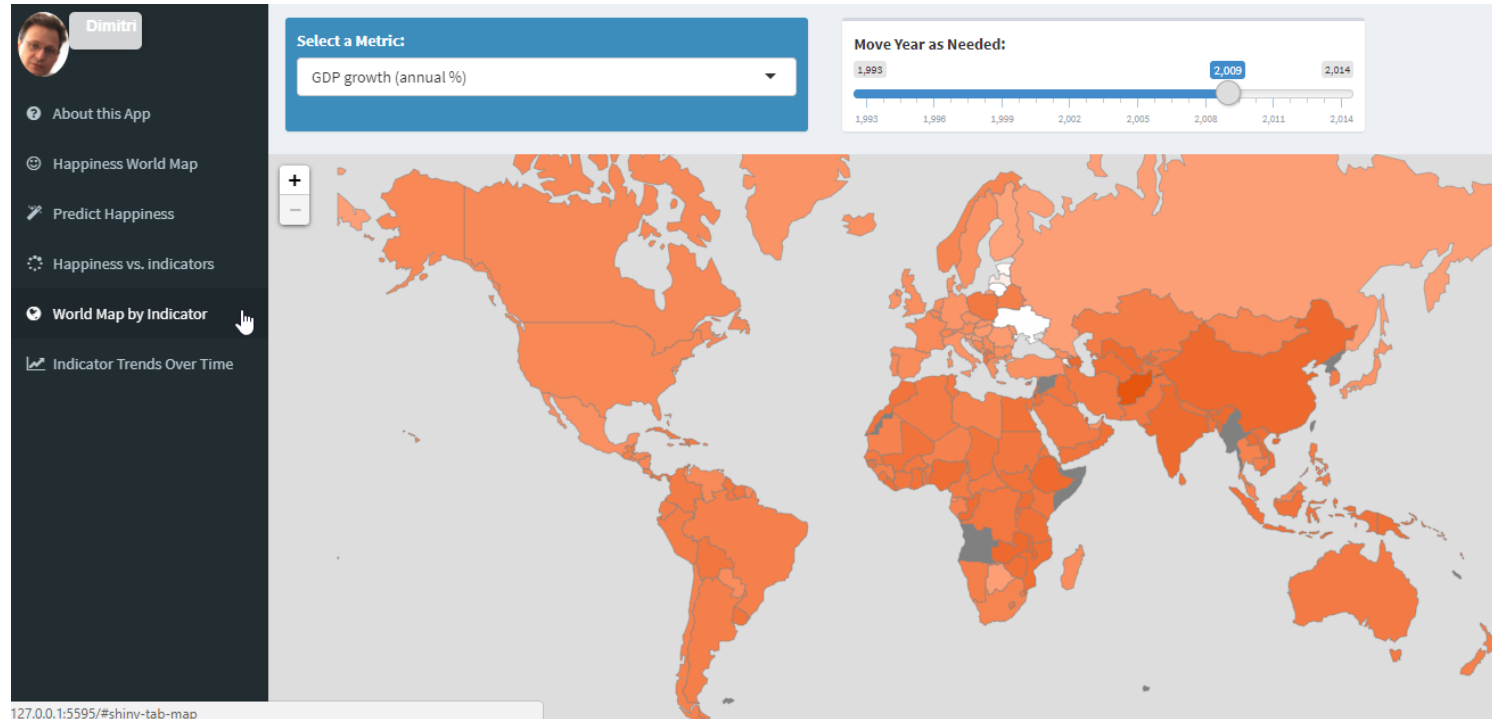
Tab 6: Indicator Trends over Time

For any country: explore indicator trend over time and juxtapose any 2 indicators:
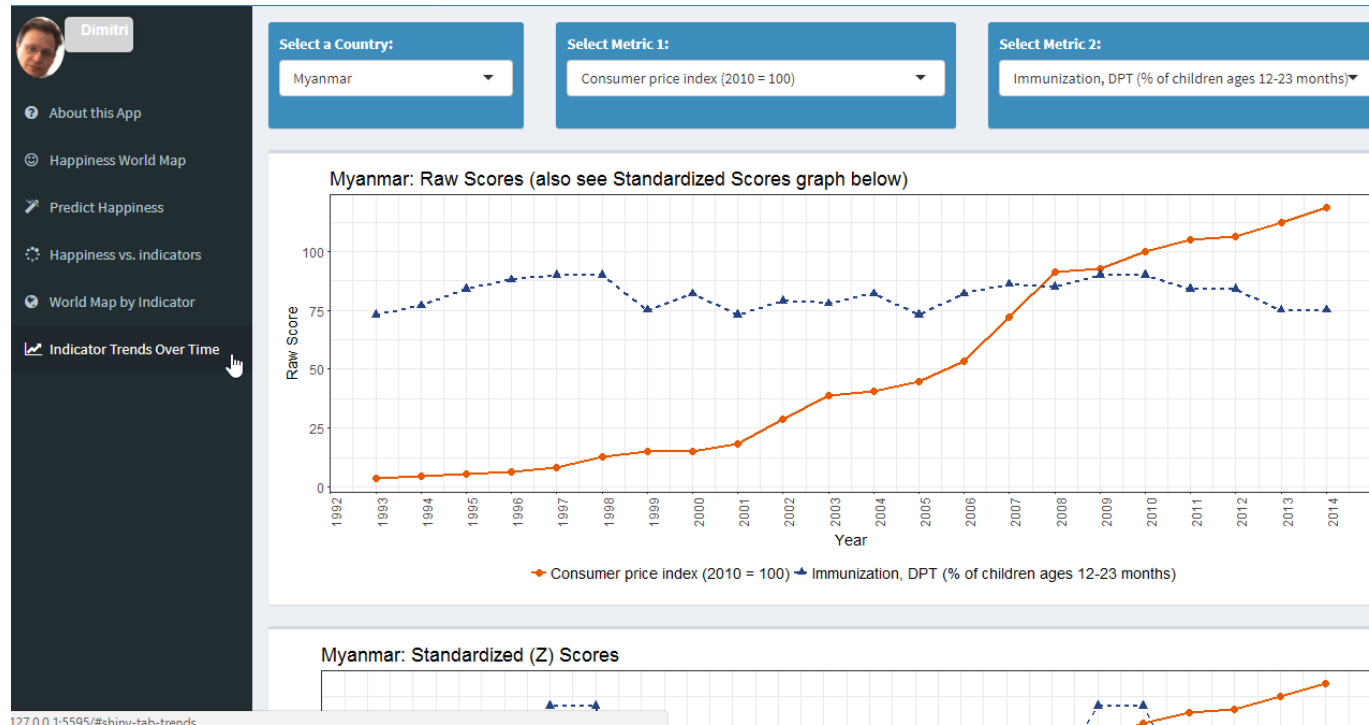
A Fictitious Case Study

Government of Bangladesh is interested in increasing Happiness of their people.

But how to approach it?

Fortunately, the government officials have heard of a nifty online Machine Learning App that uses:

- Country Happiness scores from Gallup's World Happiness survey, and
- World Bank's World Development Indicators

Maybe people of Bangladesh are already happy? How do we compare to others on Happiness?

Not so well! Our color is pale, our Happiness score is just 4.7 – a lot of room for improvement!

Bangladesh, 4.7

Leaflet
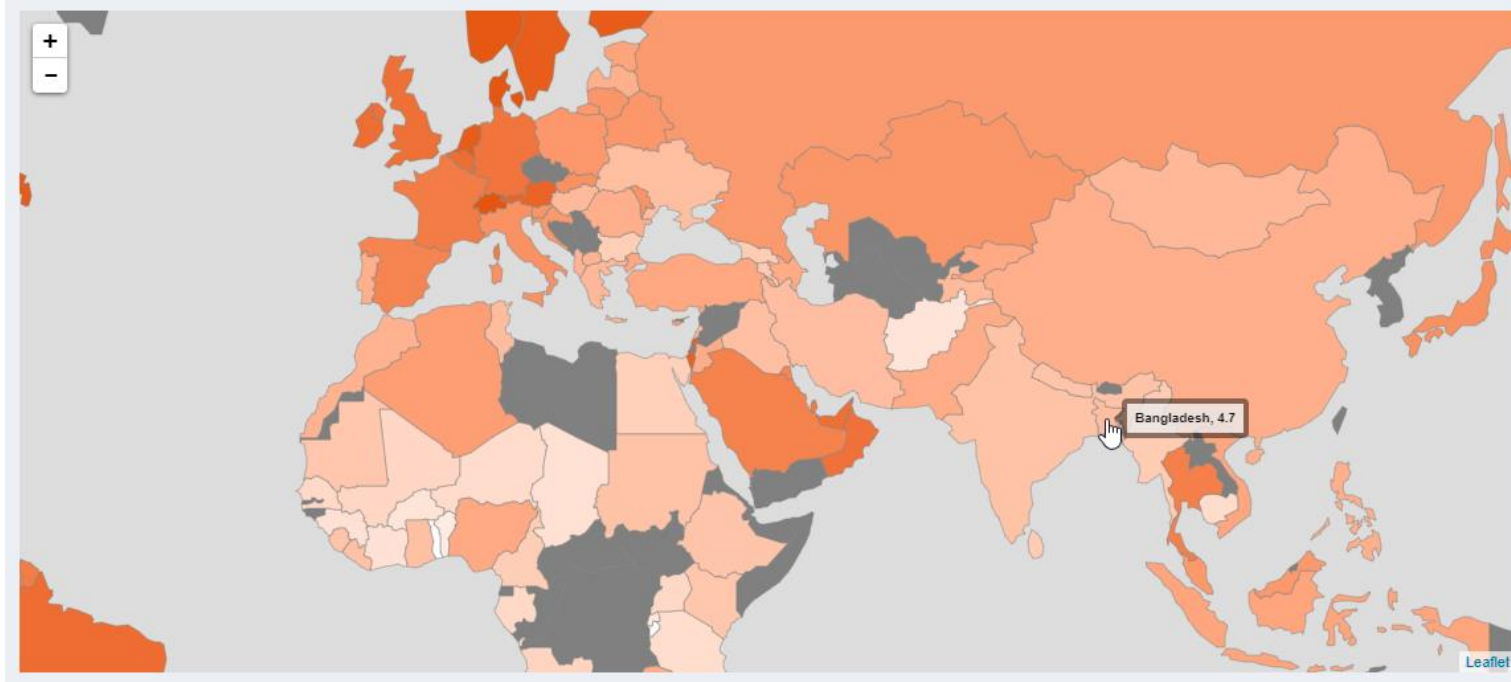
Step 1:
Country Happiness Score

Their model has 74 socio-economic indicators. How well do those – as a group – predict Happiness?

Wow, quite well: an R^2 of 0.77 is very impressive!

Step 2a:
Predicting Happiness

Select indicators and run a predictive model (Random Forests) to determine their relative importance in predicting Happiness.

Select an outcome to predict:
Happiness_Score

Select All/Deselect All

Run Predictive Model

Model Quality: Rsqr = 0.77 & RMSE = 0.57

Select indicators to predict Happiness and run prediction:
- ☑ Adolescent fertility rate (births per 1,000 women ages 15-19)
- ☑ Average precipitation in depth (mm per year)
- ☑ Business extent of disclosure index (0=less to 10=more)
- ☑ Cost of business start-up procedures (% of GNI per capita)
- ☑ Cost to export (US$ per container)
- ☑ DEC alternative conversion factor (LCU per US$)
- ☑ Depth of credit information index (0=low to 8=high)
- ☑ Diabetes prevalence (% of pop. ages 20 to 79)
- ☑ Documents to export (number)
- ☑ Documents to import (number)
- ☑ Ease of doing business index (1=most business-friendly regulations)
- ☑ Fixed telephone subscriptions
- ☑ Fixed telephone subscriptions (per 100 people)
- ☑ Immunization, measles (% of children ages 12-23 months)
- ☑ Improved sanitation facilities (% of pop.)
- ☑ Improved water source (% of pop.)
- ☑ Improved water source, urban (% of urban pop.)
- ☑ Incidence of tuberculosis (per 100,000 people)
- ☑ Internet users (per 100 people)
- ☑ Labor force particip. rate for ages 15-24, female (%)
- ☑ Labor force particip. rate for ages 15-24, male (%)
- ☑ Labor force particip. rate, male (% of male pop. ages 15-64)

Relative Importances of Predictors (sums up to 100)

Show 10 entries   Search:

	Predictors	Importance
56	Secure Internet servers (per 1 million people)	5.2
19	Internet users (per 100 people)	4.2
6	DEC alternative conversion factor (LCU per US$)	3.5
13	Fixed telephone subscriptions (per 100 people)	3.5
34	Mortality rate, infant (per 1,000 live births)	3.5
18	Incidence of tuberculosis (per 100,000 people)	3.4
20	Labor force particip. rate for ages 15-24, female (%)	3.1
55	Secure Internet servers	3.1
72	Unemp., male (% of male labor force)	3.1
52	Refugee pop. by country or territory of origin	3

Showing 1 to 10 of 74 entries   Previous 1 2 3 4 5 … 8 Next

We can't focus on all indicators, but are ready to consider 13. How well do those 13 predict Happiness?

Very well! An R² of 0.69! And the RMSE decreased from 0.57 to just 0.65!

Select indicators and run a predictive model (Random Forests) to determine their relative importance in predicting Happiness.

Select an outcome to predict:
Happiness_Score

Select All/Deselect All

Run Predictive Model

Model Quality: Rsqr = 0.69 & RMSE = 0.65

Select indicators to predict Happiness and run prediction:

- Adolescent fertility rate (births per 1,000 women ages 15-19)
- Average precipitation in depth (mm per year)
- Business extent of disclosure index (0=less to 10=more)
- Cost of business start-up procedures (% of GNI per capita)
- Cost to export (US$ per container)
- DEC alternative conversion factor (LCU per US$)
- Depth of credit information index (0=low to 8=high)
- Diabetes prevalence (% of pop. ages 20 to 79)
- Documents to export (number)
- Documents to import (number)
- Ease of doing business index (1=most business-friendly regulations)
- Fixed telephone subscriptions
- ☑ Fixed telephone subscriptions (per 100 people)
- Immunization, measles (% of children ages 12-23 months)
- ☑ Improved sanitation facilities (% of pop.)
- ☑ Improved water source (% of pop.)
- Improved water source, urban (% of urban pop.)
- ☑ Incidence of tuberculosis (per 100,000 people)
- ☑ Internet users (per 100 people)
- Labor force particip. rate for ages 15-24, female (%)
- Labor force particip. rate for ages 15-24, male (%)
- Labor force particip. rate, male (% of male pop. ages 15-64)

Relative Importances of Predictors (sums up to 100)

Show 10 entries   Search:

	Predictors	Importance ▼
5	Internet users (per 100 people)	15.3
4	Incidence of tuberculosis (per 100,000 people)	12.1
10	Population growth (annual %)	11
8	Mortality rate, infant (per 1,000 live births)	10.7
1	Fixed telephone subscriptions (per 100 people)	10.6
2	Improved sanitation facilities (% of pop.)	8.3
11	Population, ages 0-14 (% of total)	7.5
9	Population ages 65 and above (% of total)	7.1
7	Mobile cellular subscriptions (per 100 people)	7
6	Lifetime risk of maternal death (%)	6.8

Showing 1 to 10 of 11 entries   Previous 1 2 Next

Step 2b:
Predictor Importance

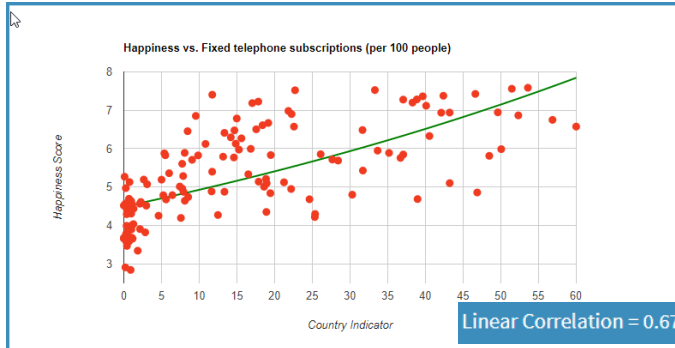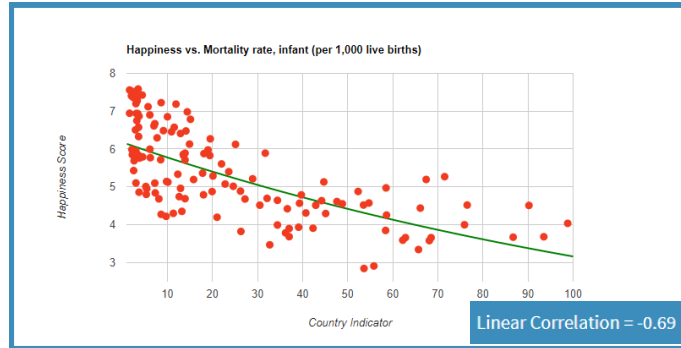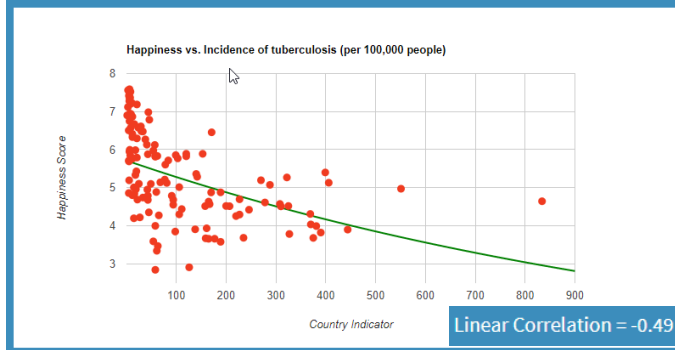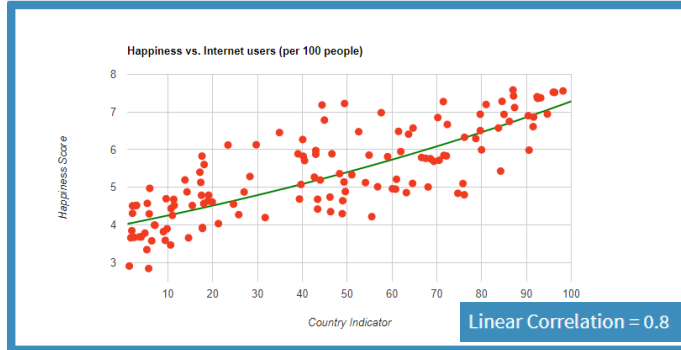We were very smart to select those few indicators!!!

We can see the most important predictors of Happiness!

How exactly do the most important predictors relate to Happiness?

Some of them are related positively and some inversely; impressive correlations!

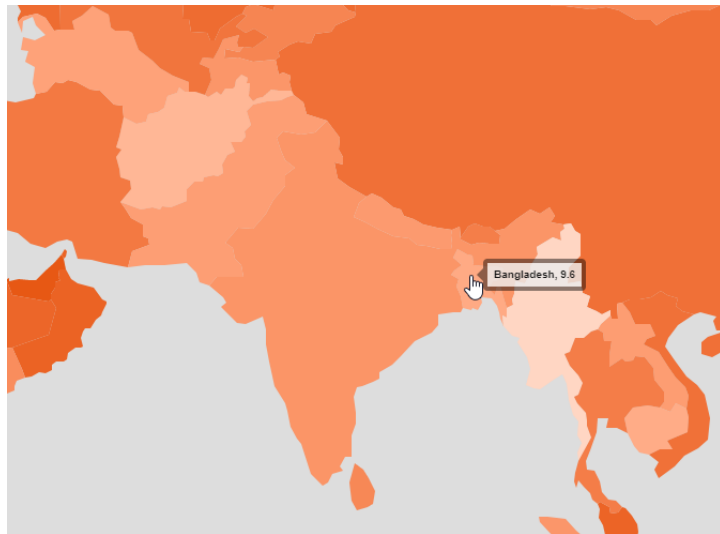**Step 3:**

Happiness vs. Indicators

Where do we stand on those important indicators compared to others in the world/region?
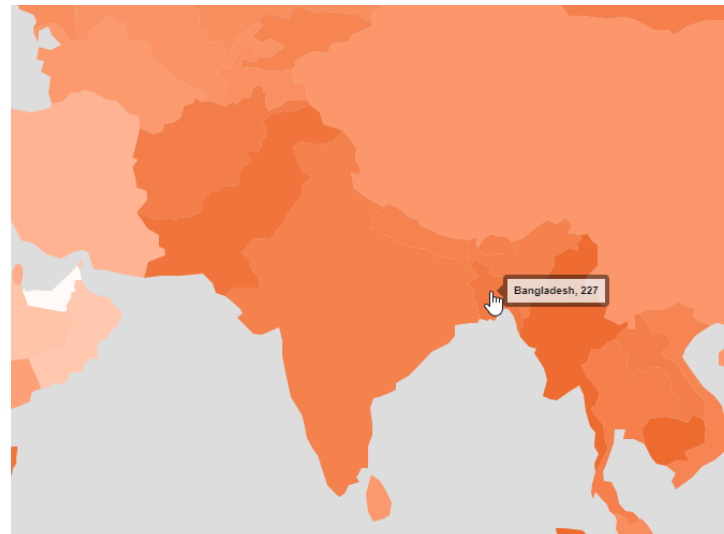
Not so great on Internet Usage; still quite high incidence of tuberculosis.

Internet Users (per 100 people)

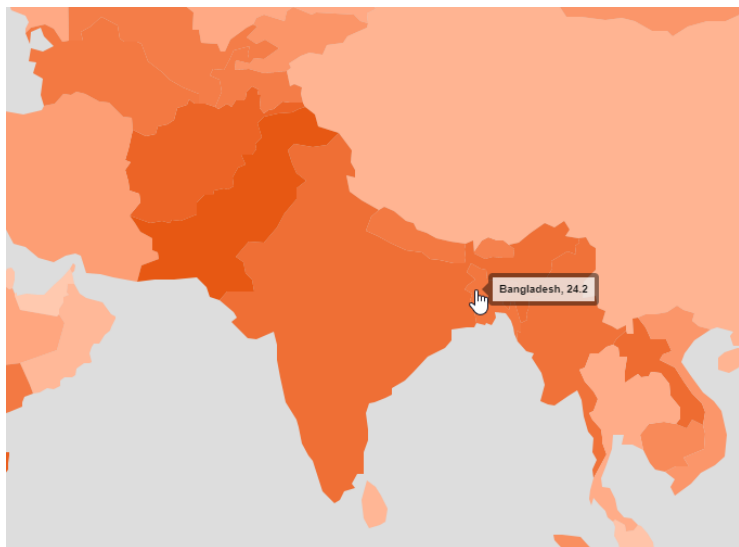Incidence of Tuberculosis (per 100,000 people)

Bangladesh, 9.6

Bangladesh, 227

Step 4:

Standing on important indicators

Where do we stand on those important indicators compared to others in the world/region? (cont'd 1)

Relatively high infant mortality rate; very low number of fixed phone subscriptions.

Infant mortality rate (per 1,000 live births)

Bangladesh, 24.2

Fixed telephone subscriptions (per 100 people)

Bangladesh, 0.7

Step 4:

Standing on important indicators

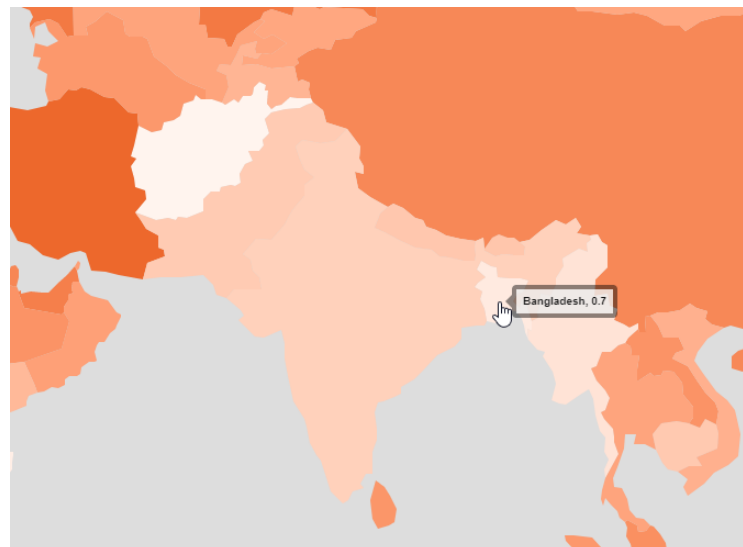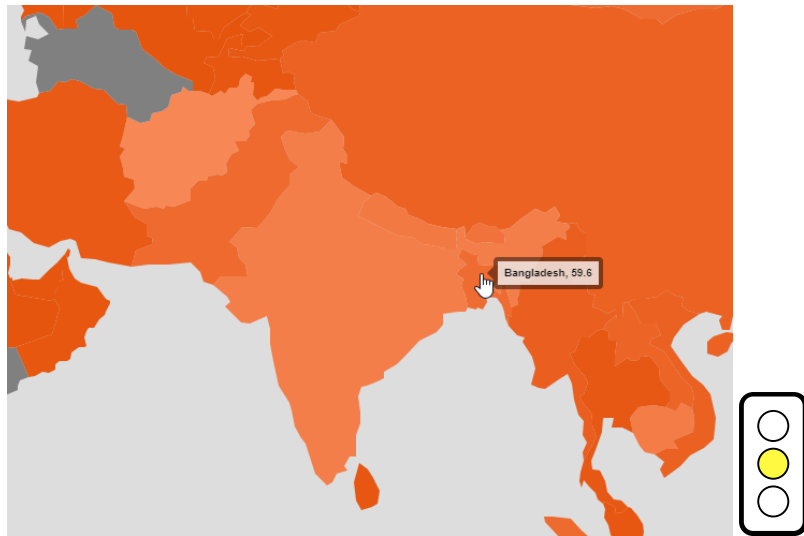# Where do we stand on those important indicators compared to others in the world/region? (cont'd 2)

Relative success on improved sanitation facilities and on cellular subscriptions.

Improved sanitation facilities (% of population)

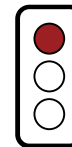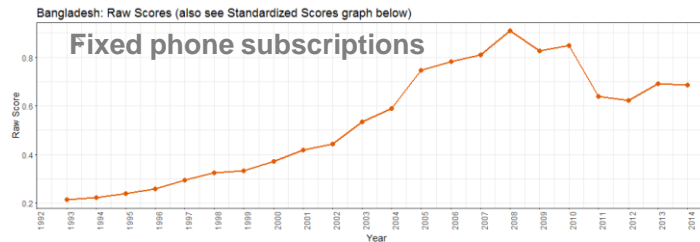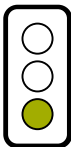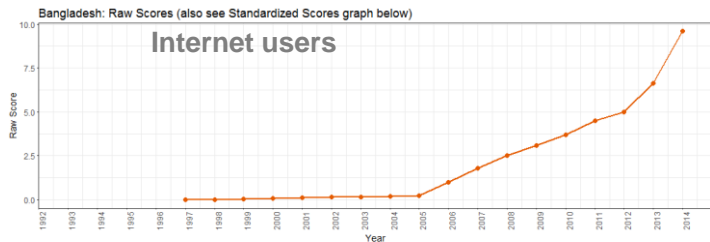Bangladesh, 59.6

Mobile cellular subscriptions (per 100 people)

Bangladesh, 75.9

Step 4:
Standing on important indicators

Our trends over time? Little improvement in tuberculosis incidence and number of fixed phone subscriptions

Improvements in Internet use, access to sanitation, & mobile phone usage; falling mortality rates

Bangladesh: Raw Scores (also see Standardized Scores graph below)

Internet users

Internet users (per 100 people)

Bangladesh: Raw Scores (also see Standardized Scores graph below)

Fixed phone subscriptions

Fixed telephone subscriptions (per 100 people)

Bangladesh: Raw Scores (also see Standardized Scores graph below)

Tuberculosis incidence

Incidence of tuberculosis (per 100,000 people)

Bangladesh: Raw Scores (also see Standardized Scores graph below)

Improved sanitation facilities

Improved sanitation facilities (% of pop. with access)

Bangladesh: Raw Scores (also see Standardized Scores graph below)

Neonatal mortality rate

Mortality rate, neonatal (per 1,000 live births)

Bangladesh: Raw Scores (also see Standardized Scores graph below)

Mobile cellular subscriptions

Mobile cellular subscriptions (per 100 people)

Step 5:
Trends for important indicators

20
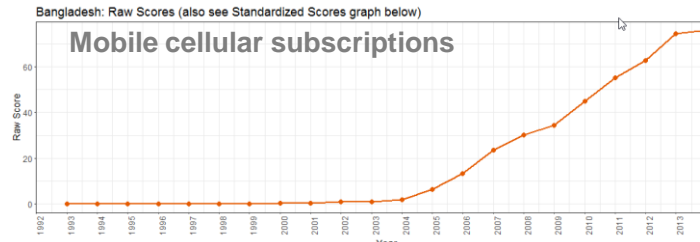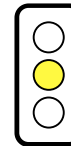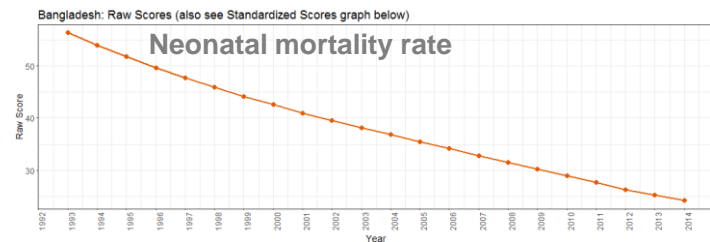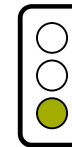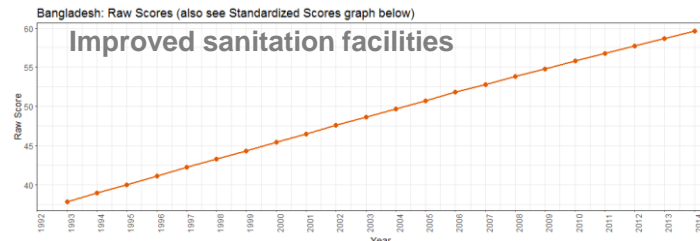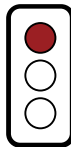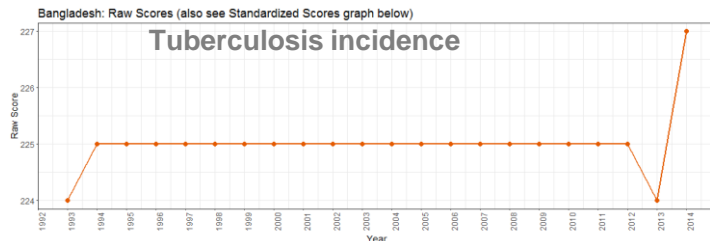
Summary of top predictors of Happiness, Bangladesh's standing on them and trends over time

Overall, Bangladesh's primary focus should be on improving (a) public health: esp., fighting tuberculosis and lowering infant mortality rate; and (b) fixed phone line infrastructure. Thank you, app!!!

Indicator	Importance	Absolute Standing	Trend over time
Internet Users (per 100 people)	15	🔴	🟢
✓ Incidence of Tuberculosis (per 100,000 people)	12	🔴	🔴
✓ Infant mortality rate (per 1,000 live births)	11	🔴	🟡
✓ Fixed telephone subscriptions (per 100 people)	11	🔴	🔴
Improved sanitation facilities (% of pop.)	8	🟡	🟢
Mobile cellular subscriptions (per 100 people)	7	🟡	🟢

Thank you! Questions?

Appendix

About World Happiness Score and World Development Indicators

WHR has was published in 2012, 2013, 2015, and 2016

World Happiness Scores:

- Used regularly by the World Happiness Report.
- The actual happiness scores and rankings come from the Gallup World Poll.
- The exact wording of the "happiness" question is:
  - "Please imagine a ladder, with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?"
- This app used the World Happiness Scores and rankings for 2015 posted on Kaggle.

World Development Indicators:

- Are collected and published yearly by the World Bank.
- This app used the data on 74 indicators from 1993 to 2014 posted on Kaggle.