

Supplementary Materials

Measuring water pollution effects on antimicrobial resistance through explainable artificial intelligence

Alfonso Monaco^{1,2,+}, Mario Caruso^{1,+}, Loredana Bellantuono^{2,3,*}, Roberto Cazzolla Gatti⁴, Alessandro Fania^{1,2}, Antonio Lacalamita^{1,2}, Marianna La Rocca^{1,2}, Tommaso Maggipinto^{1,2}, Ester Pantaleo^{1,2}, Sabina Tangaro^{2,5}, Nicola Amoroso^{2,6,++}, and Roberto Bellotti^{1,2,++}

¹Università degli Studi di Bari Aldo Moro, Dipartimento Interateneo di Fisica M. Merlin, Bari, 70125, Italy

²Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Bari, Bari, 70125, Italy

³Università degli Studi di Bari Aldo Moro, Dipartimento di Biomedicina Traslazionale e Neuroscienze (DiBraiN), Bari, 70124, Italy

⁴Alma Mater Studiorum – University of Bologna, Department of Biological Sciences, Geological and Environmental (BiGeA), Bologna, 40126, Italy

⁵Università degli Studi di Bari Aldo Moro, Dipartimento di Scienze del Suolo, della Pianta e degli Alimenti, Bari, 70126, Italy

⁶Università degli Studi di Bari Aldo Moro, Dipartimento di Farmacia - Scienze del Farmaco, Bari, 70125, Italy

+These authors contributed equally to this work.

++These authors jointly supervised this work.

*loredana.bellantuono@ba.infn.it

ABSTRACT

This Supplementary Information document contains additional materials that are not included in the main text.

List of countries by GNI (nominal) per capita

High income economies - 67 countries

Andorra	Australia	Austria	Bahamas	Bahrain	Barbados	Belgium	Bermuda
Brunei	Canada	Chile	Cook Islands	Croatia	Cyprus	Czech Republic	Denmark
Estonia	Finland	France	Germany	Greece	Greenland	Guam	Guyana
Hungary	Iceland	Ireland	Israel	Italy	Japan	Kuwait	Latvia
Lithuania	Luxembourg	Malta	Monaco	Nauru	Netherlands	New Zealand	Niue
N. Mariana Isl.	Norway	Oman	Panama	Poland	Portugal	Puerto Rico	Qatar
Romania	San Marino	Saudi Arabia	Seychelles	Singapore	Slovakia	Slovenia	S. Korea
Spain	Sweden	Switzerland	Taiwan	Tokelau	Trinidad & T.	UAE	UK
USA	Virgin Isl.	Uruguay					

Upper-middle income economies - 56 countries

Albania	American Samoa	Antigua & B.	Argentina	Armenia	Azerbaijan	Belarus	Belize
Bosnia & H.	Botswana	Brazil	Bulgaria	China	Colombia	Costa Rica	Cuba
Dominica	Dominican Rep.	Ecuador	El Salvador	Eq. Guinea	Fiji	Gabon	Georgia
Grenada	Guatemala	Indonesia	Iraq	Jamaica	Kazakhstan	Lebanon	Libya
Malaysia	Maldives	Marshall Isl.	Mexico	Mauritius	Moldova	Montenegro	Namibia
N. Macedonia	Palau	Palestine	Paraguay	Peru	Russia	Saint Lucia	Saint Vincent
Serbia	S. Africa	Suriname	Thailand	Tonga	Turkey	Turkmenistan	Tuvalu

Lower-middle income economies - 52 countries

Algeria	Angola	Bangladesh	Benin	Bhutan	Bolivia	Cambodia	Cameroon
Cape Verde	Comoros	Cote d'Ivoire	Djibouti	Egypt	Ghana	Guinea	Haiti
Honduras	India	Iran	Jordan	Kenya	Kiribati	Kyrgyzstan	Laos
Lesotho	Mauritania	Micronesia	Mongolia	Morocco	Myanmar	Nepal	Nicaragua
Nigeria	Pakistan	P. N. Guinea	Philippines	Samoa	Sao Tome	Senegal	Solomon Isl.
Sri Lanka	Tajikistan	Tanzania	Timor-Leste	Tunisia	Ukraine	Uzbekistan	Vanuatu
Venezuela	Vietnam	Zambia	Zimbabwe				

Lower-middle income economies - 28 countries

Afghanistan	B. Faso	Burundi	C. African Rep.	Chad	Congo	D. Rep. Congo	Eritrea
Eswatini	Ethiopia	Gambia	Guinea-Bissau	Liberia	Madagascar	Malawi	Mali
Mozambique	Niger	N. Korea	Rwanda	Sierra Leone	Somalia	S. Sudan	Sudan
Syria	Togo	Uganda	Yemen				

Table S1. The complete list of countries grouped by their gross national income (GNI) per capita in 2019 at nominal values, according to the Atlas method.

List of features

Water-related features

Area equipped for full control irrigation: total (1000ha)	Full control irrigation refers to the sum of surface, sprinkler and localized irrigation.
Area equipped for full control irrigation: actually irrigated (1000ha)	Area equipped for full control irrigation that is actually irrigated in the year 2019.
% of area equipped for full control irrigation actually irrigated (%)	Share of area equipped for full control irrigation that is actually irrigated in the year 2019.
Area equipped for full control irrigation: surface irrigation (1000ha)	Surface irrigation systems are based on the principle of moving water over the land by simple gravity in order to moisten the soil.
Area equipped for full control irrigation: sprinkler irrigation (1000ha)	A sprinkler irrigation system consists of a pipe network, through which water moves under pressure before being delivered to the crop via sprinkler nozzles. The system basically simulates rainfall in that water is applied through overhead spraying.
Area equipped for full control irrigation: localized irrigation (1000ha)	Localized irrigation is a system where the water is distributed under low pressure through a piped network, in a pre-determined pattern, and water as a small discharge of each plant or adjacent to it.
Area equipped for irrigation: equipped lowland areas (1000ha)	It includes: (1) cultivated wetland and inland valley bottoms which have been equipped with water control structures for irrigation and drainage; (2) areas along rivers, where cultivation occurs making use of water from receding floods and where structures have been built to retain the receding water; (3) Developed mangroves; (4) Developed deltas.
Area equipped for irrigation: spate irrigation (1000ha)	Spate irrigation can also be referred to as floodwater harvesting. It is a method of random irrigation using the floodwaters of a normally dry water course or riverbed.
Area equipped for irrigation total (1000ha)	Area equipped to provide water to crops. It includes area equipped for full control irrigation, equipped lowland areas and areas equipped for spate irrigation.
Area equipped for irrigation actually irrigated (1000ha)	Area equipped for irrigation that is actually irrigated in the year 2019.
Area equipped for irrigation by surface water (1000ha)	Part of the total area equipped for irrigation that can be irrigated from rivers or lakes.
Area equipped for irrigation by groundwater (1000ha)	Part of the total area equipped for irrigation that can be irrigated from wells or springs.
Area equipped for irrigation by mixed surface water and groundwater (1000ha)	Part of the total area equipped for irrigation that can be irrigated from surface water and groundwater.
Area equipped for power irrigation (surface water or groundwater) (1000ha)	Part of the total area equipped for irrigation where pumps are used for water supply from the source to the scheme. It includes areas where water is drained out with human- or animal- driven water lifting devices
% of area equipped for irrigation power irrigated (%)	Share of total area equipped for irrigation of a given country that is power irrigated.
Area equipped for irrigation drained (1000ha)	Irrigated area where drainage is used as an instrument to control salinity, ponding and waterlogging. This refers mainly to the area equipped for surface irrigation and to the equipped lowlands.
% of area equipped for irrigation drained (%)	Share of area equipped for irrigation that is equipped for irrigation drained.

Non-irrigated cultivated area drained (1000ha)	Area cultivated and not irrigated, where drainage is used to remove excess water from the land surface and/or the upper soil layer to make humid/wet land more productive.
Total cultivated area drained (1000ha)	Sum of the drained portions of area equipped for irrigation and non-irrigated land area.
% of total cultivated area drained (%)	Share of total cultivated area of a given country where there is a drainage system.
Number of municipal wastewater treatment facilities	Wastewater treatment is a process which removes and eliminates contaminants from wastewater and converts this into an effluent that can be returned to the water cycle.
Produced municipal wastewater ($10^9 m^3 / year$)	Wastewater produced annually by all municipal wastewater treatment plants. Municipal wastewater is a dilute mixture of domestic, trade (industrial), surface runoff, and to a lesser extent infiltration from the subsoil.
Capacity of the municipal wastewater treatment facilities ($10^9 m^3 / year$)	Total annual capacity of municipal wastewater treatment facilities of a given nation.
Collected municipal wastewater ($10^9 m^3 / year$)	Municipal wastewater collected by municipal wastewater sewers or other formal collection systems.
Quality Location - WWTP	Quality indicator related to reported WWTP location: 1 = high; 2 = medium; 3 = low; 4 = quality not analysed
Treated wastewater discharged - WWTP (m^3)	Annual treated wastewater discharged by all wastewater treatment plants of a given nation.
Quality of treated wastewater discharged	Quality indicator related to the attribute "Treated wastewater discharged": 1 = Reported as 'treated' by national/regional dataset; 2 = Reported as 'design capacity' by national/regional dataset; 3 = Reported but type not identified; 4 = Estimated
Dilution factor	The estimated dilution factor is the ratio of the quantity of the diluting water to that of the sewage.
River discharge at the WWTP outfall location (m^3)	Estimated river discharge at the WWTP outfall location.
Outfall distance WWTP within 10 km	1 = Estimated outfall location within 10km of the ocean or a large lake; 0 = Estimated outfall location further than 10km of the ocean or a large lake.
Outfall distance WWTP within 50 km	1 = Estimated outfall location within 50km of the ocean or a large lake; 0 = Estimated outfall location further than 50km of the ocean or a large lake.
Treatment level WWTP - Advanced	Advanced treatment level refers to a process which reduces the level of impurities in a wastewater below that attainable through conventional secondary or biological treatment.
Treatment level WWTP - Primary	Primary treatment level refers to the first step in the wastewater treatment process, where wastewater flows into tanks and the solids settle on the bottom and the grease and scum rise to the top.
Treatment level WWTP - Secondary	Secondary treatment level refers to a wastewater treatment phase that removes impurities from water using bacterial processes. This phase biologically removes contaminants from water using microorganisms.
Treated municipal wastewater ($10^9 m^3 / year$)	The total quantity of municipal wastewater of a given nation that was treated at least in one process in a wastewater treatment plant.
Treated municipal wastewater discharged (secondary water) ($10^9 m^3 / year$)	Total treated municipal wastewater at secondary stage that are discharged into the environment.
Direct use of treated municipal wastewater ($10^9 m^3 / year$)	Treated municipal wastewater directly used, i.e. with no or little prior dilution with freshwater during most of the year.
Direct use of treated municipal wastewater for irrigation purposes ($10^9 m^3 / year$)	Treated municipal wastewater applied artificially (irrigation) and directly (i.e. with no or little prior dilution with freshwater during most of the year) on land to assist the growth of crops and fruit trees.
Area equipped for irrigation by direct use of treated municipal wastewater (1000ha)	Part of the total area equipped for irrigation that can be irrigated by direct use of treated wastewater.

% of area equipped for irrigation by direct use of treated municipal wastewater (%)	Share of area equipped for irrigation that is equipped by direct use of treated municipal wastewater.
Non-treated municipal wastewater ($10^9 m^3/year$)	The total quantity of municipal wastewater of a given nation that is not treated by any wastewater treatment plant.
Not treated municipal wastewater discharged (secondary water) ($10^9 m^3/year$)	The total quantity of municipal wastewater of a given nation not treated by any wastewater treatment plant that is discharged into the environment.
Direct use of non-treated municipal wastewater for irrigation purposes ($10^9 m^3/year$)	Non-treated municipal wastewater applied artificially (irrigation) and directly (i.e. with no or little prior dilution with freshwater during most of the year) on land to assist the growth of crops and fruit trees.
Area equipped for irrigation by direct use of non-treated municipal wastewater (1000ha)	Part of the total area equipped for irrigation that can be irrigated by direct use of non-treated wastewater.
% of area equipped for irrigation by direct use of non-treated municipal wastewater (%)	Share of area equipped for irrigation that is equipped by direct use of non-treated municipal wastewater.
Desalinated water produced ($10^9 m^3/year$)	Water produced annually by desalination of brackish or salt water. It is estimated annually on the basis of the total capacity of water desalination installations.
Area equipped for irrigation by desalinated water (1000ha)	Part of the total area equipped for irrigation that can be irrigated by direct use of desalinated water.
% of area equipped for irrigation by desalinated water (%)	Share of area equipped for irrigation that is equipped by direct use of desalinated water.
Direct use of agricultural drainage water ($10^9 m^3/year$)	It refers to water withdrawn for agriculture but not consumed and which then is directly used again for irrigation purposes (such as for example cascade irrigation of rice cultivated on terraces).
Area equipped for irrigation by direct use of agricultural drainage water (1000ha)	Part of the total area equipped for irrigation that can be irrigated by direct use of agricultural drainage water.
% of area equipped for irrigation by direct use of agricultural drainage water (%)	Share of area equipped for irrigation that is equipped by direct use of agricultural drainage water.
Area salinized by irrigation (1000ha)	Irrigated area affected by salinization, including formerly irrigated land abandoned because of declining productivity caused by salinization.
Area waterlogged by irrigation (1000ha)	Part of the land that is waterlogged because of irrigation. Waterlogging is the state of land in which the water table is located at or near the surface resulting in a decline of crop yields. Irrigation can contribute to the raising of the level of the aquifers. The non-saturated area of soils can become too small and the soils are over-saturated with water.
% of agricultural water managed area equipped for irrigation (%)	Share of total agricultural water of a given country used to irrigate lands.
% of the cultivated area equipped for irrigation (%)	Share of total cultivated area of a given country that is also equipped for irrigation.
Dam capacity per capita ($m^3/inhab$)	Total cumulative storage capacity of all large dams of a given nation, divided by its number of inhabitants.
Dependency ratio (%)	The part of the total renewable water resources originating outside the country.
Flood occurrence (WRI)	Frequency or incidence of flooding events in a particular area over a given period of time.
Flood recession cropping area non-equipped (1000ha)	Areas along rivers where cultivation occurs in the areas exposed as floods recedes and where nothing is undertaken to retain the receding water.

Interannual variability (WRI)	Interannual variability measures the average between-year variability of available water supply, including both renewable surface and groundwater supplies.
Seasonal variability (WRI)	Seasonal variability measures the average within-year variability of available water supply, including both renewable surface and groundwater supplies.
National Rainfall Index	The index reflects how much precipitation is received relative to the long-term average for a specified area and timeframe.
Rainfed \ Irrigated yields	This ratio refers to the comparison between crop yields obtained from rainfed agriculture versus yields obtained from irrigated agriculture. Rainfed agriculture relies solely on rainfall for watering crops, while irrigated agriculture involves supplemental watering through artificial means such as irrigation systems, canals, or wells.
Irrigation potential (1000ha)	Irrigation potential means a total area which is technically feasible, economically and financially profitable, socially viable and environmentally acceptable that is irrigated or capable of being irrigated on the basis of water availability, land availability and suitability
% of irrigation potential equipped for irrigation (%)	Share of irrigation potential area that is equipped for irrigation.
Environmental Flow Requirements ($10^9 m^3 / year$)	Quantities of water required to sustain freshwater and estuarine ecosystems.
Total freshwater withdrawal ($10^9 m^3 / year$)	It is the sum of surface water withdrawal and groundwater withdrawal.
Total water withdrawal per capita ($m^3 / year$)	Total water withdrawals from agricultural, industrial and municipal purposes per capita.
Fresh surface water withdrawal ($10^9 m^3 / year$)	Freshwater taken from surface water sources, either permanently or temporarily, and conveyed to a place of use.
Fresh groundwater withdrawal ($10^9 m^3 / year$)	Freshwater taken from groundwater sources, either permanently or temporarily, and conveyed to a place of use.
Agricultural water withdrawal ($10^9 m^3 / year$)	Annual quantity of self-supplied water withdrawn for irrigation livestock and aquaculture purposes, including water specifically withdrawn by water supply companies for the operation of irrigation systems.
Agricultural water withdrawal as % of total renewable water resources (%)	Agricultural water withdrawal as share of the total renewable water resources.
Agricultural water withdrawal as % of total water withdrawal (%)	Agricultural water withdrawal as share of the total water withdrawal.
Irrigated agriculture water use efficiency ($\$/m^3$)	It refers to the measure of how effectively water is utilized in irrigation to achieve desired outputs while minimizing waste and resource consumption.
Industrial water withdrawal ($10^9 m^3 / year$)	Annual quantity of water withdrawn for industrial uses, not connected to the public distribution network.
Industrial water withdrawal as % of total water withdrawal (%)	Industrial water withdrawal as share of the total water withdrawal.
Industrial water use efficiency ($\$/m^3$)	It refers to the measure of how effectively water is utilized in industrial processes to achieve desired outputs while minimizing waste and resource consumption.
Municipal water withdrawal ($10^9 m^3 / year$)	Annual quantity of water withdrawn primarily for the direct use by the population.
Municipal water withdrawal as % of total water withdrawal (%)	Municipal water withdrawal as share of the total water withdrawal.
Irrigation water withdrawal ($10^9 m^3 / year$)	Annual quantity of water withdrawn for irrigation purposes.
Irrigation water requirement ($m^3 / ha / year$)	It refers to the amount of water needed to sustain healthy plant growth and maintain agricultural productivity in irrigated fields
Water withdrawal for cooling of thermoelectric plants ($10^9 m^3 / year$)	Annual quantity of water withdrawn for the cooling of thermoelectric plants.

Water withdrawal for livestock (watering and cleaning) ($10^9 m^3 / year$)	Annual quantity of water withdrawn to use in livestock.
Services water use efficiency ($\$/m^3$)	It refers to the effectiveness and optimization of water utilization in various service industries and sectors, such as hospitality, healthcare, education and commercial buildings.
Water use efficiency ($\$/m^3$)	It refers to the effectiveness with which water is utilized in achieving desired outcomes or objectives while minimizing waste and maximizing productivity.
Water stress (%)	Water stress is defined in its simplest terms as occurring when water demand or withdrawal substantiates a large share of renewable water resources. The World Resources Institute define baseline water stress based on the ratio of annual water withdrawals to renewable resources.
Long-term average annual precipitation in depth ($mm/year$)	Average precipitation is the long-term average in depth (over space and time) of annual precipitation in the country. Precipitation is defined as any kind of water that falls from clouds as a liquid or a solid.
Long-term average annual precipitation in volume ($10^9 m^3 / year$)	Average precipitation is the long-term average in volume (over space and time) of annual precipitation in the country. Precipitation is defined as any kind of water that falls from clouds as a liquid or a solid.
Total renewable water resources ($10^9 m^3 / year$)	The sum of internal renewable water resources and external renewable water resources. It corresponds to the maximum theoretical yearly amount of water available for a country at a given moment. Renewable water resources are rechargeable due to the hydrological cycle unless they are overexploited
Total renewable water resources per capita ($m^3 / inhab / year$)	The amount of total renewable water resources of a given country available for a single inhabitant.
Total external renewable water resources ($10^9 m^3 / year$)	The part of the country's renewable water resources which is not generated in the country.
Total internal renewable water resources ($10^9 m^3 / year$)	The part of the country's renewable water resources which is generated in the country. Internal renewable water resources comprise the average annual flow of rivers and groundwater generated from endogenous precipitation.
Total internal renewable water resources per capita ($m^3 / inhab / year$)	The amount of total internal renewable water resources of a given country available for a single inhabitant.
Total renewable groundwater ($10^9 m^3 / year$)	This is the sum of the total internal and external renewable groundwater resources.
Groundwater: accounted outflow to other countries ($10^9 m^3 / year$)	Annual natural outflow of groundwater from a country into a neighbouring country.
Groundwater: leaving the country to other countries (total) ($10^9 m^3$)	Total natural outflow of groundwater from a country into a neighbouring country.
Total renewable surface water ($10^9 m^3 / year$)	This is the sum of the total internal and external renewable surface water resources.
Surface water: inflow submitted to treaties ($10^9 m^3 / year$)	Long-term average quantity of water annually entering the country through transboundary flow (rivers, canals, pipes) which is submitted to formal agreements or treaties.
Surface water: leaving the country to other countries (total) ($10^9 m^3 / year$)	Total natural outflow of surface water from a country into a neighbouring country.
Surface water: total flow of border rivers ($10^9 m^3 / year$)	It refers to the combined volume of surface water flowing within rivers or water bodies that form borders between different geographic regions, such as countries, states, or administrative divisions.
Surface water: total external renewable ($10^9 m^3 / year$)	It refers to the total volume of surface water available from external or exogenous sources that contribute to the replenishment of surface water bodies such as rivers, lakes and reservoirs.

Overlap between surface water and groundwater ($10^9 m^3/year$)	The part of the renewable water resources which is common to both surface water and groundwater.
Total exploitable water resources ($10^9 m^3/year$)	The water resources considered to be available for development under specific economic and environmental conditions. The computation of exploitable water resources considers factors such as dependability of the flow, extractable groundwater and minimum flow required for non-consumptive use.
Exploitable: total renewable groundwater ($10^9 m^3/year$)	The total exploitable renewable groundwater.
Exploitable: total renewable surface water ($10^9 m^3/year$)	The total exploitable renewable surface water.
Exploitable: regular renewable surface water ($10^9 m^3/year$)	The regular exploitable renewable surface water. "Regular" refers to the portion of surface water that is replenished on a regular basis through natural processes such as precipitation, runoff, and infiltration.
Exploitable: irregular renewable surface water ($10^9 m^3/year$)	The irregular exploitable renewable surface water. "Irregular" is commonly used in water resource management and hydrological assessments to describe surface water sources that may exhibit significant variability in their flow patterns due to factors such as climate fluctuations, seasonal changes, or episodic events.
Improved water (%)	Share of the population of a given country that have access to improved drinking water. Improved drinking-water sources are defined as those that are likely to be protected from outside contamination, and from faecal matter in particular. Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs and rainwater collection.
R. improved water (%)	Share of rural population of a given country that have access to improved drinking water.
U. improved water (%)	Share of urban population of a given country that have access to improved drinking water.
Basic water (%)	Share of the population of a given country that have access to basic drinking water. Basic drinking-water services are defined as drinking water from an improved source, provided that collection time is not more than 30 minutes for a roundtrip, including queuing.
R. basic water (%)	Share of rural population of a given country that have access to basic drinking water.
U. basic water (%)	Share of rural population of a given country that have access to basic drinking water.
Limited water (%)	Share of the population of a given country that have access to limited drinking water. Limited drinking water from an improved source refers to those sources for which collection time exceeds 30 minutes for a roundtrip including queuing.
R. limited water (%)	Share of rural population of a given country that have access to limited drinking water.
U. limited water (%)	Share of rural population of a given country that have access to limited drinking water.
Unimproved water (%)	Share of the population of a given country that have access to unimproved drinking water. An unimproved drinking water source is one that by the nature of its construction does not adequately protect the source from outside contamination, in particular faecal matter. Unimproved drinking-water sources include: unprotected wells, unprotected springs, surface water (river, dam or lake), vendor-provided water, tanker truck-provided water.
R. unimproved water (%)	Share of rural population of a given country that have access to unimproved drinking water.
U. unimproved water (%)	Share of rural population of a given country that have access to unimproved drinking water.
No drinking water (%)	Share of the population of a given country that haven't access to drinking water.

R. no drinking water (%)	Share of rural population of a given country that haven't access to drinking water.
U. drinking water (%)	Share of urban population of a given country that haven't access to drinking water.
Safe water (%)	Share of the population of a given country that have access to safely managed drinking water. Safely managed drinking water from an improved water source refers to case in which water is accessible on premises, available when needed and free from faecal and priority chemical contamination.
R. safe water (%)	Share of rural population of a given country that have access to safely managed drinking water.
U. safe water (%)	Share of urban population of a given country that have access to safely managed drinking water.
Food-related features	
Harvested t. area: Total (1000ha)	Total harvested irrigated temporary crop area for the year 2019.
Harvested t. area: Leguminous crops (1000ha)	Harvested irrigated temporary crop area for leguminous for year 2019.
Harvested t. area: Maize (1000ha)	Harvested irrigated temporary crop area for maize for year 2019.
Harvested t. area: Potatoes (1000ha)	Harvested irrigated temporary crop area for potatoes for year 2019.
Harvested t. area: Rice (1000ha)	Harvested irrigated temporary crop area for rice for year 2019.
Harvested t. area: Sesame (1000ha)	Harvested irrigated temporary crop area for sesame for year 2019.
Harvested t. area: Sugar beet (1000ha)	Harvested irrigated temporary crop area for sugar beet for year 2019.
Harvested t. area: Sugarcane (1000ha)	Harvested irrigated temporary crop area for sugarcane for year 2019.
Harvested t. area: Sunflower (1000ha)	Harvested irrigated temporary crop area for sunflower for year 2019.
Harvested t. area: Cotton (1000ha)	Harvested irrigated temporary crop area for cotton for year 2019.
Harvested t. area: Vegetables (1000ha)	Harvested irrigated temporary crop area for vegetables for year 2019.
Harvested t. area: Wheat (1000ha)	Harvested irrigated temporary crop area for wheat for year 2019.
Harvested t. area: Fodder (1000ha)	Harvested irrigated temporary crop area for fodder for year 2019.
Harvested t. area: Cassava (1000ha)	Harvested irrigated temporary crop area for cassava for year 2019.

Harvested t. area: Groundnuts (1000ha)	Harvested irrigated temporary crop area for groundnuts for year 2019.
Harvested t. area: Sweet potatoes (1000ha)	Harvested irrigated temporary crop area for sweet potatoes for year 2019.
Harvested t. area: Flowers (1000ha)	Harvested irrigated temporary crop area for flowers for year 2019.
Harvested t. area: Other roots and tubers (1000ha)	Harvested irrigated temporary crop area for other roots and tubers for year 2019.
Harvested t. area: Sorghum (1000ha)	Harvested irrigated temporary crop area for sorghum for year 2019.
Harvested t. area: Soybeans (1000ha)	Harvested irrigated temporary crop area for soybeans for year 2019.
Harvested t. area: Millet (1000ha)	Harvested irrigated temporary crop area for millet for year 2019.
Harvested t. area: Tobacco (1000ha)	Harvested irrigated temporary crop area for tobacco for year 2019.
Harvested t. area: Other cereals (1000ha)	Harvested irrigated temporary crop area for other cereals for year 2019.
Harvested t. area: Other crops (1000ha)	Harvested irrigated temporary crop area for other use for year 2019.
Harvested area: Total (1000ha)	Total harvested irrigated permanent crop area for the year 2019.
Harvested area: Other crops (1000ha)	Harvested irrigated permanent crop area for other use for the year 2019.
Harvested area: Citrus (1000ha)	Harvested irrigated permanent crop area for citrus for the year 2019.
Harvested area: Grapes (1000ha)	Harvested irrigated permanent crop area for grapes for the year 2019.
Harvested area: Grass and fodder (1000ha)	Harvested irrigated permanent crop area for grass and fodder for the year 2019.
Harvested area: Oil palm (1000ha)	Harvested irrigated permanent crop area for oil palm for the year 2019.
Harvested area: Olives (1000ha)	Harvested irrigated permanent crop area for olives for the year 2019.
Harvested area: Other fruits (1000ha)	Harvested irrigated permanent crop area for other fruits for the year 2019.

Harvested area: Bananas (1000ha)	Harvested irrigated permanent crop area for bananas for the year 2019.
Harvested area: Tea (1000ha)	Harvested irrigated permanent crop area for tea for the year 2019.
Harvested area: Cocoa beans (1000ha)	Harvested irrigated permanent crop area for cocoa beans for the year 2019.
Harvested area: Coffee (1000ha)	Harvested irrigated permanent crop area for coffee for the year 2019.
Harvested area: Plantains (1000ha)	Harvested irrigated permanent crop area for plantains for the year 2019.
Harvested area: Coconuts (1000ha)	Harvested irrigated permanent crop area for coconuts for the year 2019.
Harvested area: Rubber (1000ha)	Harvested irrigated permanent crop area for rubber for the year 2019.
Arable land area (1000ha)	Land under temporary crops, temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (for less than five years).
Permanent crops area (1000ha)	Land cultivated with crops that occupy the land for long periods and need not be replanted after each annual harvest.
Total area of the country (excl. coastal water) (1000ha)	Total area of the country.
Cultivated area (arable land + permanent crops) (1000ha)	The sum of arable land and permanent crops areas of a given country for the year 2019.
% of total country area cultivated (%)	Share of the total land of a country that is cultivated.
Cultivated wetlands and inland valleys bottoms non-equipped (1000ha)	Part of wetland and inland valley bottom which have not been equipped with water control structures but are used for cropping. By definition, wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. By definition, a valley bottom is comprised of the active stream or river channel and the associated low-lying, contemporary floodplain.
% of total grain production irrigated (%)	Share of total grain production of a given nation that is irrigated.
Permanent meadows and pastures irrigated (1000ha)	Permanent meadows and pastures of a given nation that are irrigated.
Slaughtered cattles	Number of slaughtered cattles in a given nation for the year 2019.
Slaughtered goats	Number of slaughtered goats in a given nation for the year 2019.
Slaughtered chicken	Number of slaughtered chicken in a given nation for the year 2019.
Slaughtered turkeys	Number of slaughtered turkeys in a given nation for the year 2019.
Slaughtered pigs	Number of slaughtered pigs in a given nation for the year 2019.
Slaughtered lambs	Number of slaughtered lambs in a given nation for the year 2019.
Cattle livestock	Number of cattle livestock in a given nation for the year 2019.
Pig livestock	Number of pig livestock in a given nation for the year 2019.
Poultry livestock	Number of poultry livestock in a given nation for the year 2019.
Total meat production (10³kg)	Total meat production of a given nation for the year 2019.
Other meat production (10³kg)	Other meat production of a given nation for the year 2019.

Total aquaculture production (10 ³ kg)	Total aquaculture production of a given nation for the year 2019.
Total fishery production (10 ³ kg)	Total fishery production of a given nation for the year 2019.
Total fish and seafood production (10 ³ kg)	Total fish and seafood production of a given nation for the year 2019.
Beef production (10 ³ kg)	Beef production of a given nation for the year 2019.
Milk production (10 ³ kg)	Milk production of a given nation for the year 2019.
Poultry production (10 ³ kg)	Poultry production of a given nation for the year 2019.
Eggs production (10 ⁶ kg)	Beef production of a given nation for the year 2019.
Pig production (10 ³ kg)	Pig production of a given nation for the year 2019.
Cattle meat/animal (hg)	Cattle meat per animal yields of a given nation for the year 2019.
Pig meat/animal (hg)	Pig meat per animal yields of a given nation for the year 2019.
Poultry meat/animal (hg)	Poultry meat per animal yields of a given nation for the year 2019.
Eggs/bird (kg)	Eggs yields per bird of a given nation for the year 2019.
Milk/animal (hg)	Milk yields per animal of a given nation for the year 2019.
Meat cons./capita (kg)	Total meat consumption per capita of a given nation for the year 2019.
Other meat cons./capita (kg)	Other meat consumption per capita of a given nation for the year 2019.
Fish and seafood cons./capita (kg)	Fish and seafood consumption per capita of a given nation for the year 2019.
Goat cons./capita (kg)	Goat meat consumption per capita of a given nation for the year 2019.
Beef cons./capita (kg)	Beef consumption per capita of a given nation for the year 2019.
Milk cons./capita (kg)	Milk consumption per capita of a given nation for the year 2019.
Poultry cons./capita (kg)	Poultry consumption per capita of a given nation for the year 2019.
Eggs cons./capita (kg)	Eggs consumption per capita of a given nation for the year 2019.
Pig cons./capita (kg)	Pig consumption per capita of a given nation for the year 2019.
Total meat av./capita (kg)	Total meat available per capita of a given nation for the year 2019.
Other meat av./capita (kg)	Other meat available per capita of a given nation for the year 2019.
Fish and seafood av./capita (kg)	Fish and seafood available per capita of a given nation for the year 2019.
Goat av./capita (kg)	Goat meat available per capita of a given nation for the year 2019.
Beef av./capita (kg)	Beef meat available per capita of a given nation for the year 2019.

Poultry av./capita (kg)	Poultry meat available per capita of a given nation for the year 2019.
Pig av./capita (kg)	Pig meat available per capita of a given nation for the year 2019.
Antibiotic use in livestock (mg/PCU)	Antibiotic use in livestock in a given nation for the year 2019.
Air pollution-related features	
Aerosol index mean, stdev, max, min	It's a qualitative index indicating the presence of elevated layers of aerosols with significant absorption. The main aerosol types that cause signals detected in the aerosol index are desert dust, biomass burning and volcanic ash plumes.
CH_4 mean, stdev, max, min (molar fraction)	Column-averaged dry air mixing ratio of methane, as parts-per-billion.
CO mean, stdev, max, min (molar fraction)	Column-averaged dry air mixing ratio of carbon monoxide, as parts-per-billion.
$HCHO$ mean, stdev, max, min (molar fraction)	Column-averaged dry air mixing ratio of formaldehyde, as parts-per-billion.
NO_2 mean, stdev, max, min (molar fraction)	Column-averaged dry air mixing ratio of nitrogen dioxide, as parts-per-billion.
O_3 mean, stdev, max, min (molar fraction)	Column-averaged dry air mixing ratio of ozone, as parts-per-billion.
SO_2 mean, stdev, max, min (molar fraction)	Column-averaged dry air mixing ratio of sulphur dioxide, as parts-per-billion.
$PM_{2.5}$ mean, stdev, max, min (molar fraction)	Column-averaged dry air mixing ratio of formaldehyde, as parts-per-billion. $PM_{2.5}$ is a numerical classification given to fine particles according to the average size of their particles. This size is inferior to $2.5\mu m$.
CO_2 emission ($10^1 2kg$)	Total carbon dioxide emission of a given country for the year 2019.
CO_2 /capita ($10^3 kg$)	Carbon dioxide emission per capita of a given country for the year 2019.
CH_4 emission ($10^1 2kg$)	Total methane emission of a given country for the year 2019.
CH_4 /capita ($10^3 kg$)	Methane emission per capita of a given country for the year 2019.
GHG emission ($10^1 2kg$)	Total greenhouse gas emission of a given country for the year 2019.
GHG /capita ($10^3 kg$)	Greenhouse gas emission per capita of a given country for the year 2019.
NO_2 emission ($10^1 2kg$)	Total nitrogen dioxide emission of a given country for the year 2019.
NO_2 /capita ($10^3 kg$)	Nitrogen dioxide emission per capita of a given country for the year 2019.
Sanitation and Hygiene-related features	
Improved sanitation (%)	Share of the population of a given country having access to improved sanitation services in the year 2019. Improved sanitation facilities are defined as those that hygienically separate human waste from human contact. Improved sanitation includes flush or pour-flush to piped sewer system, septic tank pit latrines, ventilated-improved pit latrines, or pit latrines with slab or composting toilets.

Basic sanitation (%)	Share of the population of a given country having access to basic sanitation services in the year 2019. If the excreta from improved sanitation facilities are not safely managed, then people using those facilities are classed as having a basic sanitation service.
Limited sanitation (%)	Share of the population of a given country having access to limited sanitation services in the year 2019. People using improved facilities which are shared with other households are classified as having a limited service.
Unimproved sanitation (%)	Share of the population of a given country having access to unimproved sanitation services in the year 2019. Unimproved facility usually do not ensure hygienic separation of human excreta from human contact. Unimproved facilities include pit latrines without a slab or platform, hanging latrines and bucket latrines.
Safe sanitation (%)	Share of the population of a given country having access to safely managed sanitation services in the year 2019. There are three main ways to meet the criteria for having a safely managed sanitation service. People should use improved sanitation facilities which are not shared with other households, and the excreta produced should either be: (1) treated and disposed of in situ (2) stored temporarily and then emptied and treated off-site or (3) transported through a sewer with wastewater and then treated off-site.
R. improved sanitation (%)	Share of rural population of a given country that have access to improved sanitation services in the year 2019.
R. basic sanitation (%)	Share of rural population of a given country that have access to basic sanitation services in the year 2019.
R. limited sanitation (%)	Share of rural population of a given country that have access to limited sanitation services in the year 2019.
R. unimproved sanitation (%)	Share of rural population of a given country that have access to unimproved sanitation services in the year 2019.
R. safe sanitation (%)	Share of rural population of a given country that have access to safely managed sanitation services in the year 2019.
U. improved sanitation (%)	Share of urban population of a given country that have access to improved sanitation services in the year 2019.
U. basic sanitation (%)	Share of urban population of a given country that have access to basic sanitation services in the year 2019.
U. limited sanitation (%)	Share of urban population of a given country that have access to limited sanitation services in the year 2019.
U. unimproved sanitation (%)	Share of urban population of a given country that have access to unimproved sanitation services in the year 2019.
U. safe sanitation (%)	Share of urban population of a given country that have access to safely managed sanitation services in the year 2019.
Basic handwashing (%)	Share of population of a given country having access to basic handwashing facilities. Basic handwashing facilities typically include a handwashing station equipped with soap and water.
Limited handwashing (%)	Share of population of a given country having access to basic limited facilities. Limited handwashing facilities may lack one or more components necessary for effective hand hygiene. For example, while there may be access to water, soap may not be consistently available, or the handwashing station may not be conveniently located or properly maintained
No handwashing (%)	Share of population of a given country that have no access to any type of handwashing facility in the year 2019.
R. basic handwashing (%)	Share of rural population of a given country that have access to basic handwashing facilities.
R. limited handwashing (%)	Share of rural population of a given country that have access to limited handwashing facilities.
R. no handwashing (%)	Share of rural population of a given country that have no access to any type of handwashing facility.
U. basic handwashing (%)	Share of urban population of a given country that have access to basic handwashing facilities.

U. limited handwashing (%)	Share of urban population of a given country that have access to limited handwashing facilities.
U. no handwashing (%)	Share of urban population of a given country that have no access to any type of handwashing facility.
Open defecation (%)	Share of the population of a given country practising open defecation in the year 2019. Open defecation is defined as the proportion of the population who usually don't use any kind of toilet facility for defecation. Those using unimproved sanitation facilities like pit latrines without slab, open pit, or hanging latrines, are not counted as practising open defecation.
Antibiotic consumption (DDD 1000 days)	Antibiotic consumption by the population of a given country in the year 2019, expressed as daily dose of drug for 1000 days.
Antibiotic consumption - maximum (DDD 1000 days)	Maximum antibiotic consumption by the population of a given country in the year 2019, expressed as daily dose of drug for 1000 days.
Antibiotic consumption - minimum (DDD 1000 days)	Minimum antibiotic consumption by the population of a given country in the year 2019, expressed as daily dose of drug for 1000 days.
Soil pollution-related features	
Nitrogen (10 ³ kg)	Nitrogen agricultural use in a given country for the year 2019.
Phosphate (10 ³ kg)	Phosphate agricultural use in a given country for the year 2019.
Potash (10 ³ kg)	Potash agricultural use in a given country for the year 2019.
Ammonium nitrate (10 ³ kg)	Ammonium nitrate agricultural use in a given country for the year 2019.
Ammonium sulphate (10 ³ kg)	Ammonium sulphate agricultural use in a given country for the year 2019.
Ammonium phosphate (10 ³ kg)	Ammonium phosphate agricultural use in a given country for the year 2019.
Diammonium phosphate (10 ³ kg)	Diammonium phosphate agricultural use in a given country for the year 2019.
Muriate of potash (10 ³ kg)	Muriate of potash agricultural use in a given country for the year 2019.
Potassium nitrate (10 ³ kg)	Potassium nitrate agricultural use in a given country for the year 2019.
Potassium sulphate (10 ³ kg)	Potassium sulphate agricultural use in a given country for the year 2019.
Calcium ammonium and other mixtures with calcium carbonate (10 ³ kg)	Calcium ammonium and other mixtures with calcium carbonate agricultural use in a given country for the year 2019.
Fertilizers n.e.c. (10 ³ kg)	Fertilizers n.e.c. agricultural use in a given country for the year 2019. Fertilizers n.e.c. are fertilizers that contain at least one of the fertilising elements nitrogen, phosphorus or potassium, not elsewhere classified.
Other nitrogenous fertilizers (10 ³ kg)	Other nitrogenous fertilizers agricultural use in a given country for the year 2019.
Other phosphatic fertilizers (10 ³ kg)	Other phosphatic fertilizers agricultural use in a given country for the year 2019.
Fertilizers NPK (10 ³ kg)	Fertilizers for agricultural use in a given country for the year 2019. NPK refers to the three macronutrients all plants need: nitrogen, phosphorus and potassium.
PK compounds (10 ³ kg)	Compounds for agricultural use in a given country for the year 2019. PK refers to two macronutrients all plants need: phosphorus and potassium.
Other NP compounds (10 ³ kg)	Compounds for agricultural use in a given country for the year 2019. NP refers to two macronutrients all plants need: nitrogen and phosphorus.

Superphosphates above 35% (10 ³ kg)	Superphosphates (above 35%) agricultural use in a given country for the year 2019. The grade of superphosphate refers to the percentage of available phosphate (P ₂ O ₅) contained in the product. Superphosphate is a fertilizer produced by treating phosphate rock with sulfuric acid, resulting in a mixture of phosphoric acid and calcium sulfate.
Other superphosphates (10 ³ kg)	Other superphosphates agricultural use in a given country for the year 2019.
Urea (10 ³ kg)	Urea agricultural use in a given country for the year 2019.
Urea and ammonium nitrate solutions (10 ³ kg)	Urea and ammonium nitrate solutions agricultural use in a given country for the year 2019.
Pesticides (10 ³ kg)	Pesticides total use in a given country for the year 2019.
Insecticides (10 ³ kg)	Insecticides total use in a given country for the year 2019.
Nitrogen use per area of cropland (kg/ha)	Nitrogen use per area of cropland in a given country for the year 2019.
Phosphate use per area of cropland (kg/ha)	Phosphate use per area of cropland in a given country for the year 2019.
Potash use per area of cropland (kg/ha)	Potash use per area of cropland in a given country for the year 2019.
Pesticides use per area of cropland (kg/ha)	Pesticides use per area of cropland in a given country for the year 2019.
Nitrogen use per capita (kg/p.c.)	Nitrogen use per capita in a given country for the year 2019.
Phosphate use per capita (kg/p.c.)	Phosphate use per capita in a given country for the year 2019.
Potash use per capita (kg/p.c.)	Potash use per capita in a given country for the year 2019.
Pesticides use per capita (kg/p.c.)	Pesticides use per capita in a given country for the year 2019.
Insecticides use per capita (kg/p.c.)	Insecticides use per capita in a given country for the year 2019.
Nitrogen use per value of agricultural production (kg/1000\$)	Nitrogen use per agricultural production in a given country for the year 2019.
Phosphate use per value of agricultural production (kg/1000\$)	Phosphate use per agricultural production in a given country for the year 2019.
Potash use per value of agricultural production (kg/1000\$)	Potash use per agricultural production in a given country for the year 2019.
Pesticides use per value of agricultural production (kg/1000\$)	Pesticides use per agricultural production in a given country for the year 2019.
Insecticides use per value of agricultural production (kg/1000\$)	Insecticides use per agricultural production in a given country for the year 2019.
Mismanaged plastic (10 ³ kg)	Mismanaged plastic waste is waste that is not recycled, incinerated, or kept in sealed landfills. It includes materials burned in open pits, dumped into seas or open waters, or disposed of in unsanitary landfills and dumpsites.
Mismanaged plastic per capita (kg/p.c.)	Mismanaged plastic waste per capita in a given country for the year 2019.
Mismanaged plastic to ocean (10 ³ kg)	Mismanaged plastic waste emitted into the ocean by a given country for the year 2019.

Mismanaged plastic to ocean per capita (10 ³ kg)	Mismanaged plastic waste emitted per capita into the ocean by a given country for the year 2019.
Probability of plastic being emitted in ocean	Probability of plastic being emitted in ocean for given country for the year 2019.
Social, economic and life style-related features	
GDP per capita (US\$)	It refers to the Gross Domestic Product (GDP) of a country divided by its population. It is a measure used to estimate the average economic output per person within a country and is often used as an indicator of a country's standard of living or economic well-being.
Industry: value added to GDP (US\$)	It refers to the contribution made by the industrial sector to the Gross Domestic Product (GDP) of a country. GDP measures the total monetary value of all goods and services produced within a country's borders over a specified period of time. The industrial sector includes activities such as manufacturing, construction, mining and utilities.
Agriculture: value added to GDP (US\$)	It refers to the contribution made by the agricultural sector to the Gross Domestic Product (GDP) of a country. GDP measures the total monetary value of all goods and services produced within a country's borders over a specified period of time. The agriculture sector includes activities related to farming, forestry, fishing and livestock production.
Agriculture: value added (% GDP) (%)	It refers to the percentage of the Gross Domestic Product (GDP) that is contributed by the agricultural sector.
GDP deflator	It is a measure used to adjust the nominal Gross Domestic Product (GDP) for inflation or deflation, thus obtaining the real GDP. It's essentially a price index that reflects the average level of prices for all goods and services produced in an economy over a given period of time.
% of agricultural GVA produced by irrigated agriculture (%)	It refers to the proportion of the total agricultural GVA that is generated through irrigated farming practices. Agricultural Gross Value Added (GVA) represents the contribution of the agricultural sector to the Gross Domestic Product (GDP) of a country. It includes the total value of goods and services produced by the agricultural sector, excluding any intermediate inputs.
Domestic government health expenditure as % of GDP (%)	It refers to the proportion of a country's Gross Domestic Product (GDP) that is spent by the government on health-related activities and services within its borders. It represents the portion of the total economic output of a country that is allocated specifically to healthcare by the government.
Domestic government health expenditure as % of CHE (%)	The share of revenues from domestic general government sources spent on health as percentage of current health expenditure (CHE) indicates how much is funded domestically by the government. Domestic general government sources include government internal transfers and grants, government transfers and subsidies to voluntary schemes, as well as social health insurance contributions. This indicator describes the role of the general government domestic sources in funding healthcare relative to domestic private and external sources.
Out of pocket expenditure as % of CHE (%)	The share of revenues from out-of-pocket payments as percentage of current health expenditure (CHE) indicates how much is funded directly by households out-of-pocket expenditure on health. High out-of-pocket payments are associated with catastrophic and impoverishing household spending.
CHE as % of GDP (%)	It is a measure that expresses the total amount of money spent on healthcare within a country as a percentage of that country's Gross Domestic Product (GDP).
Human Development Index (HDI)	It is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions.
Gender Inequality Index (GII)	GII is a composite metric of gender inequality using three dimensions: reproductive health, empowerment and the labour market. A low GII value indicates low inequality between women and men, and vice-versa.

% of the agricultural holdings with irrigation managed by women (%)	Share of agricultural holdings with irrigation in a given country for the year 2019 that is managed by women.
% of the area equipped for irrigation managed by women (%)	Share of the total area equipped for irrigation of a given country for the year 2019 that is managed by women.
Number of people undernourished 3-year average (1000 inhab.)	The 3-year average number of undernourished people of a given country. The prevalence of undernourishment is an estimate of the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels that are required to maintain a normal active and healthy life.
Prevalence of undernourishment 3-year average (%)	The 3-year average share value of population of a given country that is undernourished.
Population density (inhab./km ²)	Population density of a given country for the year 2019.
Rural population (1000 inhab.)	Rural population of a given country for the year 2019.
Urban population (1000 inhab.)	Urban population of a given country for the year 2019.
Urban population living in slums	Urban population of a given country for the year 2019 living in slums, i.e. living in areas lacking at least one of the following five housing conditions: (1) access to improved water; (2) access to improved sanitation facilities; (3) sufficient-living area, not overcrowded; (4) structural quality/durability of dwellings; (5) security of tenure.
% of urban population living in slums (%)	Share of urban population of a given country for the year 2019 that lives in slums.
Urban agglomerations with more than 1 million	Number of urban agglomeration in a given country for the year 2019 where the population is higher than one million of people.
Population affected by water related disease (1000 inhab.)	Population affected by waterborne disease. Waterborne diseases are conditions (meaning adverse effects on human health, such as death, disability, illness or disorders) caused by pathogenic micro-organisms that are transmitted by water. These diseases can be spread while bathing, washing, drinking water or by eating food exposed to contaminated water.
Male tobacco users (%)	Share of male tobacco users for a given country for the year 2019.
Female tobacco users (%)	Share of female tobacco users for a given country for the year 2019.
Cigarettes/day	Mean number of cigarettes smoked per day for a given country for the year 2019.
Male BMI	Mean male body mass index (BMI). BMI is equal to a person's weight in <i>kg</i> divided by the square of height in <i>m</i> .
Female BMI	Mean female body mass index (BMI). BMI is equal to a person's weight in <i>kg</i> divided by the square of height in <i>m</i> .
Antibiotics import trade value (\$)	Antibiotics import trade value of a given country for the year 2019.
Antibiotics export trade value (\$)	Antibiotics export trade value of a given country for the year 2019.

Table S2. The list of all features considered for this work.

Acinetobacter Baumanni

Arable land area (1000 ha), Basic sanitation, Basic water, CO2/capita, Desalinated water, Dghe % CHE, Dghe % GDP, Direct use of treated municipal wastewater for irrigation purpose (10⁹ m3/year), Eggs cons./capita, Eggs production, Harvested area: Grapes, Harvested area: Millet, Harvested area: Other, Harvested area: Coconuts, Improved sanitation, Irrigation drained, Limited handwashing, Limited sanitation, Meat production, Milk cons./capita, O3 max, O3 mean, O3 min, Open defecation, Pig av./capita, Pig cons./capita, Pig meat/animal, Pig production, Poultry livestock, Poultry production, R. limited handwashing, R. population, Rainfed/Irrigated yields, SO2 mean, Safe sanitation, Safe water, Slaughtered chicken, Treatment level - WWTP - Advanced, U. limited handwashing, U. limited sanitation, Undernourishment.

Table S3. The complete list of features selected by *Boruta* algorithm for the case of *Acinetobacter baumannii*, collected in alphabetic order.

Escherichia coli

Antibiotic consumption - minimum (DDD 1000 days), Arable land area (1000 ha), Area equipped for full control irrigation: sprinkler irrigation (1000 ha), Area equipped for irrigation: equipped lowland areas (1000 ha), Basic sanitation, Basic water, CO2/capita, Dependency ratio, Desalinated water, Dghe % CHE, Dghe % GDP, Eggs cons./capita, Eggs/bird, Improved sanitation, Improved water, Interannual variability (WRI), Limited handwashing, Limited sanitation, Limited water, Mean Male BMI, Meat cons./capita, Meat supply/person, No handwashing, No water, OOP % CHE, Open defecation, Poultry av./capita, Poultry cons./capita, R. basic sanitation, R. improved sanitation, R. limited handwashing, R. limited sanitation, R. limited water, R. no handwashing, R. no sanitation, R. unimproved water, Rainfed/Irrigated yields, Safe sanitation, Safe water, U. basic sanitation, U. limited handwashing, U. limited sanitation, U. limited water, U. no handwashing, U. unimproved sanitation, U. unimproved water, Unimproved sanitation, Unimproved water.

Table S4. The complete list of features selected by *Boruta* algorithm for the case of *Escherichia coli*, collected in alphabetic order.

Klebsiella pneumoniae

% of agricultural GVA produced by irrigated agriculture (%), Arable land area (1000 ha), Area equipped for full control irrigation: sprinkler irrigation (1000 ha), Area equipped for irrigation: equipped lowland areas (1000 ha), Basic sanitation, Basic water, CO2/capita, Dependency ratio, Desalinated water, Dghe % CHE, Dghe % GDP, Eggs cons./capita, Eggs/bird, Harvested area: Grapes, Improved sanitation, Improved water, Irrigation drained, Limited handwashing, Limited sanitation, Limited water, Mean Male BMI, Meat cons./capita, Meat supply/person, No handwashing, No water, Open defecation, Poultry av./capita, Poultry cons./capita, R. basic handwashing, R. basic sanitation, R. basic water, R. improved sanitation, R. limited handwashing, R. limited sanitation, R. limited water, R. no handwashing, R. no sanitation, R. no water, R. unimproved sanitation, R. unimproved water, Rainfed/Irrigated yields, Safe sanitation, Safe water, U. basic sanitation, U. limited handwashing, U. limited sanitation, U. limited water, U. no handwashing, U. no sanitation, U. unimproved sanitation, U. unimproved water, Undernourishment, Unimproved sanitation, Unimproved water.

Table S5. The complete list of features selected by *Boruta* algorithm for the case of *Klebsiella pneumoniae*, collected in alphabetic order.

Pseudomonas aeruginosa

Basic sanitation, Basic water, CO2/capita, Dependency ratio, Desalinated water, Dghe % CHE, Eggs cons./capita, Harvested area: Grapes, Improved sanitation, Limited handwashing, Limited sanitation, Pig av./capita, Pig cons./capita, R. limited handwashing, Rainfed/Irrigated yields, SO2 mean, Safe sanitation, Safe water, U. limited sanitation.

Table S6. The complete list of features selected by *Boruta* algorithm for the case of *Pseudomonas aeruginosa*, collected in alphabetic order.

Streptococcus pneumoniae

Basic sanitation, Basic water, CO2/capita, Desalinated water, Eggs cons./capita, Improved sanitation, Improved water, Irrigation drained, Limited water, Open defecation, R. basic sanitation, R. improved sanitation, R. limited water, R. unimproved water, Safe water, U. basic sanitation, U. limited sanitation, U. limited water, Undernourishment, Unimproved water.

Table S7. The complete list of features selected by *Boruta* algorithm for the case of *Streptococcus pneumoniae*, collected in alphabetic order.

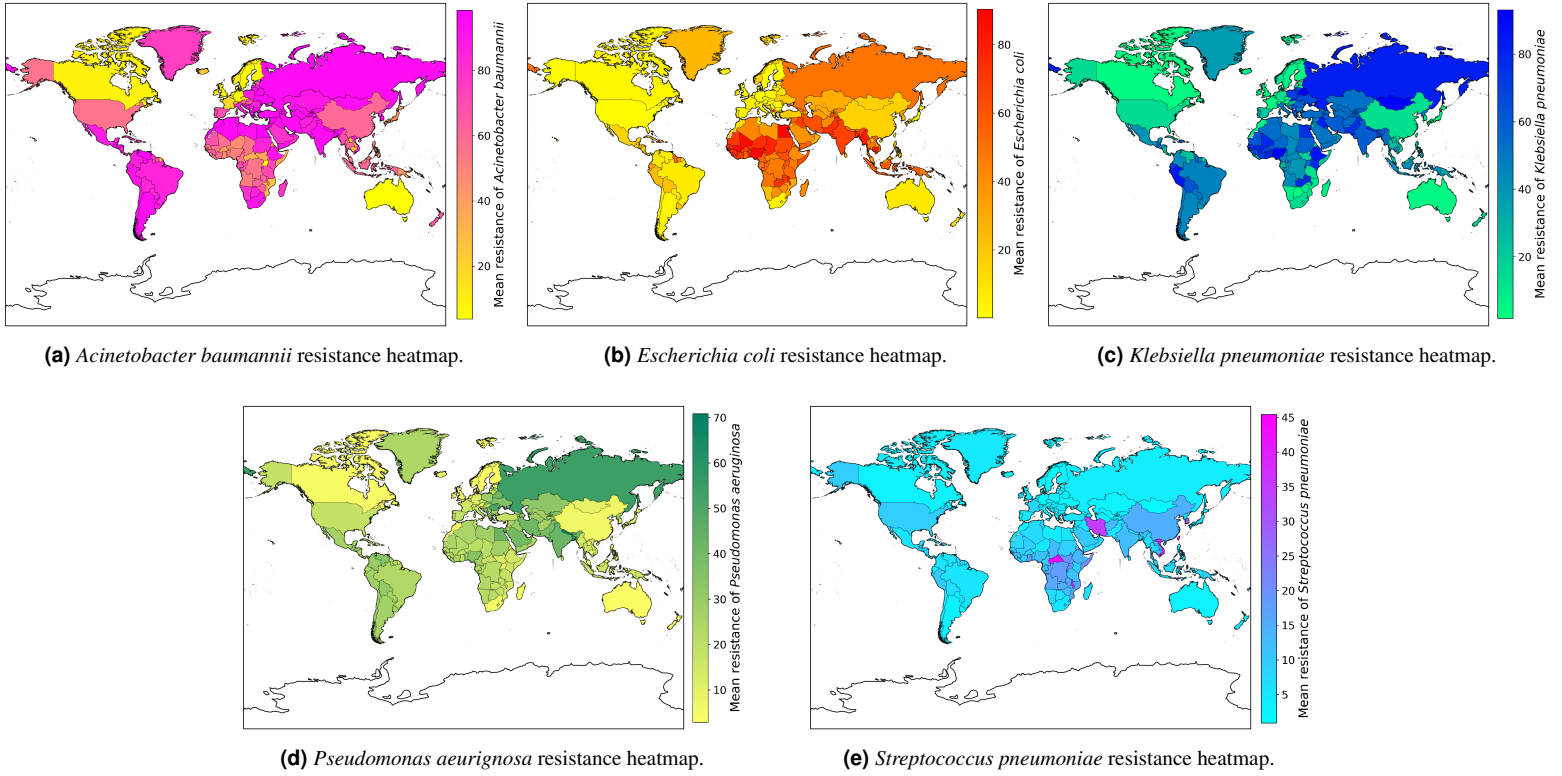


Figure S1. These heatmaps show the average worldwide resistances of each selected pathogen, calculated on the basis of the results obtained by Murray and his research group in the well-known paper about antimicrobial resistance.

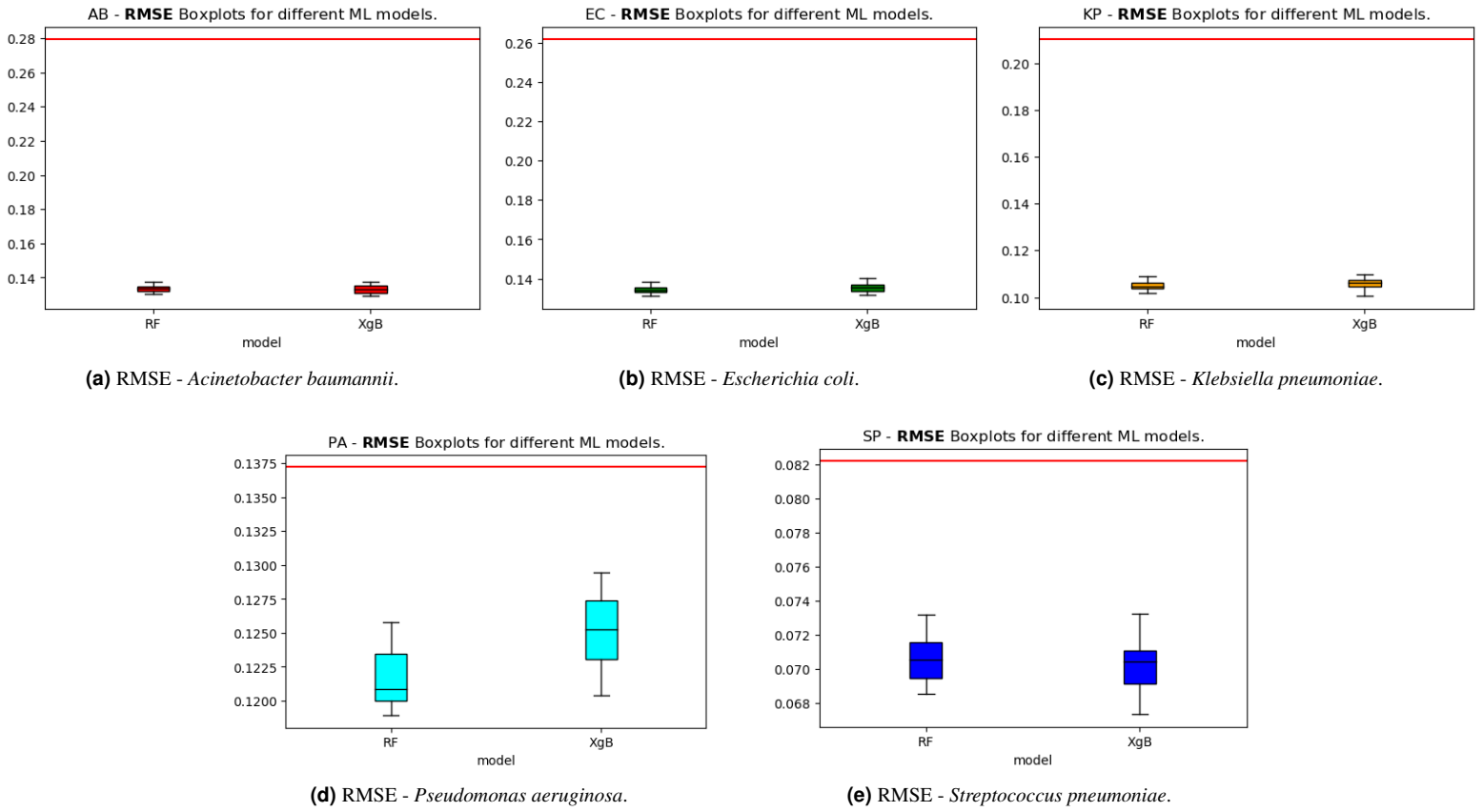


Figure S2. Root mean squared error (RMSE) results obtained in the cases of random forest, xgboost and linear regression (red line) for all pathogens.

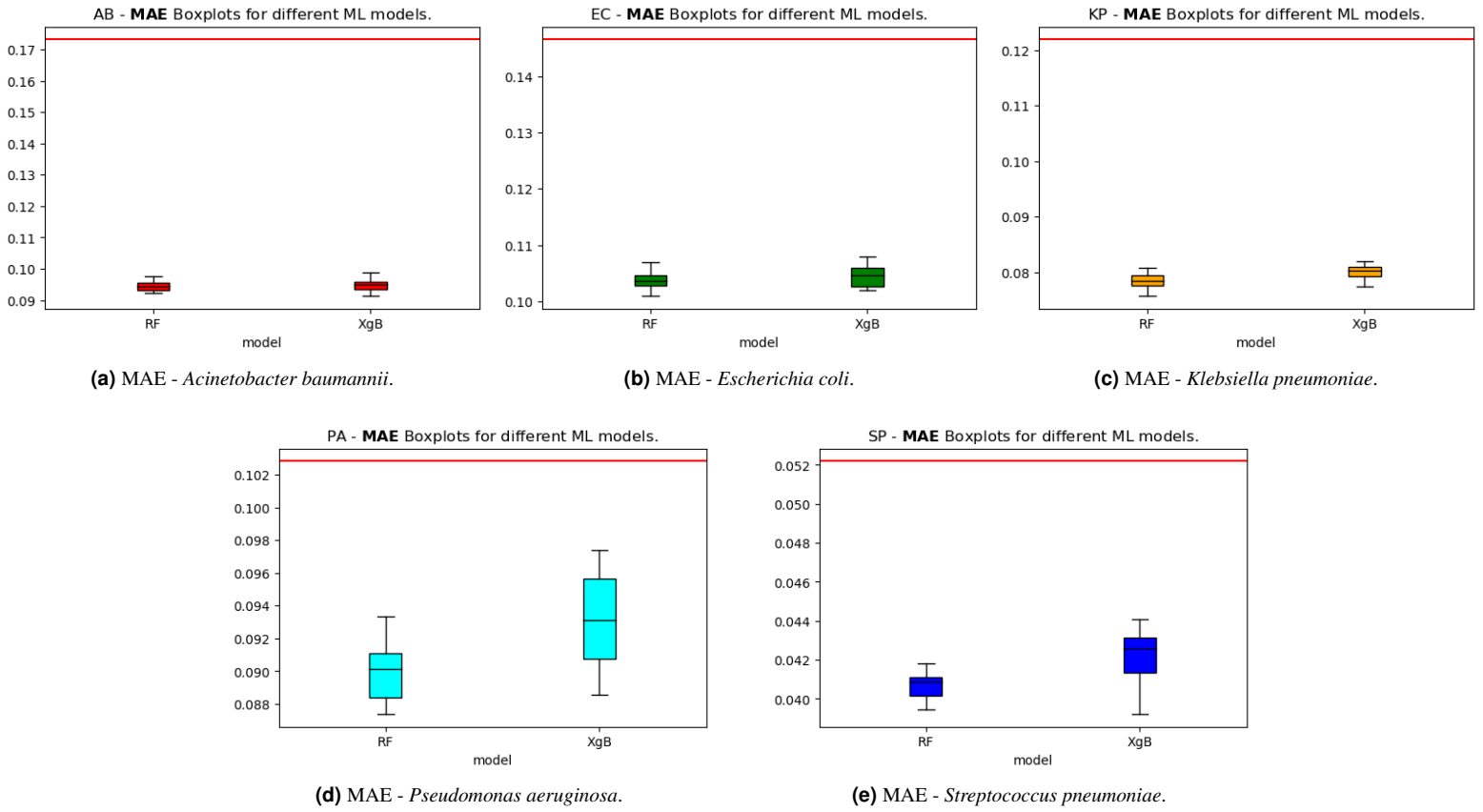


Figure S3. Mean absolute error (MAE) results obtained in the cases of random forest, xgboost and linear regression (red line) for all pathogens.

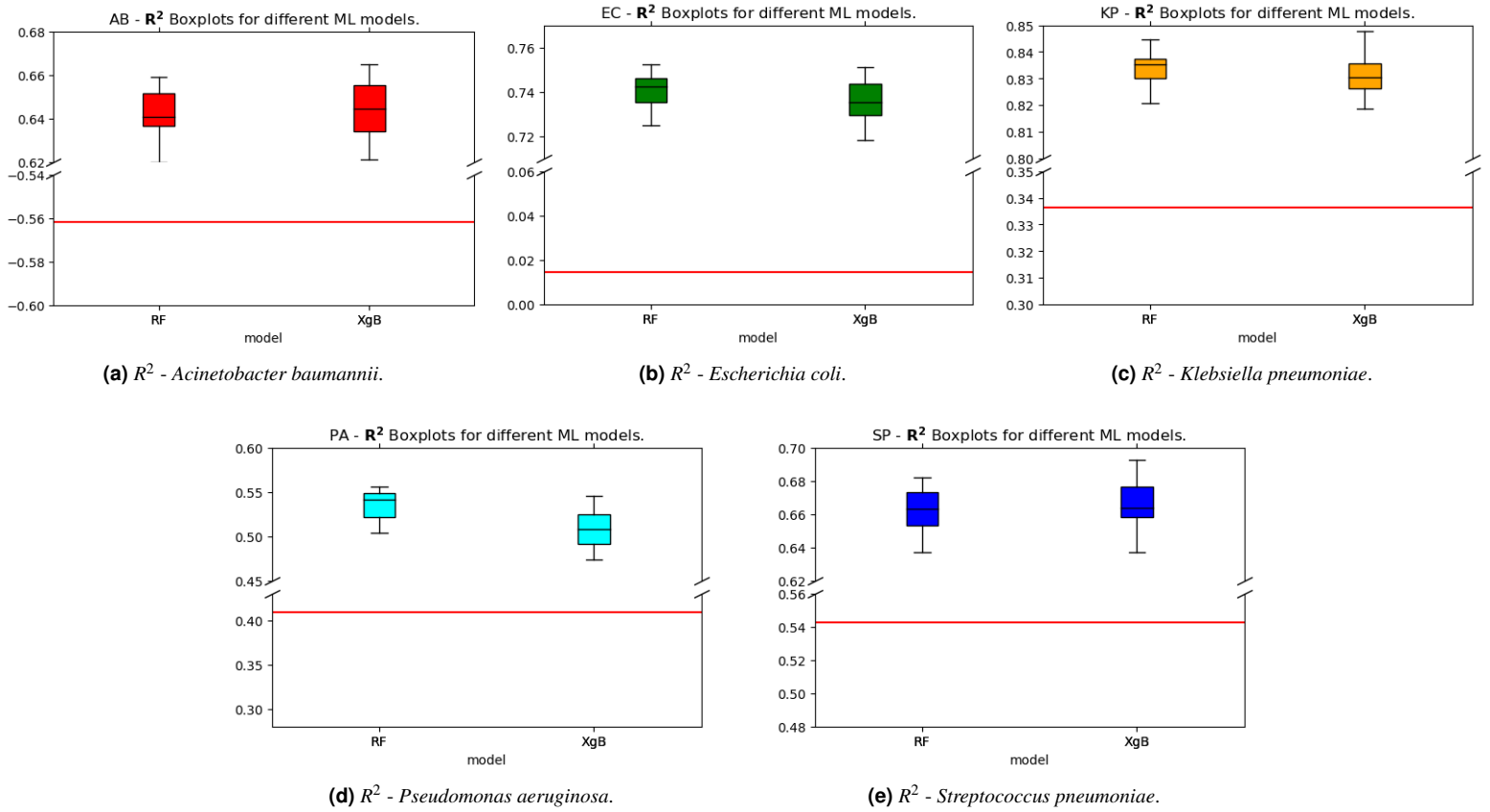
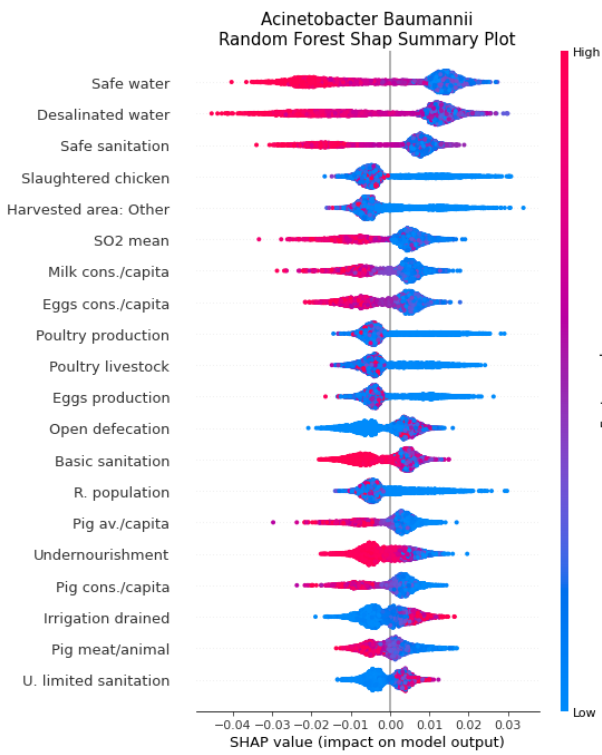
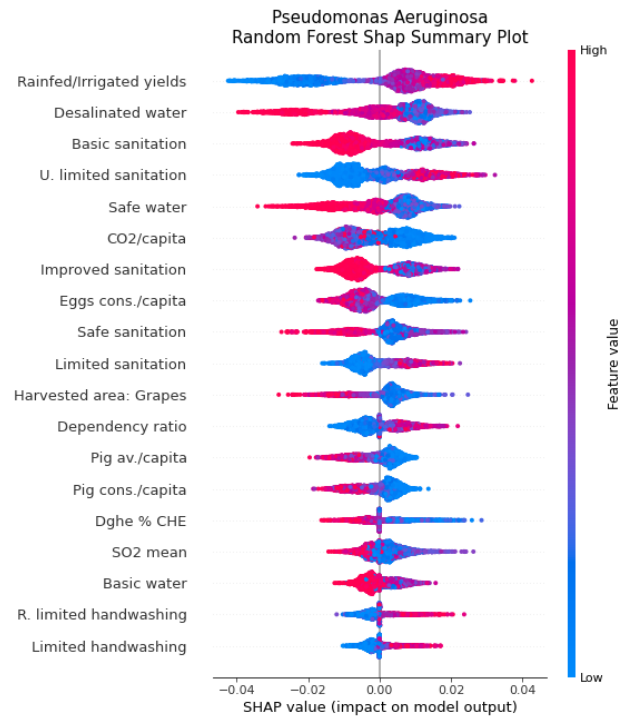


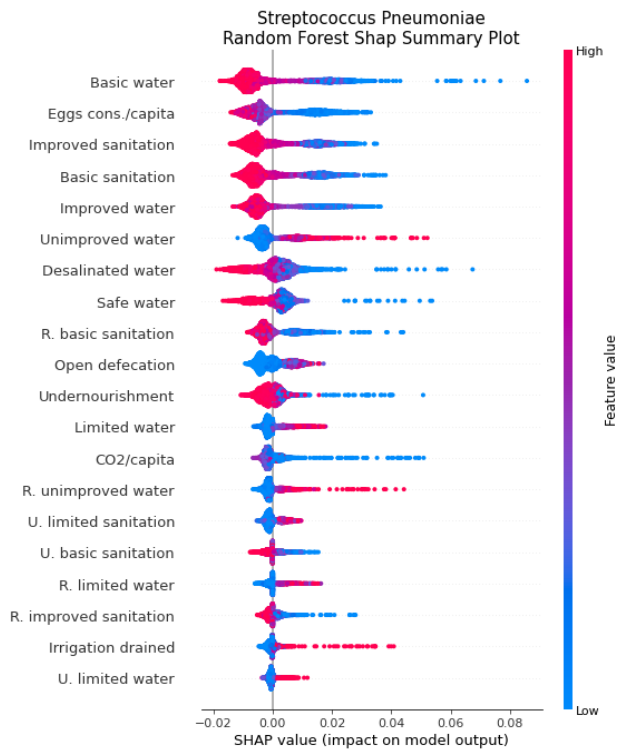
Figure S4. Coefficient of determination (R^2) results obtained in the cases of random forest, xgboost and linear regression (red line) for all pathogens.



(a) *Acinetobacter baumannii*.

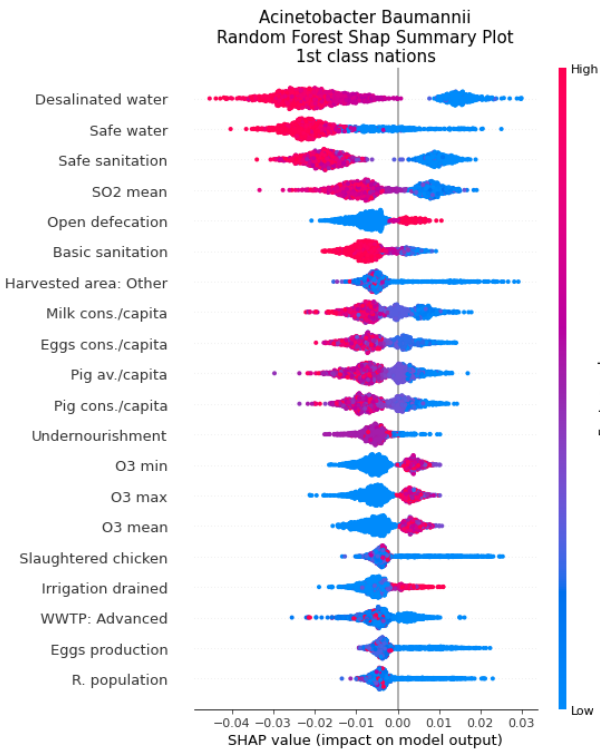


(b) *Pseudomonas aeruginosa*.

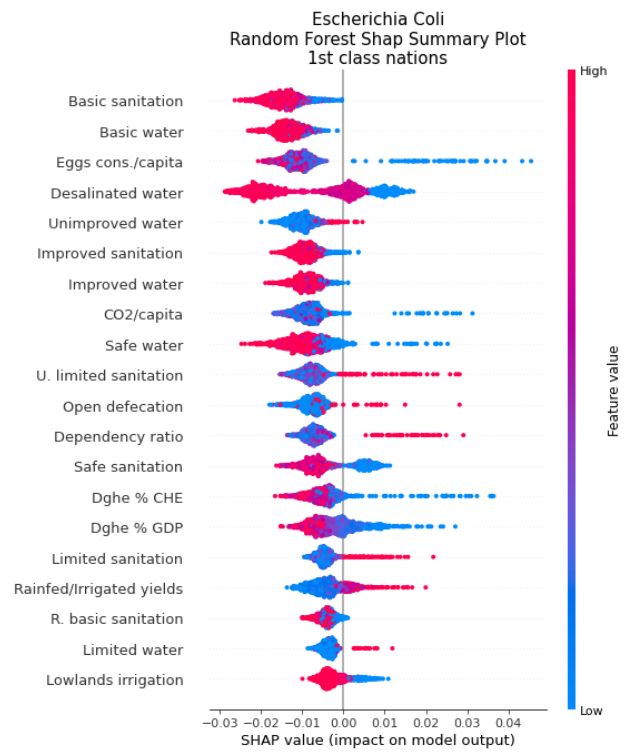


(c) *Streptococcus pneumoniae*.

Figure S5. Overall shap summary plots for *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Streptococcus pneumoniae*, obtained for random forest.



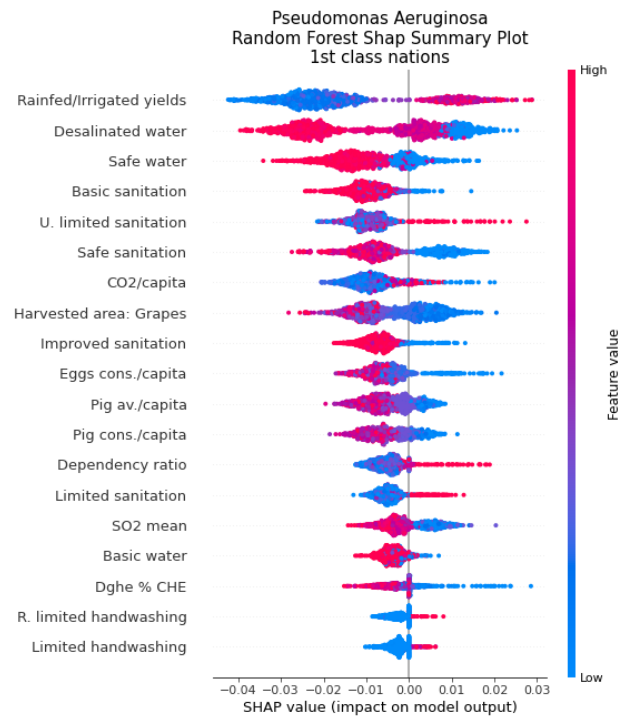
(a) 1st class nations for *Acinetobacter baumannii*.



(b) 1st class nations for *Escherichia coli*.

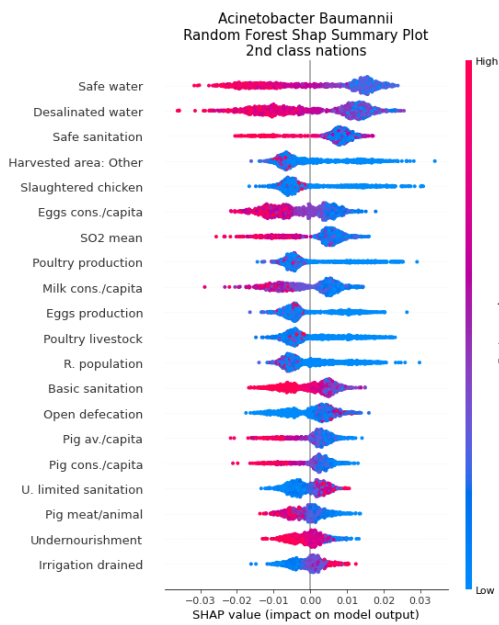


(c) 1st class nations for *Klebsiella pneumoniae*.

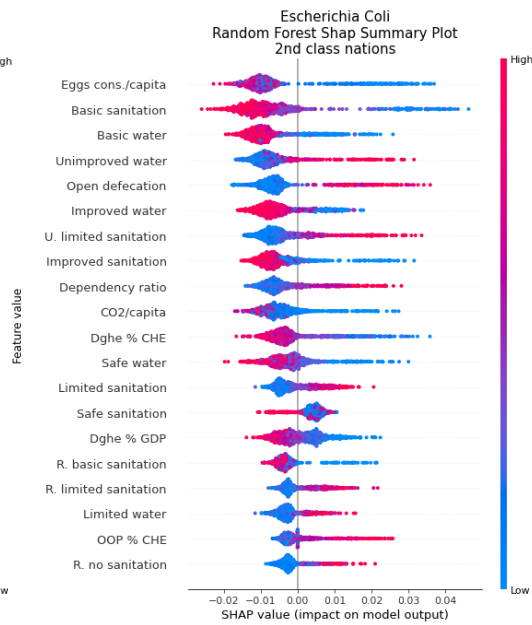


(d) 1st class nations for *Pseudomonas aeruginosa*.

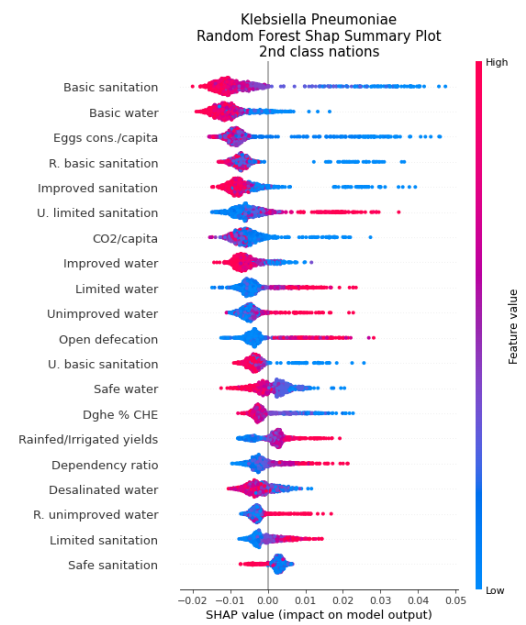
Figure S6. Shap summary plots for 1st class nations, obtained for random forest.



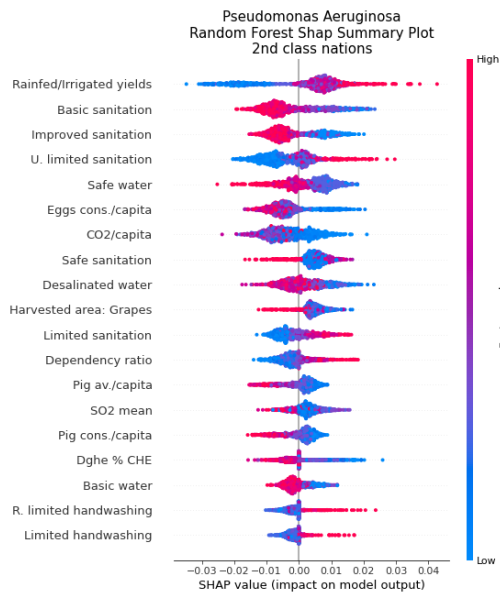
(a) 2nd class nations for *Acinetobacter baumannii*.



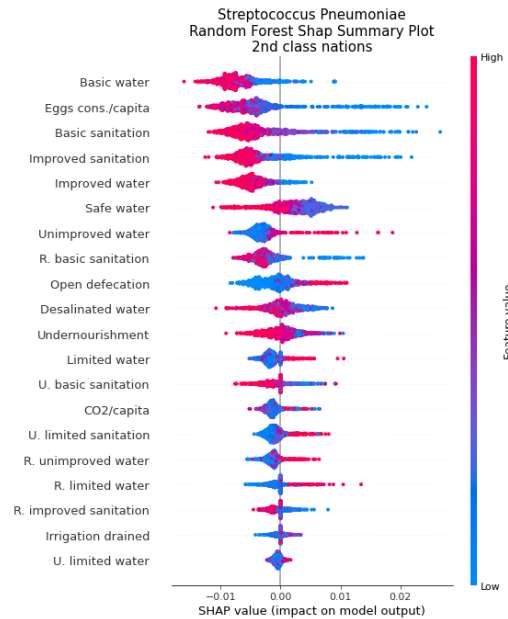
(b) 2nd class nations for *Escherichia coli*.



(c) 2nd class nations for *Klebsiella pneumoniae*.



(d) 2nd class nations for *Pseudomonas aeruginosa*.



(e) 2nd class nations for *Streptococcus pneumoniae*.

Figure S7. Shap summary plots for 2nd class nations, obtained for random forest.

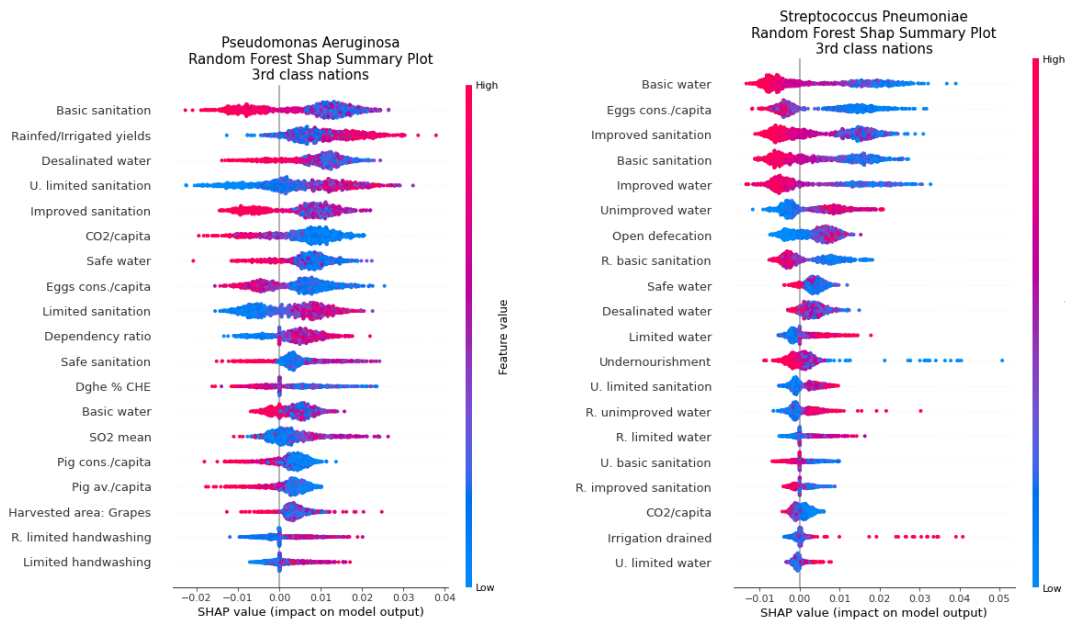
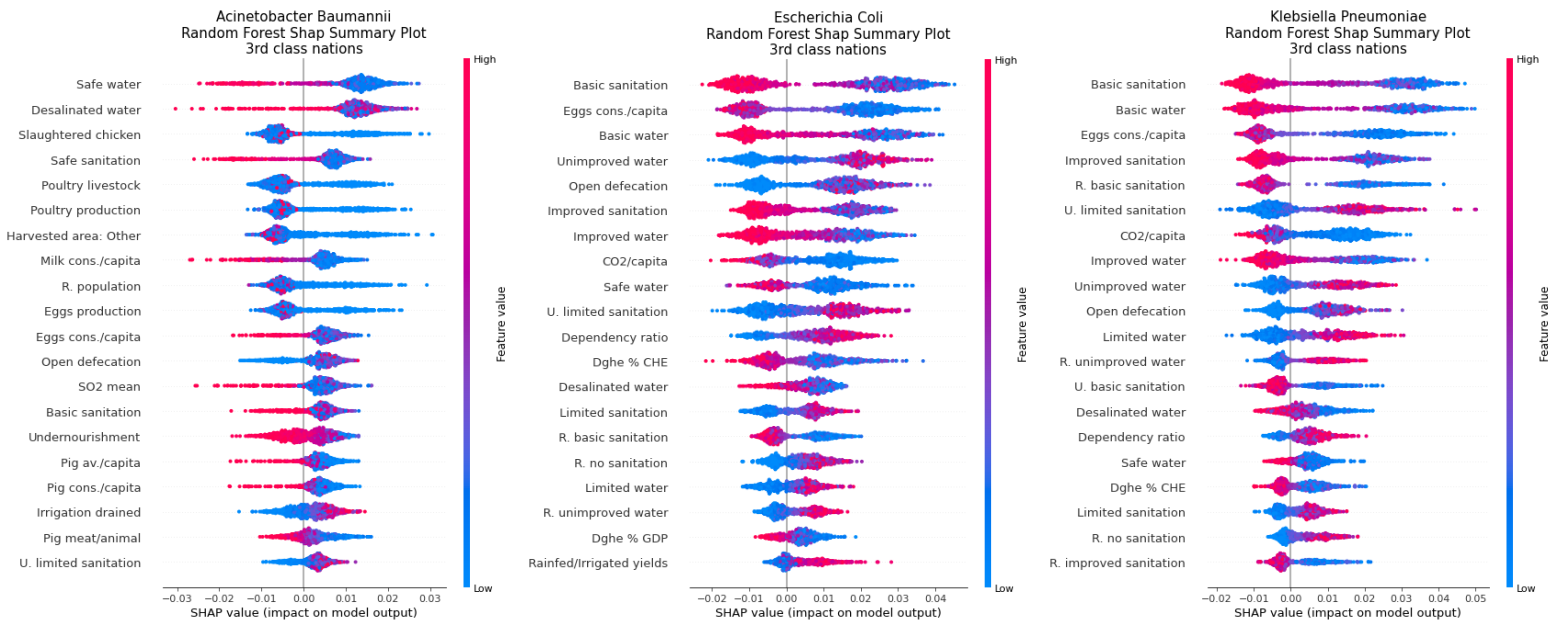
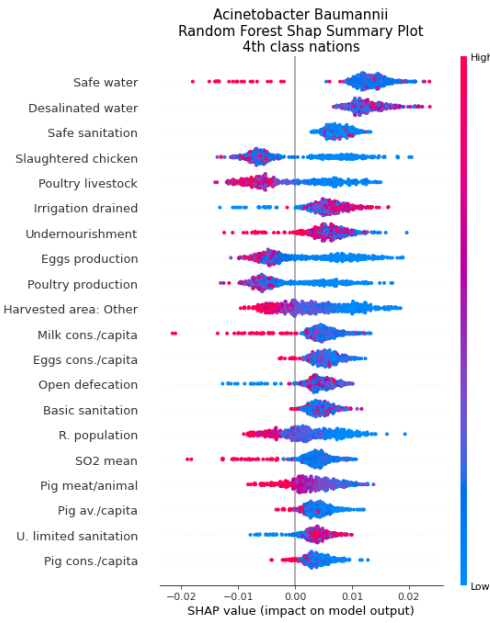
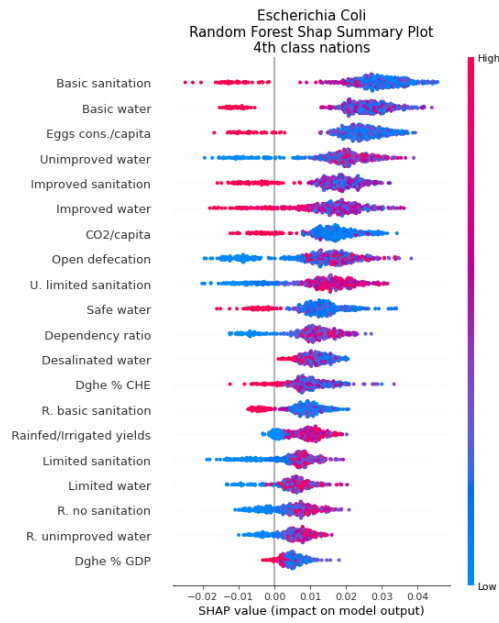


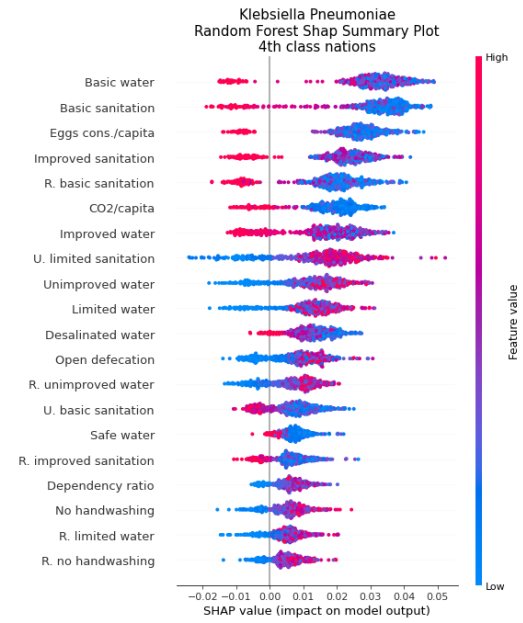
Figure S8. Shap summary plots for 3rd class nations, obtained for random forest.



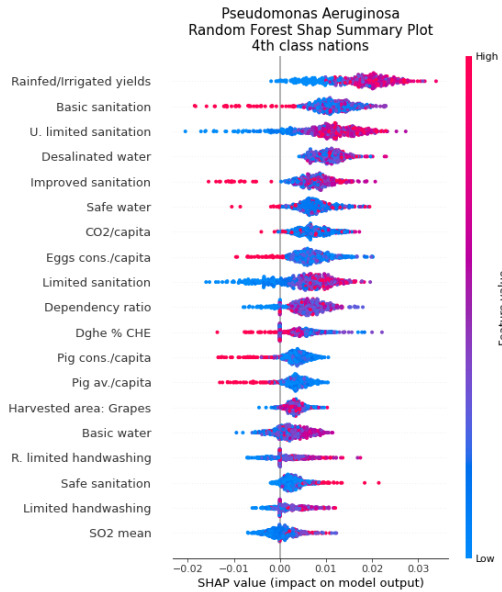
(a) 4th class nations for *Acinetobacter baumannii*.



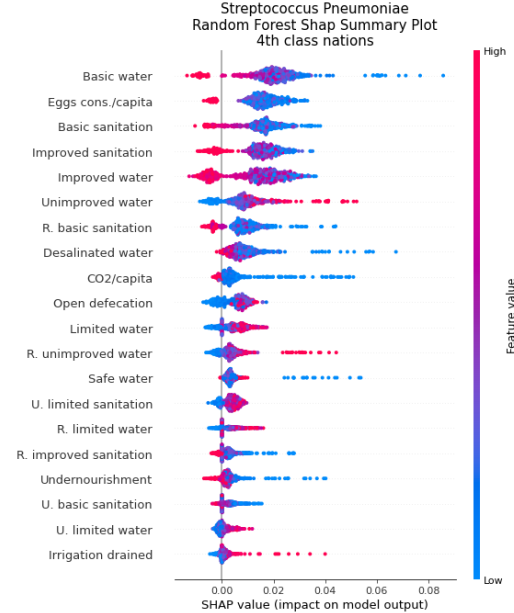
(b) 4th class nations for *Escherichia coli*.



(c) 4th class nations for *Klebsiella pneumoniae*.



(d) 4th class nations for *Pseudomonas aeruginosa*.



(e) 4th class nations for *Streptococcus pneumoniae*.

Figure S9. Shap summary plots for 4th class nations, obtained for random forest.

Pearson correlation between SHAP mean absolute values for different pathogens

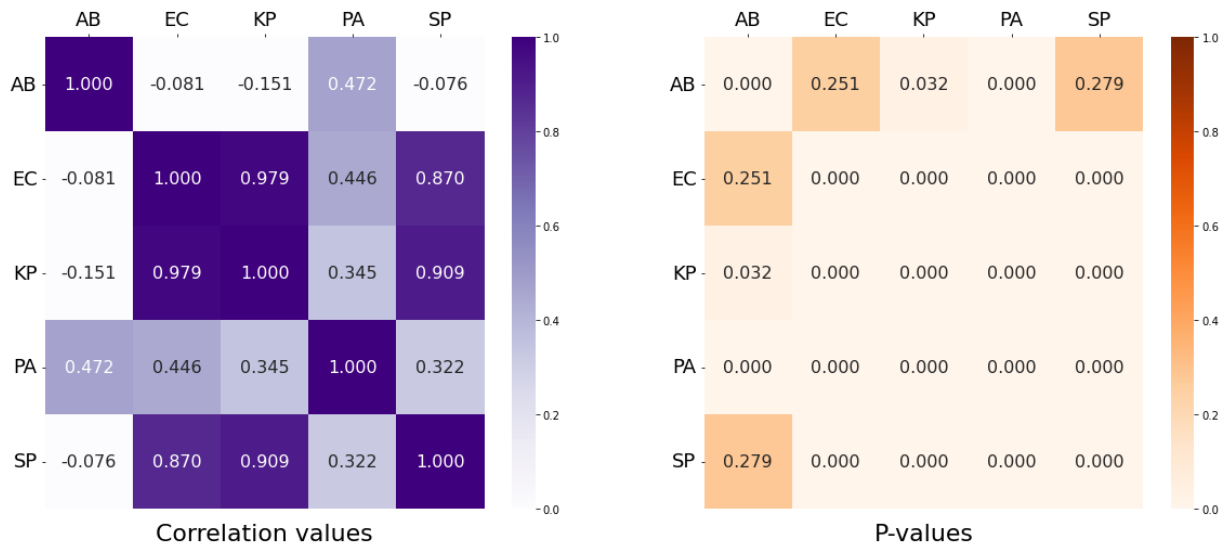


Figure S10. Pearson correlation coefficients and related p-values calculated from Shap mean absolute values of every pathogen.

Spearman correlation between SHAP mean absolute values for different pathogens

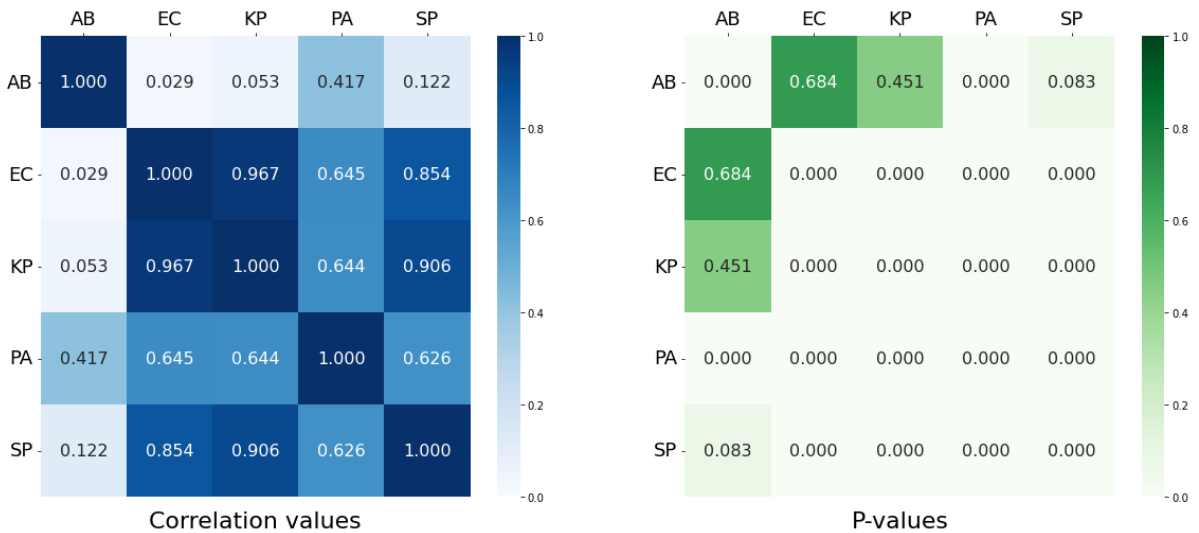


Figure S11. Spearman correlation coefficients and related p-values calculated from Shap mean absolute values of every pathogen.

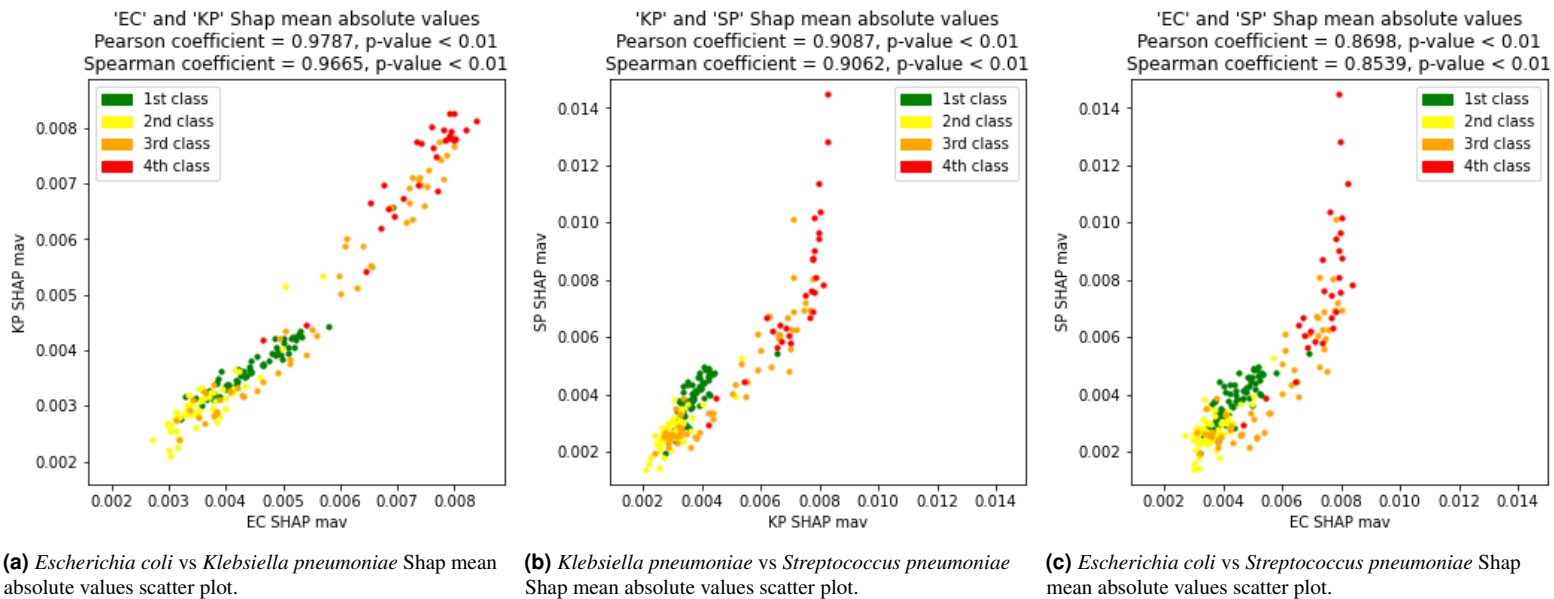


Figure S12. These scatter plots show how Shap mean absolute values related to *Escherichia coli*, *Klebsiella pneumoniae* and *Streptococcus pneumoniae* are distributed. In each plot, dots represent the Shap mean absolute values related to nations. Nations are grouped in four classes, according to the Atlas method.