What is runoff? Runoff can be thought of as the proportion of precipitation that is lost after evapotranspiration and after the soil moisture deficit is satisfied. It is typically reported in units of depth (e.g., in millimeters) just like precipitation, and is an areally-averaged quantity (i.e., average runoff depth over a basin).

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Relationship Between Physical Water Availability and Development Indicators in Africa

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Abstract: It is widely recognized that water is a crucial ingredient for economic development. But how does physical water availability relate to common health and sanitation indicators such as child malnutrition, access to improved sources of water supply, and diarrhea prevalence? And how is population distributed in relation to available water? This exploratory analysis utilizes data from the UNH-GRDC Composite Runoff Fields (v.1); the Demographic and Health Surveys (DHS); the Multiple Indicator Cluster Surveys (MICS); and the Gridded Population of the World (GPW v.2).

Findings: Preliminary analyses show:
(1) A significant proportion of the continent is characterized by water scarcity (below right).
(2) In Sub-Saharan Africa there appears to be a negative relationship between annual water availability and child malnutrition (left). Because per capita income also reduces child malnutrition, in North Africa where development levels are higher per capita income strongly mediates the negative effect of low water availability.
(3) An abundance of water, rather than being associated with higher levels of health and sanitation, is generally associated with poorer access to improved water sources and higher levels of diarrheal disease (upper right).

Further analyses will combine these countervailing impacts of water availability on child wellbeing.

- Chart A shows that as water runoff increases, the proportion of the population that relies on surface water as their sole water source also increases.
- Chart B shows that as runoff increases, the proportion of the population relying on improved water sources (piped water and wells) decreases.
- Paradoxically, those countries with the greatest physical water availability are more likely to have unimproved water sources. This suggests that these countries do not invest in water supply infrastructure because of an abundance of water resources.
- Chart C shows that there is a positive association between runoff and incidence of diarrhea. This potentially reflects greater reliance on less sanitary surface water supplies, and a tendency of water-rich places to have less water delivery infrastructure.

• In Africa, a high proportion of agricultural households are dependent on rainfed lands. I hypothesized that drier areas with low runoff would have high proportions of underweight children. This relationship is confirmed in Sub-Saharan Africa.
• North Africa, although very dry, does not experience equal high levels of child malnutrition due to much higher per capita income. This suggests that levels of development are an important factor in mediating the expected relationship between water scarcity and child malnutrition.
• Water and Development Hotspots (left) are countries with low per capita income, high malnutrition, and low levels of runoff. In these countries a high proportion of GDP is derived from agriculture. Therefore, water scarcity is likely to be a brake to development.

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