A PROJECT OF UTAH VALLEY UNIVERSITY'S
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Human Development Index (HDI) in Utah and Utah Counties 2014-2019

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This report is presented in an interactive format at https://www.uvu.edu/socialimpact/wellbeing. The authors' calculations are available for download in CSV format at https://tinyurl.com/hdiutah. Please attribute the use of the data or findings from the report.

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Executive Summary

This report presents the Human Development Index (HDI), the inequality-adjusted HDI (IHDI), and the Gender Development Index (GDI) for Utah and its counties in 2014 and 2019. Each index is calculated according to the United Nations Development Program's methodology. While there are international and national measures of the HDI, the IHDI and GDI have not been calculated at the county level for Utah. We believe our calculations will yield new insights on how Utahns fare in terms of economic well-being.

This report aims to provide alternative indicators to Gross Domestic Product (GDP) at the Utah state and county levels that integrate characteristics of well-being that go beyond income alone. We complement the existing analysis of the economic development of our region by providing additional metrics to evaluate economic and social policies aimed at improving the well-being of Utahns.

Utah's economic performance is one of the most successful in the country, with above-average economic growth with a low unemployment rate, and a business-friendly environment. However, economic growth turns into economic development only when it is translated into improvements in education, health, and access to a decent standard of living as measured by income. The HDI is a composite index that considers these three dimensions when measuring the population's well-being. It can be understood as a measure of a population's potential to have a healthy and long life, access to education, and a decent standard of living.

This report highlights the following at the state level:

> Utah's HDI ranked 15th nationwide in 2019, an increase of six places from 2014.
>
> When the HDI is adjusted for inequality in all three dimensions, also known as the IHDI, Utah ranked 18th in 2019, improving ten spots from 2014.
>
> In the GDI, which is the ratio of the HDI between women and men, Utah ranked last among all states in both 2019 and 2014.

This report highlights the following at the county level:

> The highest HDI values are concentrated along the Wasatch Front, in Cache and Summit counties in the north, and Washington County in the south. When the index is adjusted for inequality, these counties preserve their position as the counties with the highest level of human development. For the HDI, Utah County ranked fourth in 2019, gaining one position compared to 2014. For the IHDI, Utah County ranked sixth in 2019, losing one position compared to 2014.

The counties with the lowest HDI levels are concentrated in rural and frontier regions. There is an 8.4% difference in the HDI value between the county with the lowest HDI (Emery County) and the highest (Summit County) in 2014. For 2019 these differences are similar: there is a 10% difference between the HDI value of the highest county (Morgan) and the lowest (San Juan).

The difference between HDI and IHDI is the loss of human development potential due to the unequal distribution between and within each of the HDI's three dimensions. In the absence of inequality, the HDI and the IHDI would be the same. Loss due to inequality can come from any of the three dimensions of the HDI: health, education, or income. In 2019, Utah experienced a 14% loss in potential human development, 21% loss in life expectancy, 12% in education, and 9% in income.

The most significant inequality losses occurred in rural and frontier counties, with smaller losses in urban areas. In 2014, there was a 14% gap between the IHDI value of the lowest county in the ranking (Rich) and the highest county (Washington). In 2019, Rich and Washington remained the lowest- and highest-ranked counties, but the gap between them increased to 18%. In Utah County in 2019, the total loss due to inequality was 16% (22% health, 13% education, and 12% income), which was above the statewide value.

The human capital index considers only health and education indexes to compare how counties fare without considering income levels. We identified four relationships between human capital and income: a) high-income counties showed high human capital indexes, b) lower-income counties correlated with low human capital indexes, c) medium-income counties correlated with high human capital indexes, and d) medium-high income counties correlated with low human capital.

The GDI does not show the same pattern as the HDI and IHDI. The highest GDI is found in rural and frontier areas, while urban areas like Utah County have one of the lowest GDIs for 2014 and 2019.

Women faced a double loss: one due to inequality in the distribution of the measured dimensions and the other due to women's overall lower measurements than men in HDI. While both men and women face the problem of inequality, women are disadvantaged in all three dimensions, but mainly in income. In the case of Utah County, women faced a loss due to inequality of 18%, while for men, it was 14% in 2014. In 2019, the difference between genders was reduced, showing similar percentages of loss due to inequality. However, the HDI and IHDI of women were lower than that of men.

In sum, the calculation of the three indexes shows that Utah's economic development is concentrated in urban areas where the most resources are available. This development is not homogeneous, and the IHDI shows that inequality is a roadblock in achieving the potential human development level for all Utahns. The GDI confirms what previous empirical works have shown about the disadvantaged situation for women in Utah. This report highlights gender disparities at the county level to identify areas needing policy intervention to close the gap.

1. Introduction

Utah's economy is known for its annual growth rate above the national average, low unemployment rate, and diversified economy. National media has recognized Utah as one of the fastest-growing states with an investment-friendly business environment. The COVID-19 pandemic proved the resilience of Utah's economy. Utah was one of the states that recovered fastest, with its employment rate returning to pre-COVID levels by October 2020. The manufacturing industry also returned to growth trend percentages by the last quarter of 2020. As can be seen, standard macroeconomic statistics for Utah's economy depict a place where economic growth establishes favorable conditions for the region's economic development. Going beyond economic performance measurements and quantifying well-being indicators is critical to verify whether the social well-being benefits of economic growth turn into economic development.

An enhanced assessment of an economy's status and its development should consider additional variables besides production. Based on Amartya Sen's capabilities framework, the United Nations Development Programme (UNDP) designed a comprehensive index that considers human development as an alternative indicator to GDP per capita. Human development is understood as a process whereby people can live longer and better, have access to education, and enjoy a decent standard of income (UNDP, 1990)—in other words, expanding people's capabilities and freedom of choice. The UNDP has published the Human Development Index (HDI) since 1990, and it is widely used to rank countries according to their economic development. The index gives policymakers an additional tool to evaluate a country's well-being that is not based solely on the production of goods and services. The HDI calculation methodology has undergone various changes over time. In 2010, the UNDP modified the HDI to consider inequality (Klugman et al., 2011). The adjusted index was named the Inequality-adjusted Human Development Index (IHDI). Other metrics were added, such as the Gender Development Index (GDI) introduced in 1995 (UNDP, 1995) and the Multidimensional Poverty Index (MPI) developed in 2010 by the Oxford Poverty and Human Development Initiative (OPHI) in conjunction with UNDP, which highlights the relationship between poverty and inequality (Alkire and Santos, 2014). A 2020 expansion of the HDI adds the impact of climate change on the population's well-being (UNDP, 2020a). The income component of the HDI was adjusted to account for the social costs of carbon on the planet, the Planetary pressure adjusted-HDI (PHDI).

Two organizations besides the UNDP calculate the HDI. The Global Data Lab from the Institute for Management Research at Radboud University estimates the HDI and sub-national indexes for 161 countries and 1625 regions from 1990-2019, following the UNDP methodology (Smits & Permanyer, 2019). The Measure of America (MOA) of the Social Science Research Council calculates the American Human Development

Index (AHDI) since 2005 at the state and county level following a similar methodology to that of the UNDP (Lewis & Gluskin, 2018). Although the ranking at the international level has opened a debate about what economic progress means, a measurement of the index at the domestic level is equally important since it reveals regional disparities that aggregate measures like GDP miss. Estimates for HDI exist at the subnational level for the United States, but there is no calculation of the IHDI or GDI at the state and county levels.

This report calculates and analyzes the HDI, IHDI, and GDI for Utah at the county level for 2014 and 2019. The results can supplement the analyses that have been made of the Utah economy by providing alternative indicators to GDP. The measurement of HDI and IHDI at the Utah county level is a Center of Social Impact (CSI) project to analyze data from primary sources on the population's well-being for 2014 and 2019 based on data availability. The main goal is to provide analysis that goes beyond economic performance measurements. Human development implies the expansion of capabilities in which people can live a long healthy life, have access to education, and enjoy a decent standard of living. This report shows that while economic performance is necessary to enhance well-being, it is not sufficient. Disparities exposed by the metrics presented in this report need to be addressed in the short term to secure a better future place for all Utahns.

This report is accompanied by a dashboard published on the CSI web page. Some visualizations make it easier to compare all the variables considered between 2014 and 2019 and between counties. Furthermore, the HDI and IHDI are calculated for all states to compare Utah with the rest of the country.

2. Development Indexes

Although this report focuses on Utah and its counties, this section uses each index to show how the United States compares with other countries. Indeed, the United States occupies high positions in the different rankings presented. However, the UNDP indexes show that the high economic performance of the United States does not always translate into an equally high level of well-being of the population. Subsequent sections show how Utah and its counties perform in terms of the same well-being indicators.

2a. Human Development Index

GDP has been questioned as an indicator of well-being and economic progress since the 1970s. The GDP measures the market value of products and services, and it has been essential in guiding public policy. As measurement has been criticized for not including nonmarket transactions, that could give a better assessment of social progress (Van den Berg, 2009). The main complaints focus on production activities' impact on the environment and quality of life. However, it is still considered valid as

the metric by which countries measure their economic performance. The 2008 recession renewed the need to have a multidimensional variable to measure well-being and economic progress and not only the production of goods and services. In recent decades, international databases not only include real GDP per capita to compare countries according to their economic progress but opted to expand to variables that can portray how countries are progressing in social and economic terms.

The HDI ranking data has been available since 1990. It was preceded by the Index of Sustainable Economic Welfare (ISEW) (Daly & Cobb, 1989). It was followed by the Genuine Progress Indicator (GPI) in 1995 (Cobb et al., 1995), the Quality-of-Life Indicator (QLI) in 2005, the Happy Planet Index (HPI) in 2006 (Marks et al., 2006), the OECD Better Life Index (BTI) in 2011 (OECD, 2011), Human Well-Being Index (HWBI) in 2017 (Summers et al., 2017), and the Human Life Indicator (HLI) in 2018 (Ghishlandi et al., 2019) among the well-known indexes. The relative abundance of alternative indicators has not meant a displacement of GDP as the metric of economic welfare. There is a debate on an ideal measurement based on economic development theory because of methodological issues and the costs and benefits of moving away from GDP as the variable that monitors economic performance (Fleurbaey, 2009; Felice, 2016). These efforts meant a turn to the study of the well-being of a country, to reduce the weight of the GDP per capita in the analysis and include variables that measure the population's well-being, access to health and education, the deterioration of the environment, income inequality, and gender equality, among others (Rezek et al., 2011; Bleys, 2012; Ravallion, 2012; Szigeti et al., 2013).

In recent decades, the measurement of countries' economic progress is no longer based on GDP per capita. The analysis is complemented with other indicators that account for economic development. Among these indicators is the HDI, which has become widely recognized as a yardstick for examining global development and guiding a series of policies to reorient objectives and actions (Stanton, 2007). Its popularity as an indicator comes from the fact of its simplicity. However, it does not come without criticism for its problems with methodology, weights, variable selection, and theoretical property, among others (Srinivasan, 1994; Felice, 2006; Kovacevic, 2009; Salas-Bourgoin, 2014; Bilbao-Ubillos, 2013; Nayak, 2013; Ghishlandi et al., 2019).

The HDI was conceived based on Amartya Sen's capabilities approach while Ul Haq put the theory to practice at the UNDP (Ul Haq, 2003). The framework of capabilities as a source of human development suggests that people deserve to live in a society where the conditions for a long healthy life exist, have access to knowledge through education, and access a decent living standard. This framework also includes other variables such as the right to happiness, democracy, and freedom of expression. Including all the proposed variables in the capability's framework would be complex and hard to analyze since an indicator with all the properties to reflect human

development was sought. Hence, the health and education variables were chosen as the primary ones in constructing the composite index. The income variable is also included, since as already indicated above, income growth is necessary, but it is not a sufficient condition. In this sense, income becomes a variable that serves as a medium to achieve health and education goals. The capabilities framework is translated into the HDI as an indicator of human development potential, reflecting the individual's freedom of choice.

The HDI is a composite index that weighs quantitative information on the ability of the individuals to satisfy their basic needs, access to education, and access to a decent standard of living. The satisfaction of basic needs is approximated by the life expectancy at birth. Access to education is represented by two variables, the expected years of schooling (EYS) and the average years of schooling (AYS). The proxy of access to a decent standard of living is represented by the average per capita income in dollars transformed in logarithms. Each dimension is calculated according to the UNDP (2010) methodology; each variable has a goalpost defined by the UNDP (Appendix 1)[1].

$$Dimension\ index = \frac{Actual\ value - minimum\ value}{Maximum\ value - minimum\ value}$$

For instance, to calculate the health index, the actual value of life expectancy is discounted by the minimum goalpost of life expectancy estimated by the UNDP and divided by the difference between the maximum and minimum goalposts. Thus, improvements in the HDI can be understood as reducing the gap between the actual value and the goalposts. After comparing with goalposts, an index is obtained for each dimension: health, education, and income indexes. The education index is calculated as the geometrical measure of EYS and AYS. The HDI is estimated by taking the geometric mean of the normalized indexes for each of the three dimensions.

$$HDI = \sqrt[3]{Health * Education * Income}$$

HDI ranges from a minimum of zero to a maximum of one. The UNDP reports the HDI for 189 countries. In 2019, the United States ranked 17th for HDI and 10th for GDP per capita ($ PPP) (World Bank, 2020). Table 1 shows that high-income countries like the United States do not necessarily rank as highly for health or educational outcomes as they do for income.

[1] A detailed explanation of the methodology and the variables used in the reports can be found in Appendix 1.

Table 1. 2019 HDI and 2020 GDP Per Capita Rankings for the Top 20 Countries

Rank HDI 2019	Country	HDI 2019	IHDI 2019	Life expectancy at birth (years)	EYS (years)	AYS (years)	GNI ($PPP)	Rank GDP percapita (World Bank) 2020
1	Norway	0.957	0.899	82.4	18.1	12.9	66,494	12
2	Ireland	0.955	0.885	82.3	18.7	12.7	68,371	3
2	Switzerland	0.955	0.889	83.8	16.3	13.4	69,394	7
4	Hong Kong, China (SAR)	0.949	0.824	84.9	16.9	12.3	62,985	14
4	Iceland	0.949	0.894	83.0	19.1	12.8	54,682	17
6	Germany	0.947	0.869	81.3	17.0	14.2	55,314	20
7	Sweden	0.945	0.882	82.8	19.5	12.5	54,508	19
8	Australia	0.944	0.867	83.4	22.0	12.7	48,085	21
8	Netherlands	0.944	0.878	82.3	18.5	12.4	57,707	15
10	Denmark	0.940	0.883	80.9	18.9	12.6	58,662	13
11	Finland	0.938	0.888	81.9	19.4	12.8	48,511	24
11	Singapore	0.938	0.813	83.6	16.4	11.6	88,155	2
13	United Kingdom	0.932	0.856	81.3	17.5	13.2	46,071	28
14	Belgium	0.931	0.859	81.6	19.8	12.1	52,085	22
14	New Zealand	0.931	0.859	82.3	18.8	12.8	40,799	29
16	Canada	0.929	0.848	82.4	16.2	13.4	48,527	25
17	United States	0.926	0.808	78.9	16.3	13.4	63,826	10
18	Austria	0.922	0.857	81.5	16.1	12.5	56,197	18
19	Israel	0.919	0.814	83.0	16.2	13.0	40,187	34
19	Japan	0.919	0.843	84.6	15.2	12.9	42,932	33

Source: UNDP (2021), Human Development Report 2020 and Word Bank (2021) World Development Indicators

Table 1 presents each of the indicators that compose the HDI for the top twenty countries. The United States has the lowest life expectancy of the twenty; its value is the same as Lebanon (ranking 92) and the Maldives (ranking 95). The United States ranks higher on the education metric, with values comparable to developed countries such as Switzerland (ranking 2) or Canada (16). The income component is also the main driver of the United States' high HDI; the country's per capita income is one of the highest in the group of twenty countries, trailing only Singapore, Switzerland, Ireland, and Norway. Although the HDI for the United States is dragged down by a low life expectancy for a developed country, the education and income components counter this effect. Table 1 also shows that only Singapore and the United States have a higher ranking for GDP per capita (last column) than for the HDI. This suggests that comparing countries according to variables besides income can show a more complete story. The idea of a higher income meaning higher economic progress does not hold for Singapore and the United States.

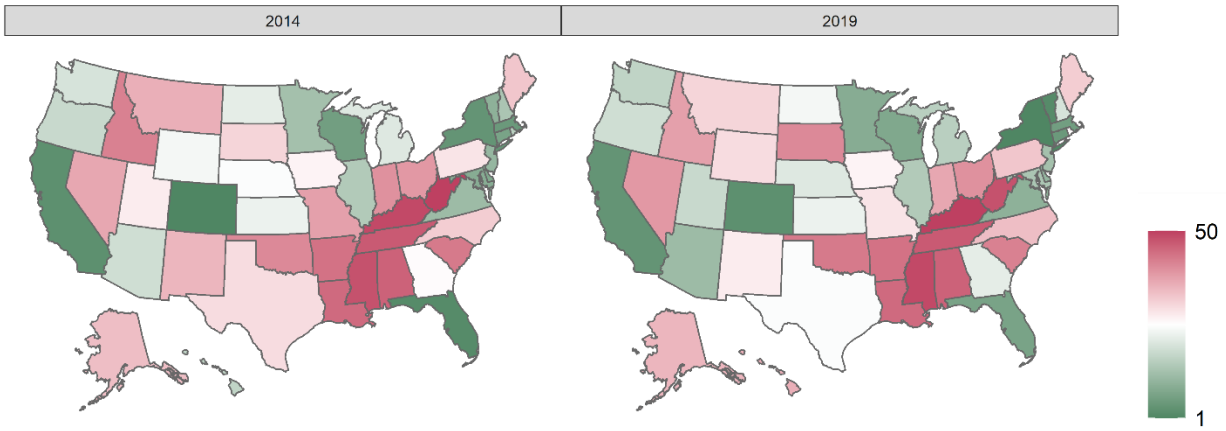
2b. Inequality-adjusted Human Development Index

In 2010, the UNDP introduced several indexes to extend the HDI. One of those indexes was the Inequality-adjusted HDI (IHDI) (Klugman et al., 2011). Since the HDI measures

national averages, it masks the distribution across the population for each of the dimensions. If there were no inequality, the IHDI and the HDI would be the same. However, inequality causes the value of the index to adjust downward. For this reason, the HDI is regarded as an index of *potential* human development compared to the IHDI, which measures *actual* human development. The difference between the two indexes is the loss of human development potential due to the unequal distribution between and within each of the HDI's three dimensions (UNDP, 2010). The UNDP adjusts the HDI using Atkinson's (1970) measure of inequality, which is based on a ratio of generalized means. The 2019 IHDI ranking places the United States in position 28 (UNDP, 2021)—a slide of 11 places from its HDI ranking of 17; this is mainly explained by the gap generated by income inequality which is larger than that of the other two dimensions (Table 1).

The HDI at the state level is published elsewhere (in 2014, Utah ranked 21st for its HDI, and in 2019 it ranked 15th), but the calculation of the IHDI at the state level did not exist. This report presents the IHDI for all states and Utah counties for 2014 and 2019. Figure 1 shows the ranking for each of the 50 states in 2014 and 2019. In 2014, Utah ranked 28th for its IHDI. By 2019 it had jumped to 18th place, making it the state with the most significant improvement (the next largest was Missouri which improved nine spots).

Figure 1. IHDI by State in 2014 and 2019



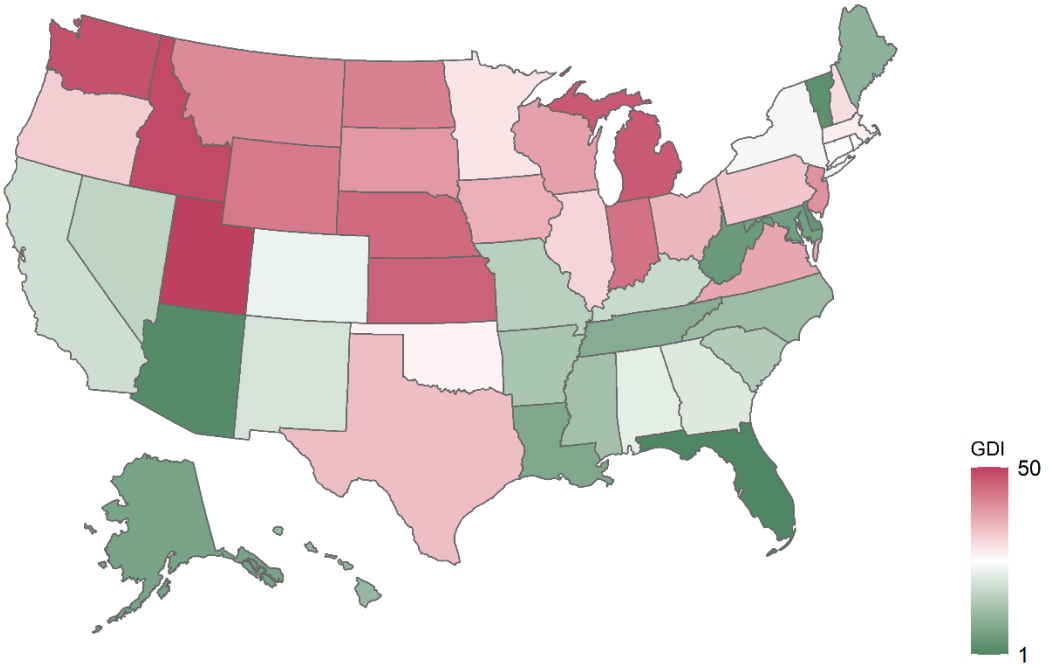
Source: Authors' calculations

2c. Gender Development Index

The UNDP introduced the Gender Development Index (GDI) in its 2010 report (UNDP, 2010). The GDI incorporates the differences in the HDI between genders by calculating the ratio of each dimension for females divided by males. One key difference between the GDI and the previous indexes is that GDI can take a value greater than one since countries or regions can have a higher HDI for females than males. It was the case for Uruguay and Estonia in 2019 (UNDP, 2021). The United States ranked 17th for GDI in

2019; thus, there is no difference between the HDI and the GDI rankings when compared with other countries. Our report extends the GDI to Utah's state and county levels, and Figure 2 presents these results for 2019. Unlike the United States, which performs equally well for both the HDI and GDI, accounting for gender causes Utah to fall from its HDI ranking of 15th to a last-place ranking of 50th for GDI in 2019. Although the index improved from 0.954 in 2014 to 0.960 in 2019, it was not enough to climb positions in the ranking, and Utah also ranked 50th for GDI in 2014. These results confirm what other studies, such as the Utah Women & Leadership Project, have found about gender inequality in Utah. For instance, WalletHub's Best & Worst State for Women's equality shows Utah as the lowest ranking in education and health. The following sections will look at the GDI results in greater depth to explain these differences for Utah counties.

Figure 2. GDI by State in 2019



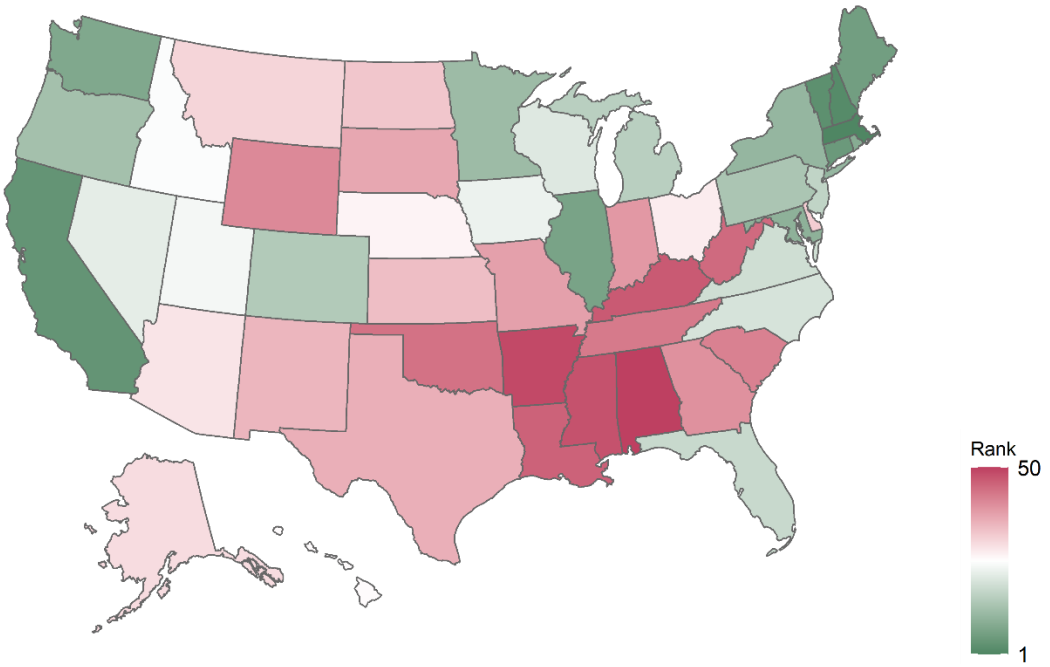
Source: Authors' calculations

2d. Gender Inequality Index

The UNDP also calculates the Gender Inequality Index (GII). This index differs from the previous indexes in the different data sources it uses. The possibility of a long and healthy life is represented by the maternal mortality rate and the adolescent (15-19 years) birth rate. The empowerment dimension has two indicators: the number of women in legislative seats and the population with at least a secondary education, differentiated between females and males. The labor market dimension is measured by

labor force participation, also differentiated between females and males. These dimensions are combined to constitute a composite index that measures the inequality in each of the three dimensions (UNDP, 2010). The UNDP calculation places the United States in 46th position out of 189 countries. This score puts the United States behind countries with lower GDP per capita, such as Slovenia or the United Kingdom. Figure 3 presents the GII for all states and Utah counties for 2019. The 2014 value is not calculated due to data availability. Utah fares much better in the GII than it does in the GDI, ranking 24th out of 50. As it will be discussed in the following sections, educational and health access can be considered two factors that have favored a better position in the ranking. In contrast, labor participation and the number of representatives in congress have pulled the score down.

Figure 3. GII by State in 2019



Source: Authors' calculations

3. Human Development Index for Utah and Utah Counties

The present and following sections show the results for Utah at the county level for the HDI, IHDI, and GDI for 2014 and 2019. The construction of the indexes for Utah counties follows the UNDP methodology; however, there are adjustments in the goalposts considering the regional scope of the study. See Appendix 1 for an explanation of those adjustments.

Table 2 summarizes the HDI, IHDI, and GDI indexes for 2014 and 2019. As explained in Appendix 1, this report analyzes only 27 counties, excluding Piute and Daggett, due to their small populations. Table 2 is divided according to the Utah Department of Health county status: urban, rural, and frontier to offer additional disaggregation results[2]. The first row shows the indexes for Utah as a state, estimated from the database created for the fifty states.

Table 2. Summary Ranking Indexes for Utah Counties 2019 and 2014

	2019						2014					
	HDI	Rank	IHDI	Rank	GDI	Rank	HDI	Rank	IHDI	Rank	GDI	Rank
Utah	0.861	15	0.737	18	0.960	50	0.844	21	0.723	28	0.954	50
Urban												
Cache	0.863	5	0.741	2	0.945	19	0.854	3	0.723	4	0.945	17
Davis	0.869	3	0.729	5	0.942	20	0.856	2	0.725	3	0.934	20
Salt Lake	0.859	8	0.734	3	0.969	4	0.843	7	0.728	2	0.967	6
Utah County	0.863	4	0.729	6	0.932	25	0.850	5	0.717	5	0.928	25
Weber	0.840	11	0.712	10	0.964	7	0.828	10	0.709	7	0.962	8
Rural												
Box Elder	0.838	13	0.705	11	0.946	18	0.825	12	0.687	13	0.935	19
Carbon	0.820	20	0.686	17	0.938	22	0.795	26	0.643	25	0.954	10
Iron	0.849	9	0.716	8	0.938	21	0.823	13	0.694	8	0.947	16
Morgan	0.892	1	0.725	7	0.915	27	0.851	4	0.687	11	0.923	26
Sanpete	0.834	14	0.688	16	0.948	14	0.823	14	0.669	16	0.932	22
Sevier	0.820	21	0.699	13	0.948	15	0.804	23	0.653	21	0.929	24
Summit	0.877	2	0.733	4	0.968	5	0.862	1	0.716	6	0.952	13
Tooele	0.841	10	0.699	14	0.952	11	0.828	9	0.694	9	0.970	4
Uintah	0.816	23	0.676	21	0.932	26	0.808	19	0.665	18	0.942	18
Wasatch	0.861	6	0.715	9	0.949	13	0.840	8	0.687	12	0.952	12
Washington	0.861	7	0.750	1	0.961	8	0.843	6	0.729	1	0.948	15
Frontier												
Beaver	0.838	12	0.647	25	0.974	3	0.812	17	0.660	19	0.953	11
Duchense	0.816	24	0.675	22	0.947	17	0.808	20	0.659	20	0.934	21
Emery	0.829	16	0.663	23	0.953	10	0.795	27	0.639	26	0.930	23
Garfield	0.813	25	0.676	20	0.935	24	0.809	18	0.669	15	0.964	7
Grand	0.822	18	0.679	19	0.967	6	0.806	21	0.648	24	0.972	3
Juab	0.819	22	0.679	18	0.950	12	0.803	24	0.652	22	0.951	14
Kane	0.811	26	0.640	26	0.954	9	0.822	15	0.691	10	1.000	1
Millard	0.834	15	0.699	12	0.947	16	0.805	22	0.666	17	0.960	9
Rich	0.828	17	0.635	27	0.935	23	0.826	11	0.637	27	0.906	27
San Juan	0.806	27	0.697	15	0.998	2	0.800	25	0.684	14	0.968	5
Wayne	0.821	19	0.659	24	1.004	1	0.815	16	0.651	23	0.997	2

Source: Authors' calculations

At the county level, a first impression of the three indexes shows the highest indexes for urban areas and the lowest for frontier areas for everything except the GDI. The classifications include four counties classified as rural due to their overall population density, despite having important cities that make them more easily comparable to urban counties. This is the case for Summit (Park City), Wasatch (Heber

[2] The classification is according to population density: urban counties have more than 100 people per square mile. Rural counties have fewer than 100 but more than 6 people per square mile. Frontier counties have fewer than 6 people per square mile (Utah Department of Health, 2020)

City), Washington (Saint George), and Morgan (Morgan City). Morgan City is a particular case because it is nestled between Summit County, Salt Lake County, Davis, and Weber counties, and it benefits from the advantages of big cities nearby. Our results confirmed that the population living in urban areas (about 87 percent of the total Utah population) has better outcomes in their HDI and IHDI, but not for the GDI, for which there is no clear trend. Gender inequality is lower in several frontier countries, but this pattern is not robust enough for generalization. In terms of ranking, there is no doubt that frontier counties show the lowest indexes for HDI and IHDI, though the order changes when GDI is considered.

Utah County has one of the highest values for HDI and IHDI. The HDI ranking improved one position between 2014 and 2019 but decreased one place for IHDI. The GDI does not change, and it remains among the lowest values for the state (25th out of 27 counties). This implies that although Utah County generally shows a favorable position for both HDI and IHDI, this is not reflected in equal opportunities for women in the different metrics of these indexes.

We also classified counties by quartile to determine which had low, medium, high, and very high development indexes to picture the rankings better. Table 3 shows the changes from 2014 to 2019 at the quartile level for the HDI, IHDI, and GDI for 2014 and 2019.

Table 3. Utah Counties Classification by HDI, IHDI, and GDI Indexes

Develoment Index	HDI 2014	HDI 2019		IHDI 2014	IHDI 2019		GDI 2014	GDI 2019
Low	Emery	San Juan		Rich	Rich		Rich	Morgan
	Carbon	Kane		Emery	Kane		Morgan	**Utah**
	San Juan	Garfield		Carbon	Beaver		**Utah**	Uintah
	Juab	Duchesne		Grand	Wayne		Sevier	Garfield
	Sevier	Uintah		Wayne	Emery		Emery	Rich
	Millard	Juab		Juab	Duchesne		Sanpete	Carbon
	Grand	Sevier		Sevier	Uintah		Duchesne	Iron
Medium	Duchesne	Carbon		Duchesne	Garfield		Davis	Davis
	Uintah	Wayne		Beaver	Juab		Box Elder	Cache
	Garfield	Grand		Uintah	Grand		Uintah	Box Elder
	Beaver	Rich		Millard	Carbon		Cache	Duchesne
	Wayne	Emery		Sanpete	Sanpete		Iron	Millard
	Kane	Millard		Garfield	San Juan		Washington	Sevier
	Sanpete	Sanpete		San Juan	Tooele		Juab	Sanpete
High	Iron	Box Elder		Box Elder	Millard		Wasatch	Wasatch
	Box Elder	Beaver		Wasatch	Sevier		Summit	Juab
	Rich	Weber		Morgan	Box Elder		Beaver	Tooele
	Weber	Tooele		Kane	Weber		Carbon	Emery
	Tooele	Iron		Tooele	Wasatch		Millard	Kane
	Wasatch	Salt Lake		Iron	Iron		Weber	Washington
	Salt Lake	Washington		Weber	Morgan		Garfield	Weber
Very High	Washington	Wasatch		Summit	**Utah**		Salt Lake	Grand
	Utah	Cache		**Utah**	Davis		San Juan	Summit
	Morgan	**Utah**		Cache	Summit		Tooele	Salt Lake
	Cache	Davis		Davis	Salt Lake		Grand	Beaver
	Davis	Summit		Salt Lake	Cache		Wayne	San Juan
	Summit	Morgan		Washington	Washington		Kane	Wayne

Source: Authors' calculations

Table 3 shows, for instance, that Emery County had the lowest HDI value in 2014, while Summit County had the highest value in the same year. In general, urban areas (including the four rural counties mentioned above) have high and very high HDI values for both years. Wasatch and Salt Lake counties are on the border between the high and very high development quartiles. A closer look at HDI shows that several rural and frontier counties move from low to medium or vice versa between both years. This is the case for Carbon County, which had the second-lowest score for HDI in 2014, but in 2019 improved the index to move into the medium development category. Other counties, such as Kane, were classified as medium development in 2014 before falling in 2019 to the second-lowest score. Most rural and frontier counties did not see significant improvements for the HDI between both years. Similarly, urban areas see variances in their scores but maintain their rankings in the high or very high quartiles.

The second group of indexes is the IHDI for 2014 and 2019. Table 3 shows two possible comparisons: first, changes between the HDI and IHDI, and second, differences in the IHDI between years. The adjustment for inequality modifies the index due to inequality within the dimension distribution, so it is expected that the IHDI will be lower than the HDI for all counties. However, less equal counties experience more significant losses due to inequality than more equal counties. For example, Salt Lake County actually improved from the high quartile for HDI to the very high quartile for its IHDI, while Rich County fell from the high category for HDI to the very lowest IHDI value in 2014.

Among the most noteworthy between-year changes is Kane County, which had a high IHDI in 2014 before falling to the lowest quartile in 2019. These substantial changes did not occur in urban counties that tended to maintain their positions or improve (Washington County). Utah County remained in the same place after the adjustment in 2014. Similar advances in positions happened in 2019 when comparing HDI and IHDI; counties in the high or very high categories remain mainly in the same groups. Among the exceptions, Beaver's HDI was in the high group in 2019, but after adjusting for inequality, it moved to the third-lowest in the low category. Utah County stepped down two positions after the adjustment for inequality but remained in the very high category for 2019. The IHDI for 2014 and 2019 has one distinctive aspect; all counties in the very high group in 2014 remained in the same category in 2019. Some counties, like Utah County, which lost one place in 2019, changed positions, but overall, there were more interchanges between counties in the low and medium categories. Table 3 gives additional evidence that rural and frontier counties tended to remain in the low and medium groups for both years.

Trends in the GDI between groups and years are far less pronounced than they were with the HDI and IHDI. The last two columns of Table 3 show that Utah County and Morgan County are in the lowest quartile for GDI despite being in the highest quartile for HDI and IHDI. On the flip side, Kane County and Wayne County are in the highest quartile for GDI but in the low and medium quartiles for HDI and IHDI. Not all counties followed this pattern; counties such as Wasatch, Summit, and Salt Lake have a GDI consistent with the values of HDI and IHDI. Another group of counties with medium quartile values for their HDI or IHDI managed to have a GDI within the medium or high quartiles. One possible interpretation is that the well-being conditions in rural or frontier counties are so low that differences between genders are not substantial. Hence, the more urban the area, the more significant the difference between genders. The following sections show that these discrepancies result from differences between the health, education, and income components of each index.

Table 4 shows a breakdown of the HDI into its three components: life expectancy, education (average and expected years of school), income (constant

personal income, 2019 dollars) for 2014 and 2019. Statewide, life expectancy is 80.2 years for 2019. The statewide value for expected years of schooling is 17 years, and the value for average years of schooling is 13.8 years. After normalizing each value, the value of education as an index is the geometric square root of these two metrics. The personal income at the state level is $30,801 constant 2019 dollars. All metrics are compared with goalposts which result in the health, education, and income indexes presented in Table 4. The indexes are normalized, and the cube root of the three components creates the HDI[3].

[3] The performance of the state of Utah compared with other states will be analyzed in a final section since the focus of this report is the Utah counties.

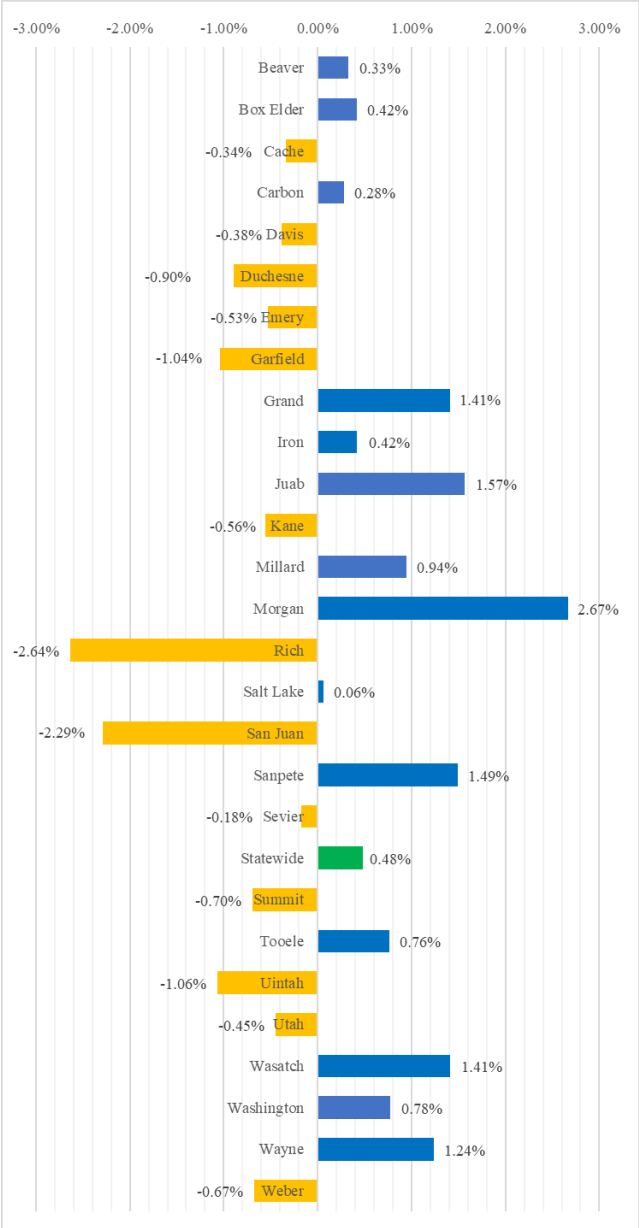
Table 4. HDI and Its Components by County in 2014 and 2019

State and County	2019					2014				
	HDI	Life Expectancy	Expected years of schooling	Average years of schooling	Personal Income (2019 dollars)	HDI	Life Expectancy	Expected years of schooling	Average years of schooling	Personal Income (2019 dollars)
Utah	0.861	80.20	17.01	13.80	30,801	0.844	79.81	16.89	13.63	23,918
Urban										
Cache	0.863	81.46	17.76	14.04	23,906	0.854	81.73	17.95	13.96	19,605
Davis	0.869	80.60	16.63	14.11	34,554	0.856	80.91	16.35	14.00	27,901
Salt Lake	0.859	79.56	16.79	13.75	32,867	0.843	79.51	16.64	13.56	25,487
Utah County	0.863	80.42	17.64	14.24	26,084	0.850	80.78	17.70	14.07	20,020
Weber	0.840	78.16	16.21	13.28	31,248	0.828	78.69	16.14	13.17	24,239
Rural										
Box Elder	0.838	78.84	15.63	13.43	30,295	0.825	78.51	15.62	13.26	24,790
Carbon	0.820	74.86	16.94	13.29	25,497	0.795	74.65	16.20	12.92	19,408
Iron	0.849	78.92	17.70	13.73	24,493	0.823	78.59	17.15	13.62	17,367
Morgan	0.892	80.13	19.04	14.31	37,091	0.851	78.04	16.74	14.02	31,237
Sanpete	0.834	80.11	17.20	13.19	19,986	0.823	78.93	17.68	13.24	16,602
Sevier	0.820	77.09	15.87	13.19	25,084	0.804	77.23	15.69	13.10	19,051
Summit	0.877	78.70	16.79	14.68	42,507	0.862	79.25	16.33	14.37	34,294
Tooele	0.841	78.41	15.35	13.45	35,164	0.828	77.82	15.64	13.20	28,667
Uintah	0.816	76.78	15.75	12.77	26,723	0.808	77.61	14.83	12.94	24,019
Wasatch	0.861	79.95	16.00	14.06	35,491	0.840	78.83	15.95	13.83	27,659
Washington	0.861	81.94	16.84	13.68	27,392	0.843	81.30	16.96	13.56	20,681
Frontier										
Beaver	0.838	78.24	16.26	13.16	30,436	0.812	77.99	15.26	13.11	22,181
Duchesne	0.816	76.12	15.19	12.89	30,440	0.808	76.81	14.65	12.89	26,956
Emery	0.829	76.34	16.40	13.27	29,209	0.795	76.74	14.28	12.88	22,161
Garfield	0.813	77.44	15.03	13.47	23,253	0.809	78.25	15.62	13.36	18,226
Grand	0.822	79.00	14.10	13.62	27,170	0.806	77.90	14.32	13.38	22,195
Juab	0.819	77.67	15.37	13.02	26,464	0.803	76.47	15.86	13.01	19,658
Kane	0.811	77.67	13.90	13.78	24,877	0.822	78.10	15.25	13.62	24,017
Millard	0.834	79.33	15.94	13.04	27,383	0.805	78.59	14.72	12.82	21,296
Rich	0.828	79.91	14.46	13.53	26,997	0.826	82.07	15.73	13.21	18,368
San Juan	0.806	76.64	15.85	12.59	22,504	0.800	78.44	15.82	12.47	17,471
Wayne	0.821	77.86	16.08	13.33	22,381	0.815	76.91	16.61	13.90	17,895

Source: Authors' calculations

The three dimensions observed in Table 4 help to better explain the HDI value. At the county level, there were no significant changes when compared with 2014 for health and education. In contrast, most counties had substantial increases in personal income, even after adjusting for inflation. However, frontier counties showed lower life expectancy, education, and income values in both years than other areas. For instance, in both 2014 and 2019, there is a difference of five years of life expectancy between Duchesne and Cache counties. When looking at the numbers from the top-down, changes from 2014 to 2019 were less favorable for frontier counties. In other words, the well-being conditions of this population have not improved compared to urban areas. In Utah County, life expectancy, expected and average years of education

are above the statewide level, but personal income was below the statewide average in both years.



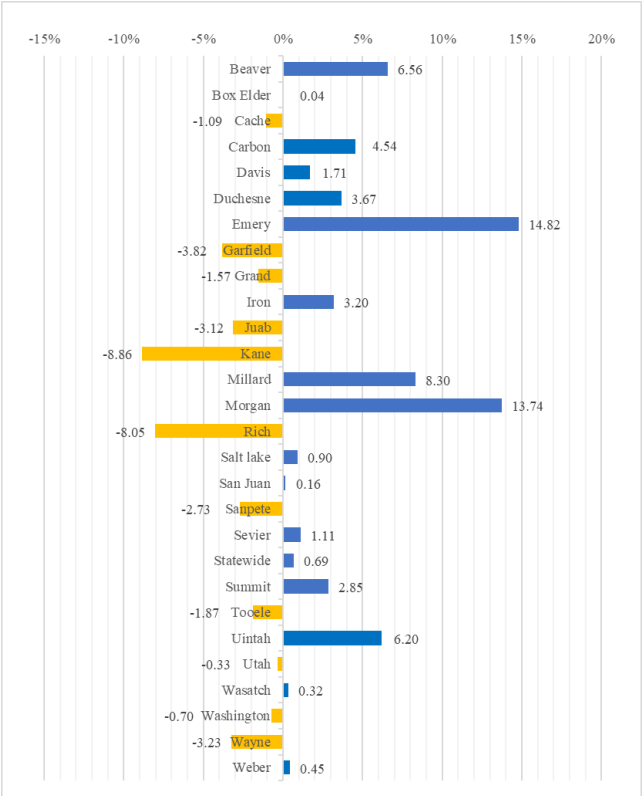
Figures 4-7 show changes between 2014 and 2019 for each of the dimensions. For life expectancy (Figure 4), the positive or negative percentage change is below two percent in most cases; the percentage change statewide was less than 0.5%. However, there are some cases worth mentioning. Declines in life expectancy were equally likely to occur in urban, rural, or frontier counties. These declines were less surprising for rural or frontier counties that usually lack access to health services in remote areas, but very surprising for several urban areas (Utah County decreased by -0.5%, Davis County by -0.4%, and Cache County by -0.3%). Morgan County shows the most significant increase of 2.7%, followed by Juab County (1.6%), Grand County (1.4%), and Sanpete County (1.5%). Rich County (-2.6%) and San Juan County (-2.3%), both frontier counties, have the steepest decreases.

Figures 5 and 6 show the percentages changes in average years of schooling and expected years of schooling, respectively. There are small increases for average years of education for most counties, and the declines occurred only in rural and frontier counties. Statewide, there was an increase of 1.2% between 2014 and 2019. In contrast, Wayne County showed a steep decline (4.11%) when compared with other counties. Interestingly, the changes in average years of schooling do not seem to correspond with the changes in expected years of schooling shown in Figure 6.

Source: Authors' calculations

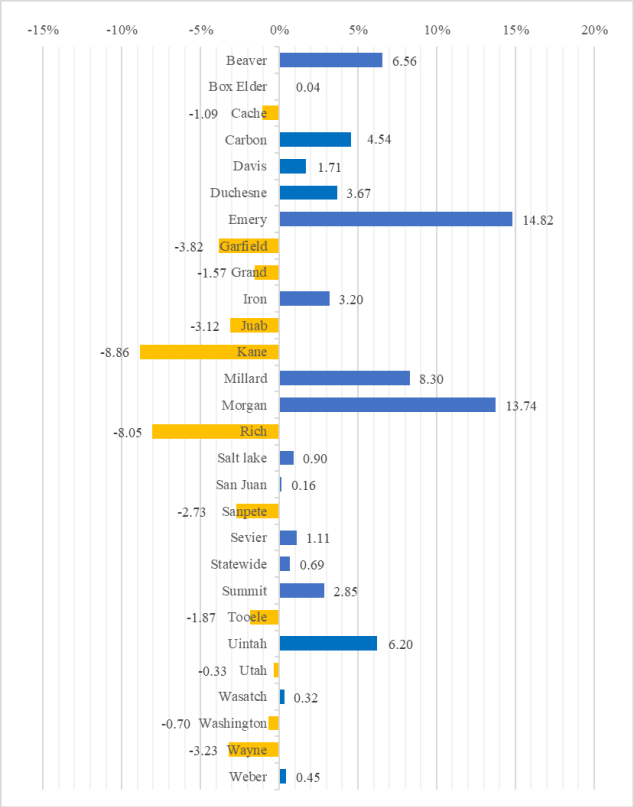
Statewide, the expected years of schooling increased only 0.7%, but some counties saw significant positive changes. This was the case for Morgan (13.7%), a moderately urban county, and Emery (14.8%), a frontier county. Both counties also showed a positive change for average years of schooling; however, the gains in each case were smaller than 3%. In both counties, the high expected schooling years did not translate into a high average of schooling. Another outlier case is Uintah County, which increased its expected years of schooling by 6.2% despite decreasing its average years of schooling by 1.3%. Some counties with negative changes to their expected years of schooling (Cache, Garfield, Grand, Juab, Iron, Kane, Rich, Tooele, and Utah counties) showed positive changes in the average years of schooling metrics. In other words, these counties overcame the adverse prospect and showed a positive outcome for education.

Figure 5. Average Years of Schooling Percent Change between 2014 and 2019



Source: Authors' calculations

Figure 6. Expected Years of Schooling Percent Change between 2014 and 2019

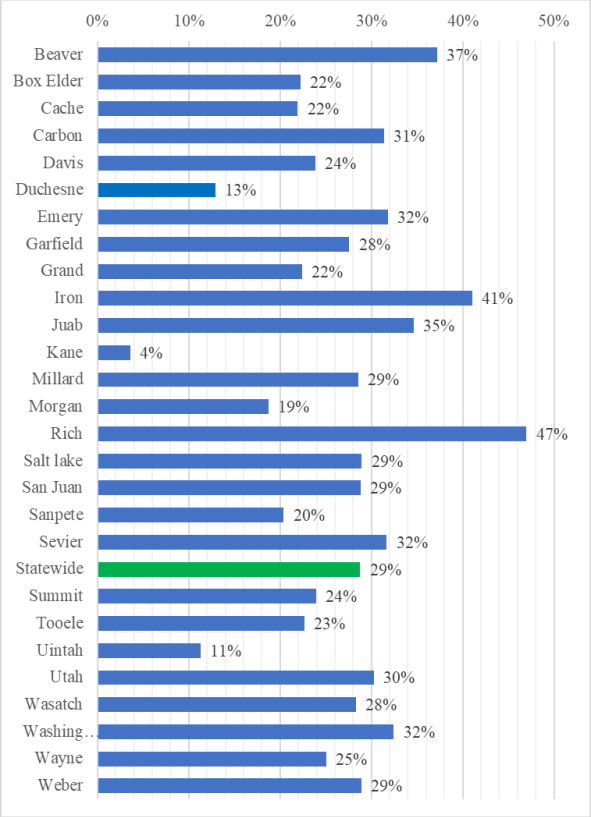


Source: Authors' calculations

Figure 7 shows changes in personal income (2019 constant dollars) between 2014 and 2019. All changes were positive, ranging from a 4% increase in Kane County to a 47% increase in Rich County. Urban counties had a percentage increase in income close to the statewide value (29%), while changes between the two years varied in rural and frontier counties. This significant increase in income was

substantial for some counties, enabling them to achieve higher rankings.

Figure 7. Personal Income Percent Change between 2014 and 2019



Source: Authors' calculations

Another way to see changes between 2014 and 2019 is by considering the ordinal ranking of each index. Table 5 shows changes in the rankings by quartiles, revealing differences between counties with high and low HDIs. Counties in the lowest quartile show the most remarkable decreases in their HDI rankings; of the seven low-HDI counties, only Juab and Sevier move up at all, and they both gain only two places. These declines in rankings are driven primarily by the health and income indexes. There are also drops in the rankings for counties in the high and very high quartiles; however, these declines are small losses of only one or two positions. There are a few counties that show increases in all dimensions between both years: Sevier (low development), Carbon, Emery and Millard (medium development), Beaver (high development), and Wasatch and Morgan (very high development). The rankings by indicator confirm what was shown in Figures 4-7; when compared to 2014, the health index for counties in the lowest quartile shows the most significant decreases in ranking. In the highest quartile, several counties climbed positions. Summit was the exception, losing seven places in its health index. Of more significant concern are some of the negative changes in the rankings for frontier counties: both Kane and Rich counties fell eleven positions in their HDI rankings between 2014 and 2019.

For the education index, the most significant decreases in the rankings occur within the two lowest quartiles. Emery County climbed fifteen positions, and Kane County lost twelve positions. Table 5 shows that the income index changes follow the same trends as the other two indexes; the lowest quartiles show the most significant losses in the rankings, while the highest quartiles generally show advances in the positions or drops of only one or two positions. Changes in the rankings also confirm the hypothesis that the counties in the lowest quartiles do not see an increase in well-being and sometimes even experience a decline.

Table 5. Changes in the HDI ranking between 2014 and 2019

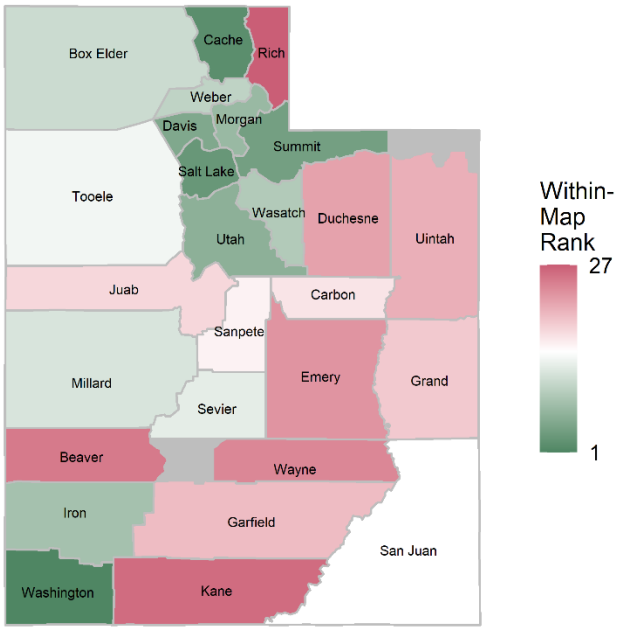
Develoment Index 2019	Counties	Health Index	Education Index	Income Index	HDI 2019
Low	San Juan	(10)	(1)	0	(2)
	Kane	(3)	(12)	(10)	(11)
	Garfield	(6)	(6)	(1)	(7)
	Duchesne	(2)	0	(2)	(4)
	Uintah	(2)	3	(6)	(4)
	Juab	6	(3)	1	2
	Sevier	0	3	1	2
Medium	Carbon	0	3	1	6
	Wayne	5	(7)	(2)	(3)
	Grand	8	(3)	(2)	3
	Rich	(7)	(8)	7	(6)
	Emery	0	15	3	11
	Millard	2	8	2	7
	Sanpete	2	(6)	0	0
High	Box Elder	0	1	(2)	(1)
	Beaver	2	6	4	5
	Weber	(7)	(1)	2	(1)
	Tooele	5	(1)	(1)	(1)
	Iron	(1)	1	4	4
	Salt Lake	(3)	3	1	(1)
	Washington	2	0	4	(1)
Very High	Wasatch	2	0	2	2
	Cache	0	(2)	(4)	(2)
	Utah	1	0	(1)	1
	Davis	1	3	(1)	(1)
	Summit	(7)	1	0	(1)
	Morgan	12	3	0	3

Source: Authors' calculations

4. Inequality-adjusted Human Development Index by Utah Counties

The HDI is a measure of the potential of a country or region to achieve the state of well-being measured by its health, education, and income indexes. Thus far, we have presented the potential human development values for Utah counties. However, the actual level of human development is influenced by inequality. If inequality exists, then there is a gap that needs to be quantified and assessed. The IHDI adjusts the HDI and shows the actual level of development after accounting for the unequal distribution in each dimension. Table 6 presents the results of the inequality-adjusted indexes for 2019, and Figure 8 presents the IHDI on a map. The map shows the same patterns observed in Table 6 but adds a visual component. The map shows that the high-ranked counties (green) tend to cluster together near urban centers, while the redder counties tend to be large, sparsely populated counties (frontier and rural). Piute and Daggett counties are marked in grey since no indexes are calculated for them.

Figure 8. IHDI by Utah Counties in 2019



Source: Authors' calculations

The first row of Table 6 shows the results at the state level. The HDI is reduced to 0.737 when the index is adjusted for inequality in each dimension, implying an overall loss in human development of 14.5% for 2019. Another indicator that shows this gap created due to inequality is the coefficient of human inequality, defined as the arithmetic mean of the three inequality measures. If the inequality in the three dimensions is similar, then the loss in the HDI and the coefficient of human inequality will be very similar; otherwise, with high differences in inequality in the three dimensions, the calculated loss will be more significant. In the case of the state of Utah, both values are alike, 14.3%, which means that the three dimensions of the HDI have similar losses. At the state level in 2019, adjusting for inequality causes Utah to fall from its HDI ranking of 15th to an IHDI ranking of 18th.

As shown in the first three columns of Table 6, the most significant losses due to inequality occur in frontier counties: 23.2% for Rich County and 22.8% for Beaver County. These values are much higher than the statewide loss due to inequality (14.5%). In contrast, urban counties show the lowest overall loss. Utah County has an overall loss of 15.6%. As can be seen, the IHDI values are lower than HDI in all cases since there is an adjustment due to inequality. However, when the HDI ranking is compared with the IHDI ranking, some counties improved their position with the IHDI, it does not mean that the IHDI value is higher than HDI, but the ranking position improved. For instance, San Juan County gained twelve places. In contrast, Beaver County lost thirteen positions and Rich County ten positions.

A closer look at the three dimensions shows that the most significant losses at the county level are in the health and, to some extent, in income. Table 6 shows the values of each adjusted dimension and the loss calculated when the inequality in the dimension distribution is considered. For the state of Utah in 2019, the most significant loss occurs in life expectancy (21.4%) when compared to the education index (12.3%) or income (9.2%). The loss in life expectancy is also reflected in the different counties. In most cases, urban counties have percentage losses higher than the state value. Some rural and frontier counties show percentages below the state value, such as San Juan County (18.3%) or Millard County (19.0%). This finding is surprising since urban counties tend to have greater access to health services than rural or frontier counties.

Table 6. Inequality-adjusted Human Development Index

State and County	HDI 2019	Inequality-adjusted HDI			Coefficient of Human Inequality (%)	Inequality-adjusted health index	Loss in Life Expectancy (%)	Inequality-adjusted education index	Loss in Education (%)	Inequality-adjusted income index	Loss in Income (%)	IHDI 2014
		2019	Overall loss (%)	Difference with HDI rank								
Utah	0.861	0.737	14.45	-3	14.29	0.728	21.38	0.729	12.31	0.753	9.20	0.723
Urban												
Cache	0.863	0.741	14.08	3	13.91	0.744	21.30	0.768	10.33	0.713	10.11	0.723
Davis	0.869	0.729	16.02	-2	15.90	0.726	22.16	0.729	12.20	0.733	13.33	0.725
Salt Lake	0.859	0.734	14.52	5	14.37	0.721	21.31	0.724	12.11	0.758	9.68	0.728
Utah County	0.863	0.729	15.63	-2	15.50	0.725	22.06	0.751	12.66	0.711	11.78	0.717
Weber	0.840	0.712	15.23	1	15.07	0.697	22.05	0.691	13.13	0.748	10.03	0.709
Rural												
Box Elder	0.838	0.705	15.86	2	15.74	0.706	22.02	0.688	12.45	0.722	12.75	0.687
Carbon	0.820	0.686	16.38	3	16.28	0.659	21.93	0.716	12.05	0.683	14.87	0.643
Iron	0.849	0.716	15.61	1	15.48	0.709	21.80	0.745	12.00	0.696	12.66	0.694
Morgan	0.892	0.725	18.75	-6	18.56	0.729	21.20	0.800	10.81	0.654	23.67	0.687
Sanpete	0.834	0.688	17.53	-2	17.46	0.732	20.85	0.713	12.85	0.624	18.68	0.669
Sevier	0.820	0.699	14.73	8	14.54	0.683	22.29	0.712	9.29	0.703	12.05	0.653
Summit	0.877	0.733	16.40	-2	16.28	0.718	20.45	0.765	10.16	0.716	18.24	0.716
Tooele	0.841	0.699	16.86	-4	16.76	0.703	21.82	0.689	11.64	0.706	16.82	0.694
Uintah	0.816	0.676	17.20	2	17.10	0.687	21.41	0.680	11.56	0.661	18.33	0.665
Wasatch	0.861	0.715	16.90	-3	16.78	0.712	22.82	0.711	12.59	0.723	14.93	0.687
Washington	0.861	0.750	12.87	6	12.76	0.773	18.91	0.738	10.38	0.740	8.99	0.729
Frontier												
Beaver	0.838	0.647	22.80	-13	22.38	0.703	21.52	0.690	13.01	0.558	32.61	0.660
Duchesne	0.816	0.675	17.18	2	17.08	0.688	20.37	0.672	11.48	0.667	19.40	0.659
Emery	0.829	0.663	20.03	-7	19.81	0.683	21.18	0.705	11.90	0.605	26.35	0.639
Garfield	0.813	0.676	16.85	5	16.79	0.707	19.97	0.677	12.30	0.646	18.10	0.669
Grand	0.822	0.679	17.33	-1	17.28	0.727	19.96	0.655	13.07	0.659	18.81	0.648
Juab	0.819	0.679	17.08	4	16.97	0.686	22.64	0.672	12.34	0.679	15.93	0.652
Kane	0.811	0.640	21.13	0	20.83	0.689	22.37	0.666	11.56	0.571	28.55	0.691
Millard	0.834	0.699	16.16	3	16.07	0.739	18.99	0.699	10.62	0.661	18.61	0.666
Rich	0.828	0.635	23.24	-10	22.60	0.720	21.92	0.677	10.89	0.527	35.00	0.637
San Juan	0.806	0.697	13.52	12	13.45	0.712	18.27	0.681	11.21	0.699	10.89	0.684
Wayne	0.840	0.712	15.23	1	15.07	0.697	22.05	0.691	13.13	0.748	10.03	0.709

Source: Authors' calculations

The loss in the education index due to inequality is more or less homogeneous across all counties. It does not show significant extremes values. It cannot be

concluded that frontier or rural counties have higher losses than in urban counties. On the other hand, loss of income after adjusting for inequality in the distribution is higher for rural and frontier counties. Losses due to inequality are most notable in terms of differences between counties. While the loss due to inequality for the income index at the state level is only 9.2%, county values do not oscillate around this value, as was the case for education. The highest values of income loss due to inequality are found in frontier counties. Rich County showed a 35% loss in 2019, the highest of all counties. Beaver County also had a loss of more than 30%. Urban counties show losses closer to the state percentage, and some of the four rural counties considered semi-urban, such as Washington County, show some of the lowest losses at 9%.

Table 7 shows changes in the IHDI ranking between 2014 and 2019. Counties are classified into quartiles according to the 2019 IHDI. The county with the lowest ranking was Rich County, which had no changes in ranking between 2014 and 2019. The highest-ranked county was Washington, which also had no change in ranking over the five years.

Table 7. Changes in the IHDI Ranking from 2014 to 2019

Develoment Index 2019	Counties	Inequality-Adjusted Health Index	Inequality-Adjusted Education Index	Inequality-Adjusted Income Index	IHDI 2019
Low	Rich	(9)	(9)	0	0
	Kane	(5)	(14)	(16)	(16)
	Beaver	(3)	5	(8)	(6)
	Wayne	2	(9)	2	(1)
	Emery	(2)	13	(2)	3
	Duchesne	(3)	0	0	(2)
	Uintah	(6)	3	(3)	(3)
Medium	Garfield	(3)	(5)	(4)	(5)
	Juab	2	(6)	5	4
	Grand	7	(1)	3	5
	Carbon	0	7	9	8
	Sanpete	6	(3)	2	0
	San Juan	(5)	1	1	(1)
	Tooele	2	1	(5)	(5)
High	Millard	3	8	2	5
	Sevier	(1)	0	14	8
	Box Elder	2	1	1	2
	Weber	(8)	(1)	0	(3)
	Wasatch	8	1	3	3
	Iron	1	1	(1)	0
	Morgan	19	2	(6)	4
Very High	**Utah**	(3)	(2)	2	(1)
	Davis	(3)	1	(1)	(2)
	Summit	(2)	6	(3)	2
	Salt Lake	(1)	2	0	(1)
	Cache	1	(1)	2	2
	Washington	1	(1)	3	0

Source: Authors' calculations

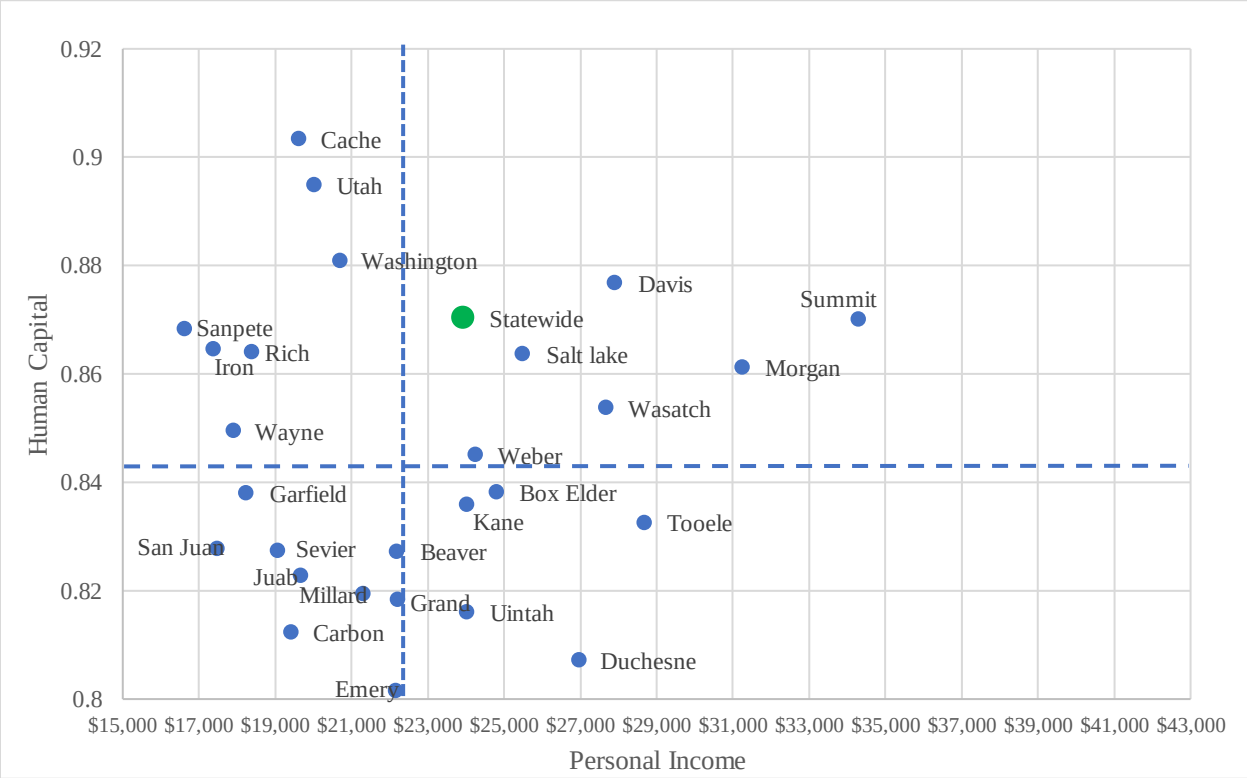
As shown in Table 7, counties in the low quartile show the most significant declines in the ranking compared to 2014. The counties in the very high quartile show small losses in 2019 (from one to three positions) and some gains. In particular, Summit climbed six places in the ranking for the inequality-adjusted education index. Likewise, it is striking that the health index is the one that shows the most significant decreases in the ranking for the counties with the lowest IHDI. Of the low-IHDI counties, only Wayne County gains two spots. Utah County remains in the very high quartile of IHDI, showing slight falls in the rankings for health, education, and overall IHDI, accompanied by a gain of two positions in the adjusted income index. Again, there is a clear difference in the ranking positions for low and very high development indexes. Low development index counties showed significant losses in their position between 2014 and 2019, while counties in very high development index showed slight

decreases or gains. There is a gap between urban and frontier-rural counties that persists when the IHDI is measured.

5. Human Capital

One of the criticisms of HDI is the high correlation between HDI and GDP per capita (Srinivasan, 1994, Szigeti et al., 2013, Kovacevic, 2010). Thus, the HDI as a measure of well-being has been questioned as a suitable alternative indicator of the GDP. However, the high correlation between both measures disappears when considering only the non-income components of HDI: health and education. This exclusion of the income index is known as human capital in economic development studies (Bloom et al., 2004; Mayer-Foulker, 2001; Thomas and Frankenberg (2002). Hence, this section shows the differences between personal income and human capital. Figures 9 and 10 show the results for 2014 and 2019, respectively. Each figure uses the median personal income and median human capital to group the counties' positions into four quadrants.

Figure 9. Human Capital and Personal Income by Utah Counties 2014

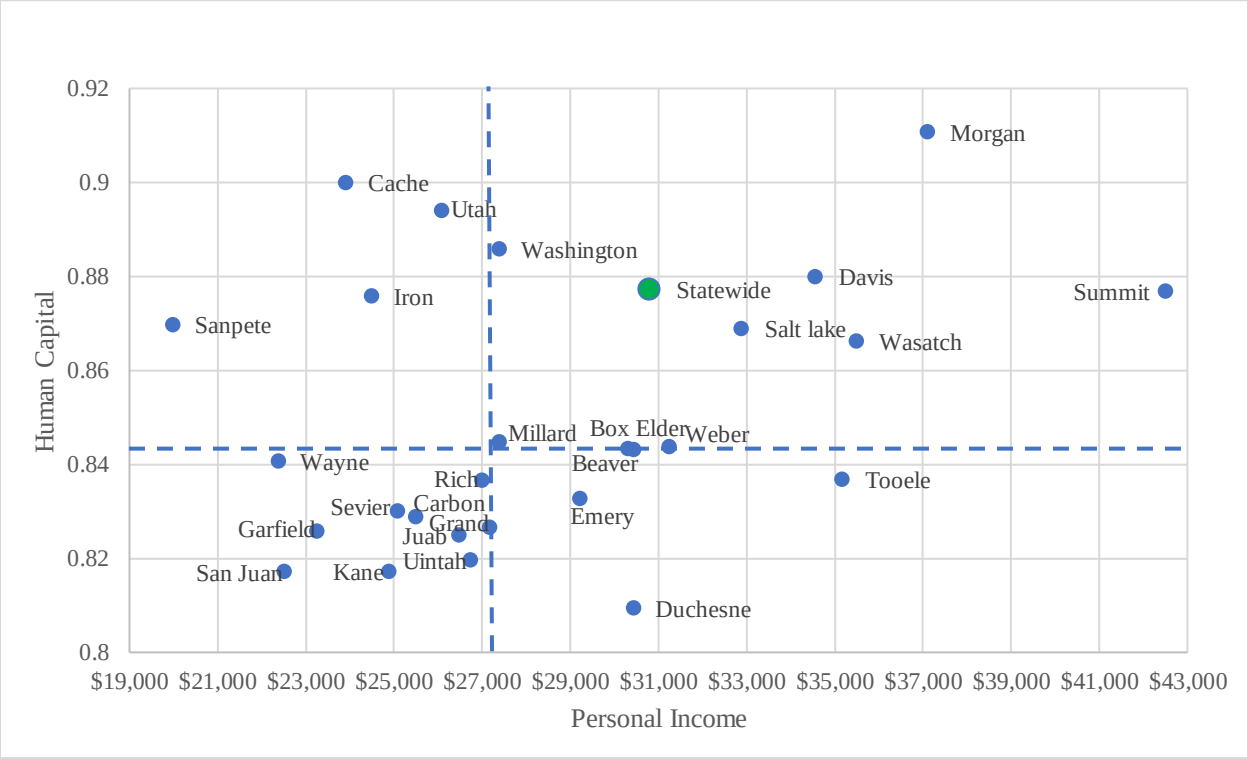


Source: Authors' calculations

The upper left quadrant represents counties with a human capital index above the median and a personal income below the median. The upper right quadrant represents counties above the median for human capital and personal income. The

lower left quadrant represents counties below the median for human capital and personal income. The last quadrant (bottom right) represents counties below the median for human capital and above the median for personal income. Counties in the upper left have achieved a level of human capital above the median with income levels than counties with higher personal income (right-most quadrants). That is the case of Utah County or other urban counties such as Cache and Washington (Washington is considered urban). It is worth noting that the upper left quadrant contains several rural and frontier counties as well. Some of them showed in previous tables and figures very low HDI or IHDI (Rich and Wayne counties). The top right quadrant shows a positive relationship between human capital and personal income. The counties in this quadrant also have the high and very high development index in Tables 2 and 7. This quadrant also contains the rest of the urban and semi-urban counties (Morgan, Summit, and Wasatch counties). The bottom right quadrant is consistent with the low and medium development index; the relationship between human capital and personal income is confirmed. Finally, the bottom right quadrant presents the counties that are most problematic for economic development. These counties have high personal income levels that are not translated into high human capital; this is generally the case for rural and frontier counties in the medium development index, as seen in tables 2 and 7.

Figure 10. Human Capital and Personal Income by Utah counties 2019

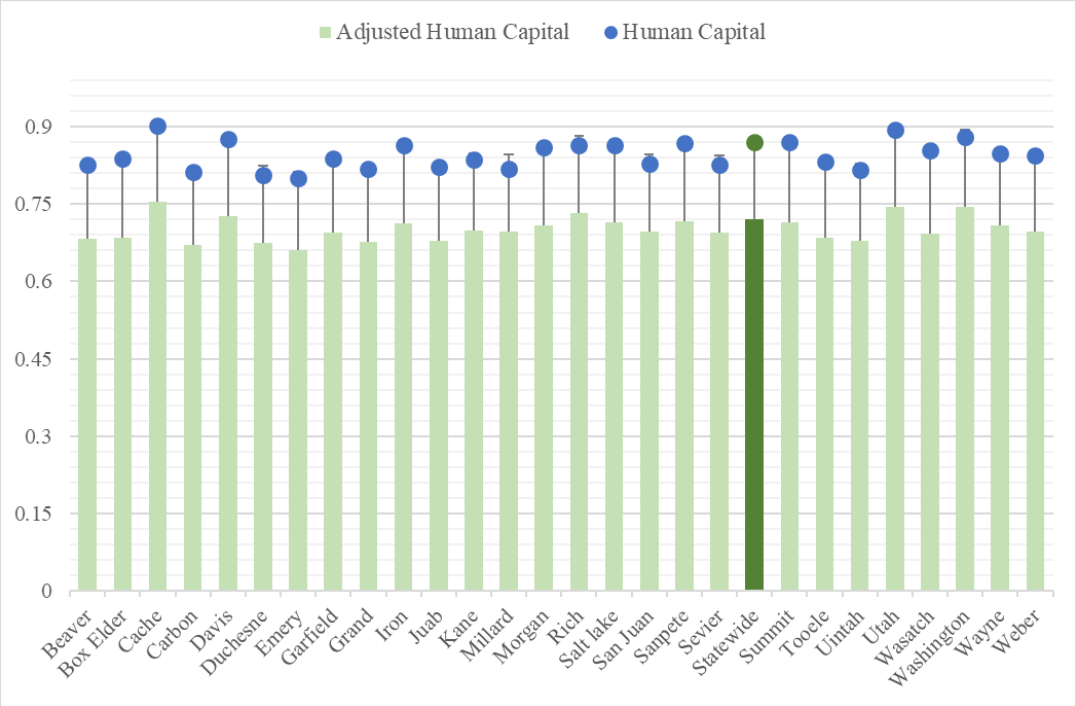


Source: Authors' calculations

A comparison of Figure 9 (2014) to Figure 10 (2019) highlights several differences. For example, there are more counties in the lower left quadrant in 2019, most of which are rural and frontier. Other counties shifted from the top left and bottom right quadrants to the top right quadrant. Also, the statewide median position (green dot) for both human capital and income increased (more for personal income than for human capital). In 2019, some counties (Millard, Box Elder, Weber, and Beaver) moved to the outer margin of the upper right quadrant. There is a wide dispersion in the top right quadrant for urban counties (we consider Morgan, Wasatch, and Washington urban). Summit County shows a distinct distance from other counties concerning personal income, while Morgan County enjoys a higher human capital than Summit County, even with lower income. These two figures seem to indicate that counties can achieve higher human capital despite a lower personal income. This is the case for Utah County, where education and health dimensions determine its very high HDI. Still, other counties, such as Morgan County, rely on all three dimensions to achieve a position among the high development counties.

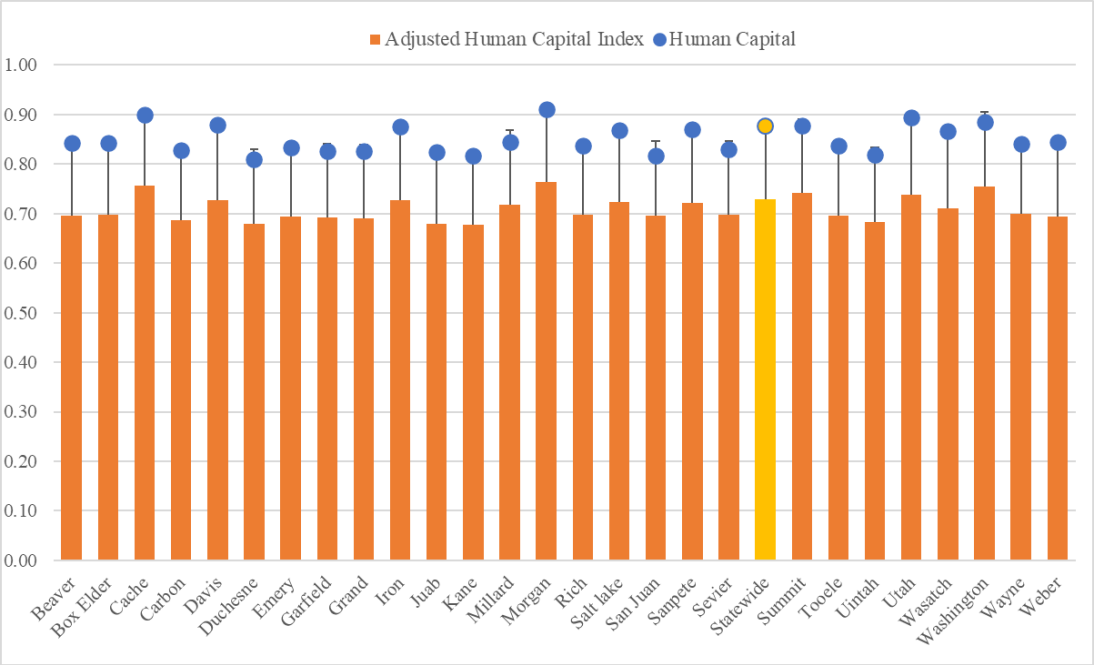
The human capital measure has also been adjusted for inequality. Figures 11 and 12 show the differences between human capital and inequality-adjusted human capital for 2014 and 2019. In 2014 there was a loss of 17% in human capital due to inequality, and in 2019 the loss was slightly smaller at 16.6%. When these results are compared with the loss suffered in the HDI, it is apparent that the loss to human capital is more significant. This result is expected due to the disproportionately large loss due to inequality in the health index (life expectancy) seen in Table 6.

Figure 11. Human Capital and Inequality-adjusted Human Capital 2014



Source: Authors' calculations

Figure 12. Human Capital and Inequality-adjusted Human Capital 2019



Source: Authors' calculations

6. HDI and IHDI by Gender

This section presents the results by gender for the HDI, its three dimensions, the IHDI, and the loss estimation due to inequality. Table 8 shows the results for 2014 sorted by the loss due to inequality. When it comes to human development, women face a double disadvantage: not only do they start with lower HDI values, but they also lose more than men due to inequality. Table 8 shows that the HDI for men shifts down after adjusting for inequality; that loss was just more significant for women in most counties. In 2014, the most significant loss for women (25%) occurred in Rich County, while the most significant loss for men (20.5%) occurred in Morgan County. The minor loss women experienced was 13% in Salt Lake County, while men's smallest loss was 11.8% in Washington County. Table 8 also shows a clear distinction between urban, rural, or frontier counties for females. The higher losses for females mainly occurred in rural and frontier counties, while losses to males are more sporadically distributed between the three categories of counties.

Table 8. HDI and IHDI by Gender: Utah Counties in 2014

	Female							Male					
Counties	Health Index	Education Index	Income Index	HDI	IHDI	Loss Due to Inequality		Counties	Health Index	Education Index	Income Index	HDI	IHDI	Loss Due to Inequality
Rich	0.908	0.793	0.648	0.775	0.581	25.01%		Morgan	0.936	0.836	0.878	0.882	0.702	20.46%
Sevier	0.858	0.779	0.691	0.773	0.588	23.92%		Rich	0.966	0.759	0.855	0.855	0.682	20.26%
Wayne	0.858	0.877	0.702	0.808	0.622	23.06%		Duchesne	0.888	0.727	0.879	0.828	0.668	19.36%
Carbon	0.843	0.787	0.714	0.780	0.601	22.93%		Summit	0.925	0.832	0.887	0.881	0.710	19.34%
Grand	0.894	0.755	0.743	0.795	0.615	22.57%		Wasatch	0.923	0.799	0.858	0.858	0.693	19.23%
Sanpete	0.878	0.830	0.686	0.794	0.617	22.30%		Tooele	0.896	0.763	0.863	0.839	0.691	17.63%
Emery	0.864	0.725	0.697	0.758	0.590	22.21%		Beaver	0.891	0.768	0.835	0.830	0.686	17.28%
Juab	0.888	0.782	0.696	0.785	0.619	21.10%		Uintah	0.890	0.751	0.862	0.832	0.691	16.93%
Millard	0.919	0.763	0.700	0.789	0.623	20.98%		Wayne	0.863	0.776	0.796	0.811	0.674	16.90%
Beaver	0.885	0.765	0.731	0.791	0.627	20.68%		Grand	0.904	0.740	0.816	0.817	0.681	16.70%
Garfield	0.879	0.793	0.711	0.791	0.630	20.36%		Emery	0.854	0.743	0.855	0.816	0.680	16.69%
Iron	0.881	0.831	0.701	0.800	0.654	18.26%		Box Elder	0.916	0.787	0.851	0.849	0.709	16.53%
Uintah	0.888	0.749	0.723	0.783	0.642	18.03%		Juab	0.872	0.777	0.829	0.825	0.691	16.29%
Cache	0.921	0.855	0.709	0.823	0.676	17.89%		Davis	0.956	0.826	0.873	0.883	0.740	16.17%
Kane	0.881	0.808	0.770	0.818	0.673	17.70%		Carbon	0.846	0.784	0.822	0.817	0.693	15.12%
Utah	0.919	0.849	0.696	0.816	0.673	17.50%		Sanpete	0.922	0.833	0.805	0.852	0.727	14.66%
Morgan	0.881	0.813	0.755	0.815	0.674	17.28%		Kane	0.887	0.757	0.815	0.818	0.700	14.45%
Box Elder	0.887	0.774	0.730	0.794	0.662	16.59%		Salt lake	0.922	0.814	0.837	0.857	0.736	14.06%
Duchesne	0.844	0.764	0.716	0.773	0.648	16.18%		Weber	0.909	0.790	0.837	0.844	0.726	13.98%
Wasatch	0.897	0.811	0.750	0.817	0.689	15.70%		Garfield	0.890	0.778	0.800	0.821	0.709	13.70%
San Juan	0.894	0.767	0.711	0.787	0.667	15.31%		Utah	0.951	0.863	0.827	0.879	0.760	13.55%
Washington	0.935	0.813	0.724	0.820	0.697	14.98%		San Juan	0.881	0.758	0.805	0.813	0.703	13.48%
Tooele	0.884	0.799	0.762	0.813	0.693	14.79%		Sevier	0.894	0.776	0.831	0.832	0.723	13.17%
Weber	0.897	0.793	0.753	0.812	0.694	14.57%		Millard	0.911	0.727	0.838	0.822	0.715	12.98%
Davis	0.918	0.816	0.749	0.825	0.709	13.97%		Iron	0.916	0.828	0.796	0.845	0.737	12.76%
Summit	0.895	0.830	0.793	0.838	0.721	13.97%		Cache	0.947	0.863	0.810	0.871	0.763	12.49%
Salt lake	0.909	0.816	0.767	0.829	0.720	13.08%		Washington	0.946	0.834	0.820	0.865	0.763	11.81%

Source: Authors' calculations

Table 8 shows that the HDI is lower for women than for men in all cases except Kane County, where the values are equal for women and men (0.818). The same is true for the IHDI except in Summit and Tooele counties, which have a slightly higher value for women. Among the three dimensions of HDI, men are furthest ahead in income. Men are also ahead in the health index in most counties, but not by much. In many counties, women have a higher education index than men. In other words, the difference in HDI between men and women is explained almost entirely by the difference in income. When human capital is calculated, the differences between men and women decrease significantly.

Table 9. HDI and IHDI by Gender: Utah Counties in 2019

	Female							Male						
Counties	Health Index	Education Index	Income Index	HDI	IHDI	Loss Due to Inequality		Counties	Health Index	Education Index	Income Index	HDI	IHDI	Loss Due to Inequality
Rich	0.912	0.756	0.759	0.806	0.625	22.42%		Beaver	0.882	0.785	0.871	0.845	0.636	24.67%
Kane	0.888	0.726	0.777	0.794	0.616	22.39%		Rich	0.953	0.772	0.870	0.862	0.665	22.85%
Beaver	0.902	0.805	0.766	0.823	0.645	21.60%		Morgan	0.919	0.922	0.914	0.918	0.713	22.32%
Wayne	0.856	0.841	0.768	0.821	0.648	21.04%		Summit	0.892	0.849	0.918	0.886	0.706	20.32%
Sanpete	0.895	0.828	0.721	0.811	0.643	20.70%		Emery	0.868	0.779	0.887	0.843	0.674	20.07%
Emery	0.839	0.827	0.748	0.804	0.643	20.01%		Kane	0.883	0.778	0.838	0.832	0.666	20.02%
Grand	0.908	0.723	0.796	0.806	0.653	18.91%		Tooele	0.910	0.784	0.889	0.859	0.697	18.94%
Millard	0.899	0.795	0.731	0.805	0.664	17.52%		Duchesne	0.860	0.753	0.888	0.831	0.676	18.70%
Juab	0.887	0.771	0.741	0.797	0.658	17.49%		Wasatch	0.921	0.822	0.901	0.880	0.716	18.67%
Iron	0.894	0.832	0.734	0.818	0.675	17.42%		Wayne	0.880	0.754	0.824	0.818	0.665	18.62%
Garfield	0.854	0.752	0.733	0.778	0.649	16.53%		Uintah	0.883	0.778	0.880	0.845	0.691	18.28%
Carbon	0.831	0.807	0.740	0.792	0.665	16.04%		Davis	0.952	0.833	0.899	0.893	0.732	18.08%
Uintah	0.873	0.759	0.737	0.788	0.662	15.96%		Garfield	0.886	0.783	0.832	0.832	0.692	16.86%
Utah	0.912	0.852	0.741	0.832	0.701	15.69%		Carbon	0.856	0.819	0.858	0.844	0.702	16.78%
Cache	0.927	0.855	0.736	0.835	0.706	15.50%		Weber	0.901	0.797	0.870	0.854	0.713	16.53%
Box Elder	0.887	0.792	0.755	0.810	0.687	15.18%		Juab	0.887	0.763	0.872	0.839	0.701	16.44%
Duchesne	0.860	0.764	0.743	0.787	0.668	15.12%		Salt lake	0.922	0.825	0.873	0.873	0.732	16.06%
Sevier	0.859	0.786	0.746	0.795	0.676	15.01%		Box Elder	0.919	0.780	0.876	0.856	0.719	16.05%
Tooele	0.891	0.775	0.792	0.818	0.696	14.94%		Millard	0.921	0.771	0.866	0.850	0.716	15.85%
Morgan	0.896	0.877	0.754	0.840	0.715	14.86%		Grand	0.901	0.779	0.823	0.833	0.704	15.52%
Wasatch	0.922	0.804	0.785	0.835	0.713	14.59%		Utah	0.947	0.867	0.865	0.892	0.755	15.43%
Weber	0.888	0.795	0.791	0.823	0.710	13.77%		Sevier	0.885	0.783	0.854	0.839	0.720	14.23%
Davis	0.911	0.829	0.790	0.842	0.728	13.56%		Sanpete	0.939	0.809	0.825	0.855	0.736	13.95%
San Juan	0.899	0.782	0.740	0.804	0.695	13.53%		San Juan	0.846	0.753	0.823	0.806	0.696	13.64%
Salt lake	0.911	0.823	0.807	0.846	0.737	12.82%		Iron	0.916	0.860	0.840	0.871	0.754	13.51%
Washington	0.948	0.819	0.774	0.844	0.739	12.46%		Washington	0.955	0.828	0.856	0.878	0.762	13.24%
Summit	0.892	0.853	0.830	0.858	0.753	12.22%		Cache	0.961	0.858	0.839	0.884	0.775	12.40%

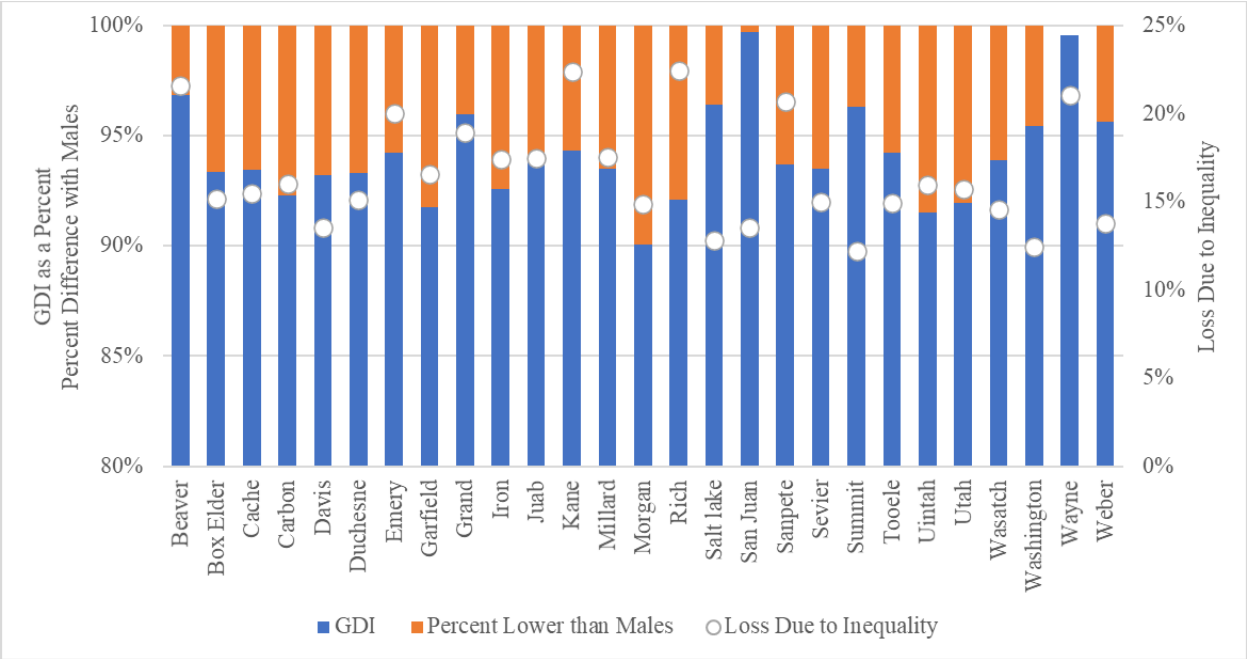
Source: Authors' calculations

Table 9 shows the results for 2019, where some differences from 2014 can be seen. For instance, the loss due to inequality is higher for men. The most significant loss due to inequality for men is 24.6% in Beaver County, while the most significant loss for women is 22.4% in Rich County. The minor loss experienced by either group is also slightly more significant for men. Cache County has a loss of 12.4% for men, and Summit County has a loss of 12.2% for women. Wayne County is the only county where the HDI is more significant for women than men (equivalently, it is also the only county for which the GDI is greater than one). There are also counties with higher IHDI for females than males, which in 2014 was only observed in a couple of cases. In 2019 Beaver, Morgan, Salt Lake, and Summit counties all have slightly higher IHDI values for women. These results can be interpreted as an improvement for women in 2019; however, it is worth noting that the most considerable losses due to inequality and the most significant gaps in HDI between genders occur in rural and frontier counties. As in 2014, the 2019 values show that differences between men and women in the HDI and IHDI owe primarily to the income index. This is confirmed by the fact that differences between the human capital are much smaller than the differences in the HDI and IHDI values for each gender. In several counties, females are in a better position when it comes to human capital.

Figure 13. Female HDI Percent Difference with Male HDI and Loss Due to Inequality, 2014

Source: Authors' calculations

Figure 14. Female HDI Percent Difference with Male HDI and Loss Due to Inequality, 2019



Source: Authors' calculations

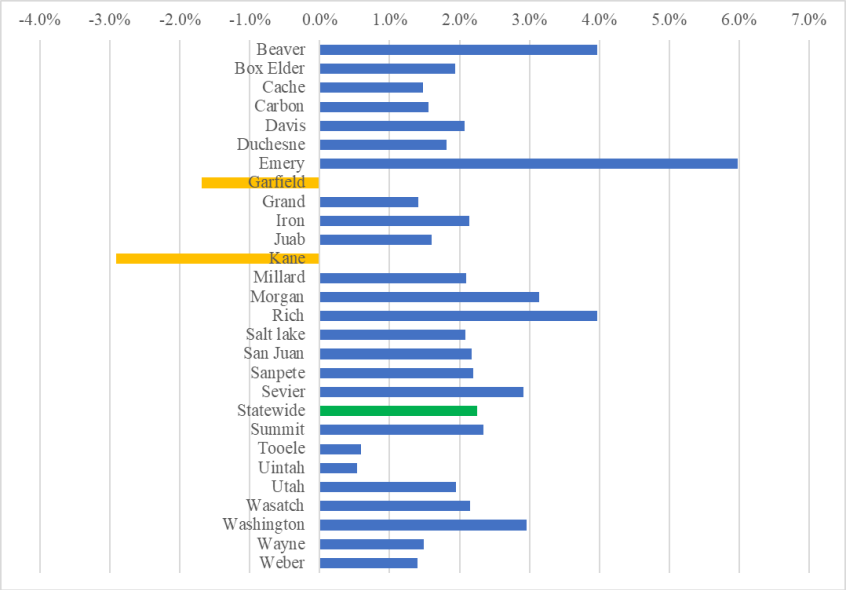
Figures 13 and 14 show the double disadvantages women face due to inequality in the dimensions and lack of equity. For instance, if females' and males' HDI (potential achievement) were equal, the blue bars in Figures 13 and 14 would be 100%. Such a situation could also be interpreted as the GDI being equal to one. The second disadvantage comes from the loss due to inequalities in each dimension. The axis on the right corresponding to the white dots shows the loss due to inequality. In 2014 Kane and Wayne counties had GDI values close to 1 (i.e., a scenario in which females and males did not show differences in their potential achievement of HDI). However, after adjusting for losses due to inequality, females in Kane (18%) and Wayne (23%) counties still have lower IHDI values than they do in many other counties. It is worth noting that these two counties are in the frontier category and both in the medium development index. Consequently, the potential achievement difference is reduced since females and males have challenges in advancing economic development.

Figure 13 also shows counties with a double disadvantage at different levels. Females faced the highest level of penalty in Rich County, where they reached only 77% of the HDI compared with men and saw a gap due to inequality of 25%. Similarly, in Morgan County, females had only 81% of the HDI compared with men, plus they faced a gap due to inequality of 17%. Figure 14 (2019) shows a slight improvement for females compared with 2014. As explained in Table 8, the loss due to inequality changed for several counties in 2019 (in general, females reduced the loss due to inequality, while for men, this loss increased in several counties). Still, Figure 14 shows that most counties did not reach 100% in their potential achievement of HDI, with two exceptions; Wayne County has a GDI of more than 100%; in other words, the HDI for females is higher than for males in 2019. However, this county faced a loss due to an inequality of 21%. San Juan County also had a GDI of 100%, with a loss due to inequality of 14%. As in 2014, Rich County faced one of the highest disadvantages in HDI compared with males, and the loss due to inequality is also the highest percentage of 22%.

Figures 15 and 16 present another way to see changes in the HDI and IHDI for females from 2014 to 2019. Both figures include the percent change at the statewide level to compare with the rest of the counties. In the case of HDI (figure 15), the gains are small—for most counties between two and three percent. There are some outliers for positive gains; Emery County increased its HDI by 6%, and Beaver and Rich counties by 4%. Garfield and Kane, both frontier counties, had slight negative changes as well. Figure 16, which shows changes in the IHDI, shows considerable improvements in several counties for females. Sevier County improves its IHDI by 20%, and Carbon improves by 11%. Most other counties improved by about two to six percent. Kane County is an outlier in both figures: from 2014 to 2019, the HDI for females decreased by 3% and the IHDI by 7%. Garfield County also loses 1.8% in HDI (Figure 15) but makes up for it by increasing its IHDI by 2.5%. Both are frontier

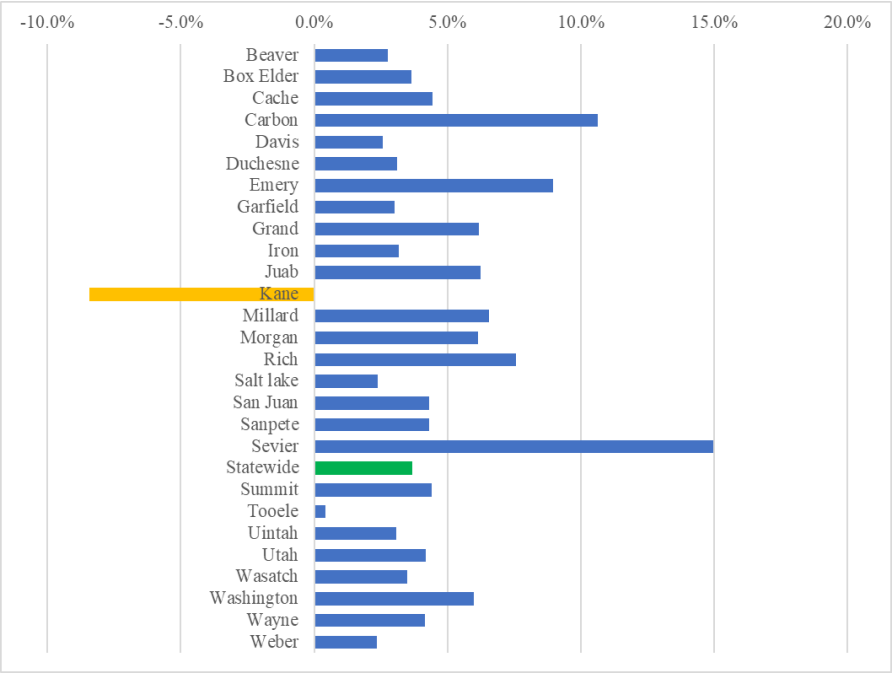
counties, and it appears that the losses in both cases are explained almost entirely by the declines in education outcomes and life expectancy (see tables 8 and 9). On the other hand, Sevier's significant gain for female IHDI (Figure 16) is explained by a significant gain in the income index (going from 0.691 in 2014 to 0.746 in 2019) coupled with moderate gains in both the education and health indexes.

Figure 15. Changes in HDI for Females Between 2014 and 2019



Source: Authors' calculations

Figure 16. Changes in IHDI for Females Between 2014 and 2019



Source: Authors' calculations

7. Final Remarks

This report presents the HDI, IHDI, and GDI at the state and county levels for 2014 and 2019. It confirms that economic growth has generally translated into improvements in the well-being of citizens in urban areas where more than 80 percent of the population resides. Our results show that the IHDI within counties is significant in urban, rural, and frontier counties. The overall loss ranges from 13% to 23% in 2019. The adjustment for inequality in the distribution of each dimension reveals that the impact of inequality in this state is significant. In particular, this report shows that the health index loses on average about 20 percent due to inequality, which causes a three-year difference in life expectancy between urban and rural populations. When the indexes are differentiated by gender, they confirm what other works claim about the disadvantages for women in Utah. These disparities hurt women on two fronts: not only do women begin with a lower HDI value than men, but they also experience higher levels of inequality in the distribution of the dimensions that comprise the IHDI. The difference in personal income is the factor that most contributes to this gap, while the differences are smaller in health and education. Even though the position of women improved compared to 2014, it is estimated that in 2020 women will lose part of what they have gained in the last five years due to the pandemic.

One of the main conclusions drawn from the report is the need to reduce inequalities in the three dimensions to reduce the gap that does not allow the population to experience their potential as determined by the HDI. The report also exposes a need to design and implement socio-economic policies that reach the 20 percent of the population dispersed in rural and frontier areas. Their needs must also be served if we are to improve the living conditions of all Utahns.

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Appendix 1: Methodology

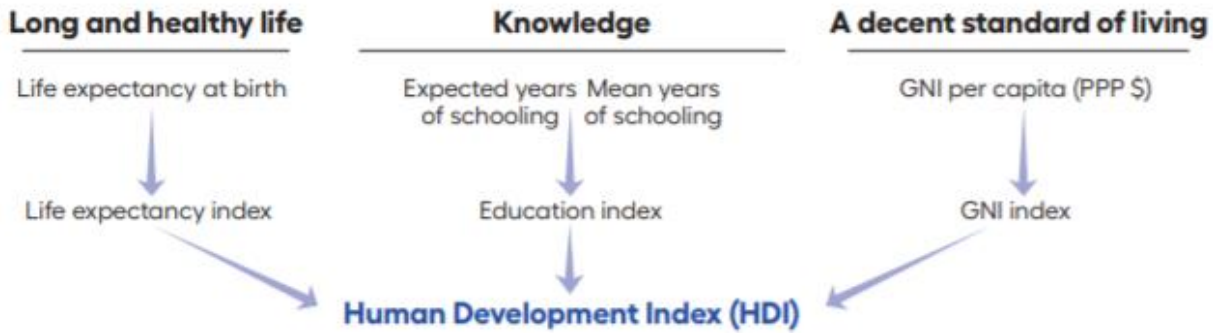
Except where noted, we follow the methodology in the UNDP's Technical notes to the 2020 Human Development Report (UNDP 2020) to compute the Human Development Index (HDI), the Inequality-adjusted Human Development Index (IHDI), the Gender Development Index (GDI), and the Gender Inequality Index (GII). We also rely on the UNDP's Training Material for Producing National Human Development Reports to adjust some of the goalposts to make them more appropriate for subnational populations (UNDP, 2015).

Any difference between our methods and the recommended methodology stems from a lack of available data. The HDR recommends using microdata to compute inequality measures. However, the smallest available public use microdata area (PUMA) has a minimum of 100,000 residents, so county-level analysis with microdata is not possible. (US Census microdata at levels smaller than a PUMA are kept private for 70 years after collection.)

Human Development Index (HDI)

The HDI is a measure of achievements in three dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. It is the geometric mean of normalized indexes for each of the three dimensions (UNDP, 2020b). Table 10 (below) shows how this value is calculated, using Utah County as an example.

Figure 17. HDI calculation from the UNDP's Technical Notes to the 2020 Human Development Report



Inequality-adjusted Human Development Index (IHDI)

The IHDI adjusts the HDI for inequality in the distribution of each dimension. It is based on a distribution-sensitive class of composite indexes and is equal to the geometric mean of the three inequality-adjusted indexes from the HDI (UNDP, 2020b).

Figure 18. IHDI calculation from the UNDP's Technical Notes to the 2020 Human Development Report

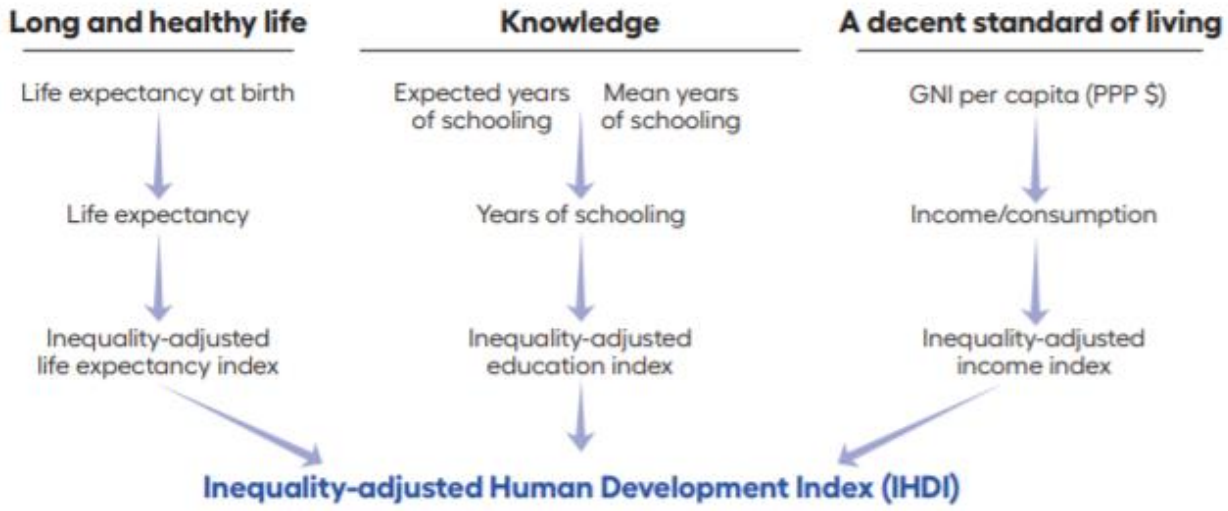


Table 10 shows how this value is calculated, using Utah County as an example. The loss due to inequality is the percent difference between the HDI and the IHDI. The coefficient of inequality is the arithmetic mean of the Atkinson (1970) measure of inequality for each of the three indexes.

Table 10. Example Calculations: Utah County 2019

Indicator	Value	Dimension Index	Inequality Measure	Inequality-adjusted Index
Life expectancy (years)	80.4222	0.9296	0.2206	(1 - 0.2206) * 0.9296 = 0.7246
Expected years of schooling	*17.6395*	*0.8820*	---	---
Average years of schooling	*14.2403*	*0.8377*	*0.1266*	---
Education Index	---	0.8598	0.1266	(1 - 0.1266) * 0.8598 = 0.7510
Personal Income (2019 PPP $)	$26,084	0.8055	0.1178	(1 - 0.1178) * 0.8055 = 0.7105

HDI	**IHDI**
$(0.9296 * 0.8598 * 0.8055)^{1/3} = 0.8635$	$(0.7246 * 0.7510 * 0.7105)^{1/3} = 0.7285$
Loss due to inequality	**Coefficient of human inequality**
1 - 0.7285 / 0.8635 = 0.1563	(0.2206 + 0.1266 + 0.1178) / 3 = 0.1550

Education Indicator

We use the American Community Survey's 5-year estimates for "Educational Attainment for the Population 25 Years and over" to estimate average years of schooling, and "School enrollment by type of school by age for the population 3 years and over" to estimate expected years of schooling.

We follow the instructions in the technical note precisely, but we adjust the upper goalpost for each metric to reflect the larger range of educational outcomes observed in US counties. The UNDP uses an upper goalpost of 15 years for average years of schooling and 18 years for expected years of schooling. We extend the upper goalposts to 17 and 20 years for average and expected years of schooling, respectively.

For the IHDI, the lack of microdata requires us to measure inequality between age groups instead of individuals. Having fewer groups to compare makes it harder to quantify inequality, but we consider this the best possible estimate in the absence of microdata.

Health Indicator (Life expectancy at birth)

We adopt the same goalposts used in the HDR (the minimum is 20 years, and the maximum is 85 years).

We could not find reliable county-level estimates for life expectancy at birth for all the years of interest, so we derive life expectancy from crude death rates (the number of deaths occurring during the year per 1,000 population, estimated at midyear). This data is maintained and provided by the Centers for Disease Control and Prevention (CDC). We use Chiang's method (Chiang 1968) to convert crude death rates into life expectancy at birth.

Because several counties have small populations, estimates of the crude rates for each age group were not always available. To ensure the best quality data possible, we pulled estimates for five-year periods at a time (for example, the life expectancy estimate we report for 2019 is obtained using all available data from 2015-2019). The CDC's website also groups the mortality data into 5- or 10-year increments. Even after combining the data this way, we could not attain estimates for one or more age groups in several of Utah's less populous counties.

Since we could not obtain an estimate for life expectancy at birth without complete mortality data for each county, we applied the following four-step imputation procedure to each age group in each county, for each 5-year period, for males, females, and males and females:

> First, we replaced extreme death rates in any age group with the median death rate for that age group. We define extreme values as a death rate of exactly zero or a death rate in the 99th percentile of all death rates for any county in that age group. We applied this imputation across all available years and all counties in the United States.
>
> Second, if a given age group in a county had an estimate in one or more of the 5-year periods, we replaced the missing value with the mean of those estimates.
>
> Third, if a given age group in a county still didn't have an estimate, we replaced the missing value with the median of the estimate for the three nearest counties with an estimate for that age group. We used Euclidean distances from the county seat of each county to determine geographic proximity.

For the IHDI, the lack of microdata requires us to measure inequality between age groups instead of individuals. Since we cannot compare inequality in life expectancy between age groups, we compare the crude death rates between age groups instead. As with the inequality-adjusted education index, having fewer groups to compare makes it harder to quantify inequality, but we consider this the best possible estimate in the absence of microdata.

Income Indicator

The HDR uses GNI per capita. Since no such estimate exists at the sub-county level, we use median personal income. We use the American Community Survey's 5-year estimates for "Inflation-Adjusted Dollars for the Population 16 Years and Over With Earnings in the Past 12 Months" to estimate personal income. We follow the methodology suggested by the US Census Bureau to adjust for inflation on multi-year estimates (U.S. Census Bureau, 2018). We also use the recommended consumer price index (All Items CPI-U-RS Annual Averages). We adopt the lower goalpost of $100 used by the HDR, but we adjust the upper goalpost from the recommended $75,000 to $100,000 to reflect the larger range of median income estimates observed in US counties.

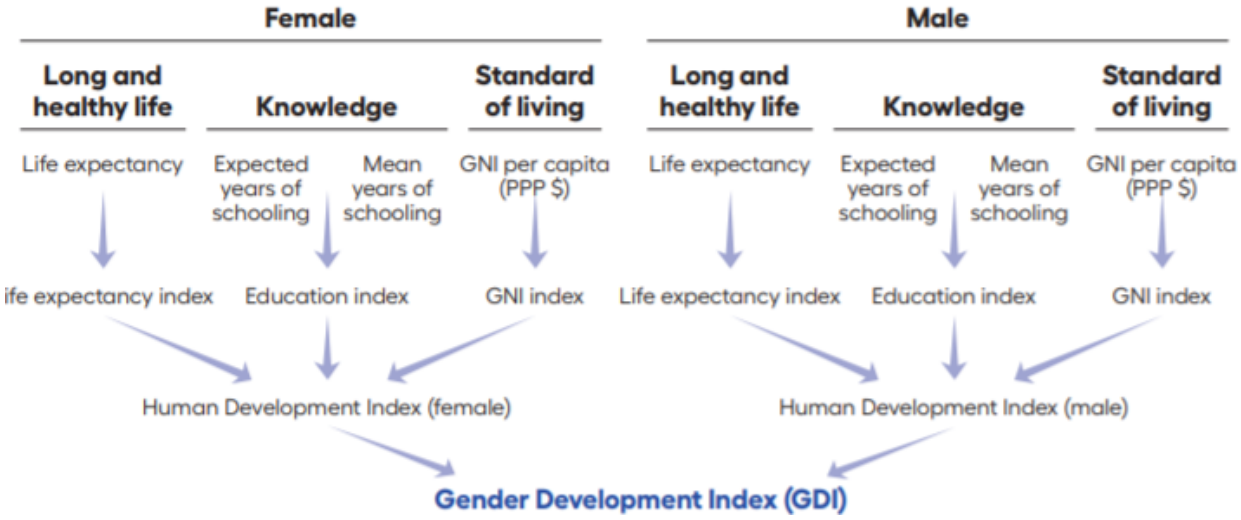
For the IHDI, the lack of microdata requires measuring inequality between income brackets instead of individuals. Since we cannot compare inequality in personal income between individuals, we compare the inequality between income brackets instead. As with the other two inequality-adjusted indexes, having fewer groups to compare makes it harder to quantify inequality, but in the absence of microdata, we consider this the best possible estimate.

The data is grouped by income brackets, ranging from "$1 to $2,499 or less" to "$100,000 or more." We use the midpoint of each income bracket and multiply that by the number of persons counted in each bracket. For the top income bracket, we use a value of $125,000 (making the range of the top bracket the same size as the bracket immediately preceding it). This value likely underestimates the median income of the top bracket. However, in the absence of a better estimate, we use it and accept that our estimate of inequality may understate the true value.

Gender Development Index (GDI)

The GDI is the ratio of the HDI for females over the HDI for males. It measures gender inequalities in achievement in the same three dimensions as the HDI: health, measured by female and male life expectancy at birth; education, measured by female and male expected years of schooling for children and female and male mean years of schooling for adults ages 25 years and older; and command over economic resources, measured by female and male estimated earned income (UNDP, 2020b). A value of 1 suggests perfect gender parity. Values under 1 suggest that women are disadvantaged, and values over 1 suggest men are disadvantaged.

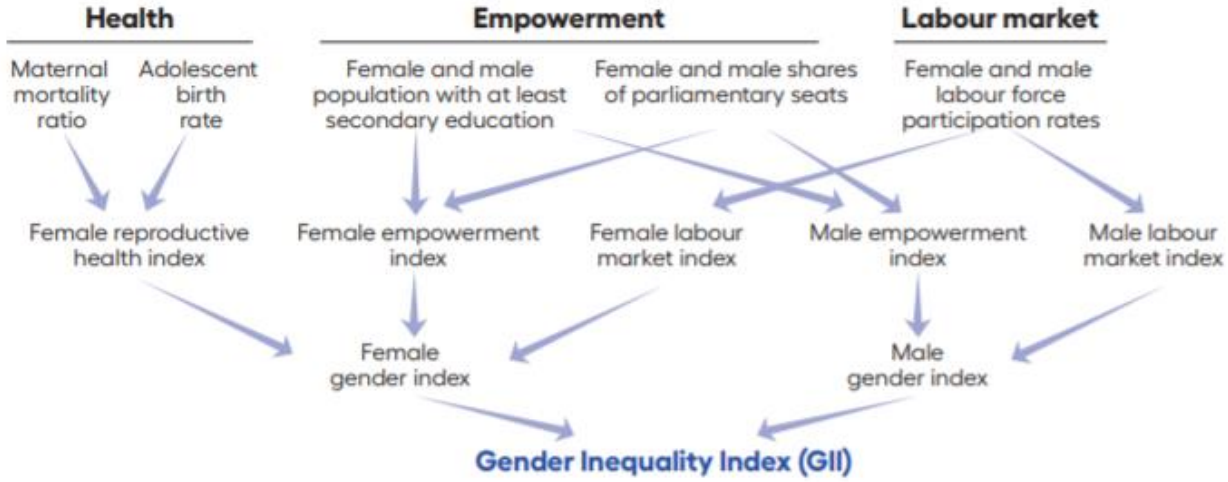
Figure 19. GDI calculation from the UNDP's Technical Notes to the 2020 Human Development Report



Gender Inequality Index (GII)

The GII reflects gender-based disadvantage in reproductive health, empowerment, and the labor market. It shows the loss in potential human development due to inequality between the sexes. It ranges from 0, where women and men fare equally, to 1, where one gender fares as poorly as possible in all measured dimensions (UNDP, 2020b). We followed the instructions in the technical note precisely to calculate this index for the 50 states in 2019.

Figure 20. HDI calculation from the UNDP's Technical Notes to the 2020 Human Development Report



We use the American Community Survey's 5-year estimates for 2019 for the education and labor force participation components. Data for the adolescent birth rate (ABR) comes from a 2019 report by the CDC (CDC, 2019). Maternal mortality rate (MMR) data for 2019 was not available at the time of publication, so we use the CDC's 2018 rates instead (CDC, 2018). For some states with too little data to accurately record the MMR, we use the mean rate of the states with available data. For the share of parliamentary seats held by each sex, we use state legislatures, including legislators from both state senates and state houses or assemblies in each state except Nebraska, which has a unicameral legislature (NCSL, 2019). Table 11 provides an example of how the GII is calculated for Utah.

Table 11. Example Calculations: GII for the State of Utah, 2019

	Health		**Empowerment**		**Labor Market**
	Maternal mortality ratio (deaths per 100K)	*Adolescent birth rate (per 1K women 15-19)*	*Share of seats in legislature (%)*	*Population with at least some secondary education (%)*	*Labor force participation rate*
Female	33	12	24.0	97.4	63.0
Male	N/A	N/A	76.0	97.3	77.0
(F + M) / 2	$\frac{\sqrt{\frac{10^a}{33} * \frac{1}{12}} + 1^b}{2} = 0.506$		$\frac{\sqrt{0.24 * 0.974} + \sqrt{0.76 * 0.973}}{2} = 0.672$		$\frac{0.63 + 0.77}{2} = 0.697$
$G_{F,M}$	$(0.506 * 0.672 * 0.697)^{1/3} = 0.619$				
G_F	$(\sqrt{\frac{10^a}{33} * \frac{1}{12}} * \sqrt{0.24 * 0.974} * 0.63)^{1/3} = 0.364$				
G_M	$(1 * \sqrt{0.76 * 0.973} * 0.77)^{1/3} = 0.872$				
HARMONIC(G_F,G_M)	$[\frac{1}{2} * (\frac{1}{0.364} + \frac{1}{0.872})]^{-1} = 0.514$				
GII	1 - (0.514 / 0.619) = 0.170				

[a] 10 is used because the maternal mortality ratio is truncated at 10 deaths per 100K live births.
[b] Since men have no maternal mortality ratio or adolescent birth rate, insert 1 here.

County Classification

We adopt the definition used by the Utah Department of Health to classify counties as "Urban," "Rural," or "Frontier." Urban counties have a population density of more than 100 people per square mile; Rural counties have a population density of fewer than 99 but more than 6 people per square mile and Frontier counties have fewer than 6 people per square mile (Utah Department of Health, 2020).

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