

# Uniting the Nation—Rethinking Adversity of the Poor

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## ABSTRACT

A root cause of today's social tensions and divisions rest with poverty. Studies suggest that that individuals who grow up in poverty-stricken families are much more likely to be in poverty during their early adulthood, and the poverty rate in African American children is astoundingly high. This paper adopts data science approaches to identify drivers behind childhood poverty in the United States, and finds that these factors tend to reinforce each other and go hand in hand with poverty. Specifically, common factors are found to be driving childhood poverty, a weak healthcare system, inadequate education resources, lack of public safety infrastructure and insufficient job opportunities. The current social safeguard framework, supported by both the government and private institutions, appears fragmented and lacks the necessary alignment across healthcare, education, public safety and job creation. The study shows that barring a systematic approach to address the drivers of childhood poverty, the poverty problem is unlikely to be fundamentally addressed. Building on these findings, the paper calls for a number of mutually coherent policies, including introducing a more effective financing scheme for the children in poverty, creating an enabling job market environment for the poor, reforming the funding pattern of schools, creating a safe environment for all children, and enhancing health services for those living in poverty.

## **Introduction**

The tragic incidents surrounding George Floyd's death have again alarmed us of the deep-seated racism and social division plaguing this nation. What is shocking is not only the discrimination suffered by black Americans, but the adversity many of them live with, notably poverty. By reading these stories, it is not difficult to figure out that the poor lives in a different world than the well-off, suffering from poverty, lack of safety, limited education opportunities, poor health, and job insecurity. Without a fundamental solution, the social division will continue to grow. Thus, to unite the nation, priority should be given to lifting those in poverty out of these adversities.

This paper conducts analysis regarding poverty reduction, focusing on the poverty of children and related adversities, which are found to be the key drivers of overall poverty of the United States. It applies data science analysis to county-level data and concludes that various sorts of adversities, including childhood poverty, lack of education opportunities, unemployment, poor health and weak public safety environment are closely interconnected, and might reinforce each other through various channels. As such, addressing poverty and related adversities needs a coherent and holistic strategy, and the current policies might lack the necessary alignment and coherence.

Section II reviews the current poverty situation in the United States, and discusses the poverty reduction policies in place and their outcomes. The shocking facts suggest that the current policy framework lacks coherence and long-term visions, and would in no way fundamentally address poverty and related adversities. Section III conducts data science study based on principal component analysis to examine the systematic inter-dependence of childhood poverty and related factors. The finding of significant inter-dependence suggests a new approach to anti-poverty policies is urgently needed. Section IV concludes policy implications of the data science analysis.

## Poverty in the United States and Anti-Poverty Policies

The poverty situation in the United States has been improving marginally in recent years but remains severe. The U.S. Census Bureau defines all members of a family to be in poverty when the household income falls below the poverty threshold, as shown in table 1.

Number of Family Members	Poverty Threshold of Household Income
1	\$12,760
2	\$17,240
3	\$21,720
4	\$26,200
5	\$30,680
6	\$35,160
7	\$39,640

Source: U.S. Department of Health & Human Services

According to the U.S. Census Bureau, the poverty rate stood at 10.5 percent in 2019. However, significant differences exist across racial and demographic groups. The poverty rate for white people was 9.1%, while the number for black people is more than twice as much, registering 18.8%. The poverty among children is more severe. Overall poverty rate for those under the age of 18 was 14.4%, with black children subject to a poverty rate of 26.3% and white children 12.3%. Moreover, children living in poverty tend to suffer from prolonged adverse situation, particularly among black Americans. Ratcliffe (2015) finds that the share of persistently poor children in black Americans is almost 10 times more than in white Americans.

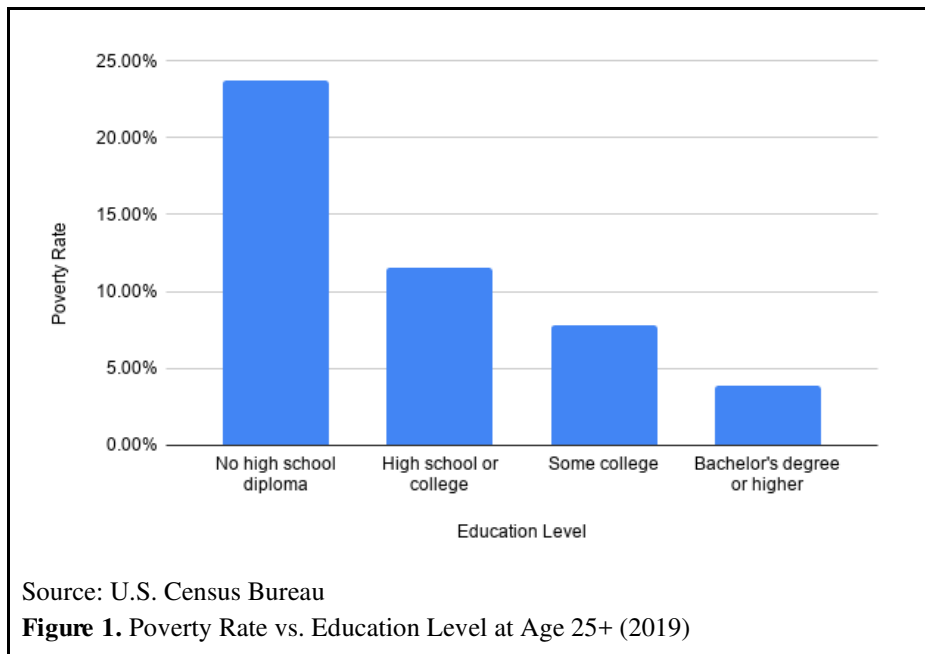
Studies show poverty can follow a child well into adulthood. A study by the National Center for Children in Poverty at Columbia University shows a strong correlation between poverty in childhood and poverty in adulthood (Table 2). Ratcliffe (2015) suggests that the future achievement of children declines as the length of time they live in poverty increases. This paper finds that children persistently in poverty are 13% less likely to complete high school and 43% less likely to complete college than those who have experienced poverty but not persistently as children. Parental education is also closely related to the academic achievement of children not persistently in poverty, and residential instability correlated to lower academic achievement for this group. Wagmiller and Adelman (2009) also concludes that individuals who grow up in poverty-stricken families are much more likely to be in poverty during their early adulthood. Moreover, the chances of being in poverty in early adulthood rise sharply as the time spent living in poverty during childhood increases.

Childhood Years in Poverty	% in Poverty at age 20	% in Poverty at Age 25
0	4.1%	5.3%
1-7	12.4%	13.6%

8-14	46%	40%
Source: National Center for Children in Poverty		

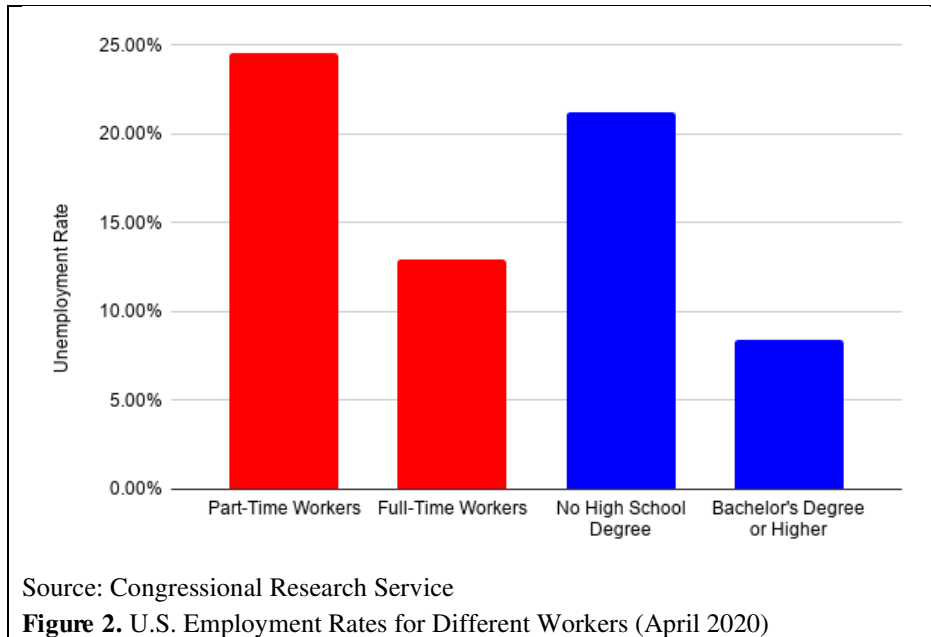
Without addressing childhood poverty, the overall poverty of this country could not be fundamentally resolved. The cause of childhood poverty is complex, but generally studies point to close relationship between poverty and factors such as education, health, employment and public safety. Specifically, many children living in poverty also struggle academically, drop out from high schools, and have spotty employment as they become young adults. The causality between poverty and these factors could be mutual, and the discussion below draws from various sources of research:

First, children in poverty tend to receive subpar education, which in turn jeopardize the job opportunities of these children as they grow up. The funding for schools in large part comes from property taxes paid by residents in the area. However, given the relatively low housing costs in poor neighborhoods, schools are often funded inadequately and their students are often equipped with insufficient resources to excel academically. As a result, many fail to graduate from high schools, attend college, or obtain a bachelor’s degree. This education gap causes most of them to lack the necessary skills to secure stable job opportunities. As shown in figure 1, those who obtain lower levels of education are significantly more likely to live in poverty in adulthood. As of 2019, 25% of people over the age of 25 in the U.S. who fail to obtain a high school diploma live in poverty, whereas less than 5% of those who have obtained a bachelor’s degree or higher do so.



Second, low employment, which often stems from job instability, is another issue that drives poverty and income inequality. Many low-wage careers that poorly educated workers often pursue tend to require low skills. Unfortunately, these workers are relatively easily replaceable, and they are especially vulnerable to shocks to the job market. For instance, during the COVID-19 pandemic, the demand for various low-income workers, especially in the service industry, decreased significantly, and many have been laid off. This causes unemployment to soar among the poor. As shown in the figure 2, the pandemic has caused unemployment rates to more than triple from 4.4% in March

2020 to 14.7% in April 2020. According to the Congressional Research Service (2020), workers with part-time jobs, an indicator of relatively low-income careers, suffered from unemployment rates approximately twice as much as those who worked full-time jobs.

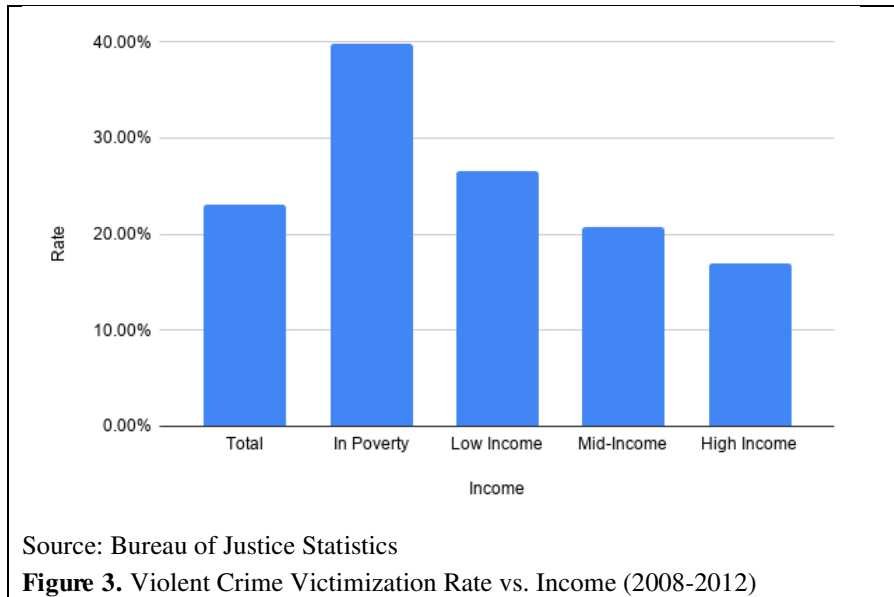


Third, lack of healthcare also contributes to poverty and income inequality. Those who cannot afford proper health treatment are also often those who are in more need of healthcare services and nutrition support. Studies show that the rich and poor have huge mortality gap—the richest 1 percent of men lives 14.6 years longer on average than the poorest 1 percent of men, while among women in those wealth percentiles, the difference is 10.1 years on average.<sup>1</sup> According to the Centers for Medicare and Medicaid Services (CMS), 49% of communities with median household income below \$34,999 had no ICU beds available, while this was the case for only 3% of communities with median household income over \$90,000.<sup>2</sup> This insufficient protection of health has also turned out to be an obstacle for the poor to perform well in schools and in the job market as adults.

Last but not least, many of those in poverty live in unsafe areas with high crime rates, which substantially impede children’s physical and mental developments. According to the FBI’s 2016 crime statistics, geographically, there is a strong correlation between income inequality crime rates per household. Moreover, individuals with lower household income are more likely to be victims of violent crime, as shown in figure 3. Figure 3 defines “In Poverty” as below the federal poverty threshold (Table 1), “Low Income” as between the federal poverty threshold and twice the threshold, “Mid-Income” as between twice the threshold and four times the threshold, and “High-Income” as over four times the threshold.

<sup>1</sup> <https://news.mit.edu/2016/study-rich-poor-huge-mortality-gap-us-0411>

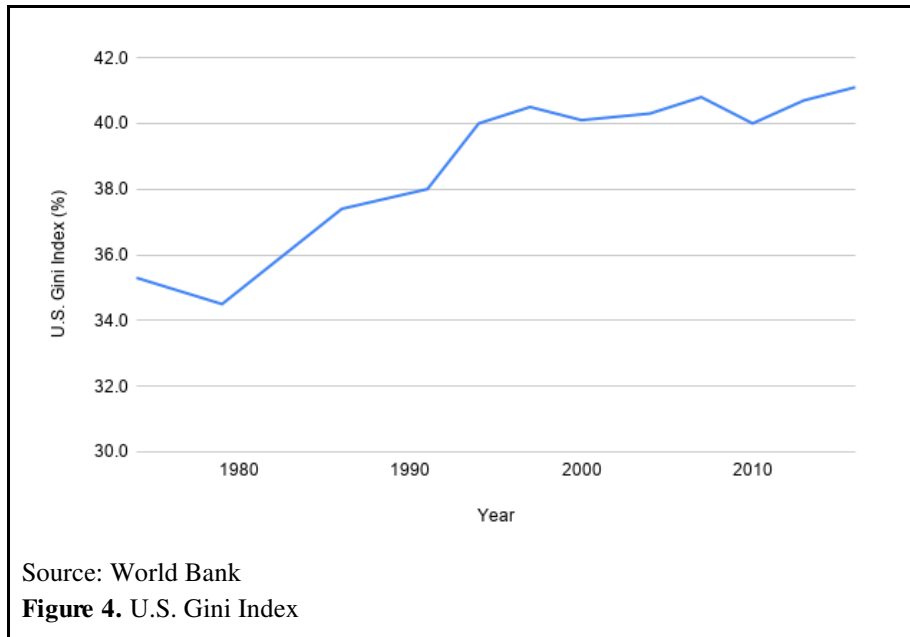
<sup>2</sup> CMS data of 2017-18.



These causes of poverty are also strongly correlated with each other. For instance, low employment is correlated with an unsafe environment, as crimes deter business owners and stifle the business environment. Furthermore, there is a strong correlation between the quality of education and low employment. In the case of the COVID-19 pandemic, those with higher education levels were significantly less likely to lose their jobs than those with lower education levels. According to the Congressional Research Service (2020), the unemployment rate for workers without a high school diploma was 21.2%, whereas that of workers with a bachelor’s degree or higher was only 8.4% (figure 2).

To reduce poverty, the United States has employed a number of policies. For example, the Earned Income Tax Credit (EITC), the Child Tax Credit (CTC), and the Supplemental Nutrition Assistance Program (SNAP) have been substantially expanded in recent decades. A report of the Congressional Budget Office (CBO) suggests that the mandatory portion of the federal budget includes almost \$800 billion for means-tested, anti-poverty programs in 2019 — enough to consume almost half of all federal income tax revenues. Total anti-poverty spending, including federal, state and local government spending as well as federal discretionary spending on anti-poverty programs, exceeds \$1 trillion per year, which is close to 5 percent of GDP. Nevertheless, some benefits might have gone to those that are not in poverty. Specifically, tax credit and exemption benefit families who file taxes and primarily earn an income above the poverty line, while those with incomes too low to owe taxes would not benefit. According to the Federal Safety Net<sup>3</sup>, despite rapidly increasing welfare spending, the poverty rate has largely hovered above 10 percent in the past five decades. Moreover, income inequality has further intensified, as illustrated by higher Gini in recent years (figure 4). The widened income disparity makes it all the more difficult for the poor to catch up with the well-off.

<sup>3</sup> <http://federalsafetynet.com/poverty-and-spending-over-the-years.html>



All in all, the contrast of anti-poverty spending and stubborn poverty rates points to lack of effectiveness under current policies. Poor targeting of benefits, widening income disparity, and lack of a coherent strategy could all have contributed to the lackluster poverty reduction exercise. A new approach is urgently needed to address prevalent poverty, in particular among black children. In this context, it is important to understand the drivers behind childhood poverty, and a holistic strategy to deal with all these closely interconnected drivers must be deployed efficiently. To do so, the following sections analyze the interconnection of poverty and related factors, and the analysis carries important implications for future policy considerations.

## Data and Modeling

It is shown above that childhood poverty are driven by a number of closely related factors, and in often the case they reinforce each other. This section conducts data science analysis to assess the commonality in these variables. It confirms that childhood poverty and other driving factors are subject to systematic inter-dependence, which has important policy implications.

This analysis is conducted using principal component analysis on five variables based on county-level statistics and surveys in New York state. Share of population holding bachelor's degree and higher is used as a proxy of access to education opportunities, while the proportion of children under the age of 18 living in poverty represents childhood poverty rate. These variables, together with employment rate, are drawn from the US Census Bureau.<sup>4</sup> The variable of public safety is drawn from the public safety score estimated by the US News, which is based on violent crime rate, per capita spending on health and emergency services, and public safety professionals in population.<sup>5</sup> The county-level health indicator denotes health Z-score estimated by the County Health Rankings & Roadmaps program, which is a collaboration between the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute.<sup>6</sup> The health indicator is estimated on the basis of data of health outcome, health behavior, clinical care, social and economic factors, and physical environment. Higher Z-scores indicate poorer health.

<sup>4</sup> <https://data.census.gov/cedsci/>

<sup>5</sup> [https://www.usnews.com/news/healthiest-communities?int=top\\_nav\\_Healthiest\\_Communities](https://www.usnews.com/news/healthiest-communities?int=top_nav_Healthiest_Communities)

<sup>6</sup> <https://www.countyhealthrankings.org/>

To assess the interconnection among these variables, the following model is specified:

$$X = \alpha + \beta S + \varepsilon \tag{1}$$

where  $X = (X_1, \dots, X_N)'$  represents N-vector of variables studied in this analysis, including childhood poverty, access to education, employment rate, public safety and health, respectively.  $\alpha = (\alpha_1, \dots, \alpha_N)'$  is the N-vector of mean.  $\varepsilon = (\varepsilon_1, \dots, \varepsilon_N)'$  denotes the idiosyncratic noise terms, and  $S = (S_1, \dots, S_K)'$  represents K-vector

factors.  $\beta = \begin{pmatrix} \beta_{11} & \dots & \beta_{1K} \\ \vdots & \ddots & \vdots \\ \beta_{N1} & \dots & \beta_{NK} \end{pmatrix}$  is the N×K matrix of factor loadings.

In the special case where K=N and the variance of the idiosyncratic term is zero, the principal component analysis shows that covariance (or correlation) matrix of X can be decomposed into N eigenvalues

$\lambda = (\lambda_1, \dots, \lambda_N)$  and N corresponding normalized eigenvectors  $P = (P_1, \dots, P_N)$ . It can be shown that the total variance of X is equal to the sum of eigenvalues:

$$\sum_{i=1}^N Var(X_i) = \sum_{i=1}^N \lambda_i \tag{2}$$

In this estimation, the principal component analysis is based on eigen-decomposition of the correlation matrix. The five variables are closely correlated, as exhibited in the following correlation table:

Table 3. Correlation Matrix					
	Childhood Poverty	Education	Employment	Public Safety	Health
Childhood Poverty	1.00				
Education	-0.51	1.00			
Employment	-0.47	0.73	1.00		
Public Safety	-0.54	0.48	0.28	1.00	
Health	0.78	-0.57	-0.34	-0.70	1.00

Childhood poverty is negatively correlated with access to education, employment rate and public safety, while positively correlated to the health variable, noting that the health variable is the Z-score—higher values represent poorer health. There are also strong correlations among education, employment, public safety, and health.

The eigen-decomposition result is show below in table 4 and 5:

Table 4. Eigenvectors (loadings)					
Variable	PC 1	PC 2	PC 3	PC 4	PC 5
Childhood Poverty	-0.472077	0.194039	0.674687	-0.193944	-0.496664
Education	0.458861	0.423169	0.293677	-0.621738	0.370905
Employment	0.385403	0.6795	-0.057306	0.497381	-0.372924
Public Safety	0.427067	-0.418766	0.656943	0.432371	0.154048
Health	-0.485457	0.38235	0.153927	0.376158	0.673017

**Table 5. Eigenvalues: (Sum = 5, Average = 1)**

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	3.161342	2.201108	0.6323	3.161342	0.6323
2	0.960234	0.491527	0.192	4.121576	0.8243
3	0.468707	0.205124	0.0937	4.590283	0.9181
4	0.263583	0.117448	0.0527	4.853865	0.9708
5	0.146135	---	0.0292	5	1

The principal component analysis results suggest that there is a strong systematic inter-dependence among childhood poverty, education, employment, public safety and health. The first component has an eigenvalue of 3.16, which, divided by 5, is 63%. This suggests that the first component alone would be able to explain 63% of total variance. Similarly, the first two components would cumulatively explain 82% of total variance.

## Policy Implication

The policy discussion and data analysis in this paper suggests evident systematic inter-dependence among childhood poverty, access to education opportunities, employment, public safety and health. Addressing childhood poverty is key to reducing overall poverty and achieve national coherence. As such, policies should give priority to reducing childhood poverty through a holistic strategy that simultaneously improve the environment of children with respect to education, employment of adults, public safety and health.

At present, the policies targeting poor children appear focused on financial support, while the whole picture of drivers behind the childhood poverty appears to be missing in policy making and implementation. That might to a large extent explain the limited progress in poverty reduction.

A holistic strategy is urgently needed. That requires policies in all areas related to childhood poverty, as suggested by this study, to be well aligned. Most importantly, policy makers should go beyond the provision of financial assistance and target to establish an enabling environment with sound public safety, health, education and job opportunities to lift the poor children out of poverty and adversity. Specifically, considerations should be given to the following:

First, there should be a more effective financing scheme for the children in poverty. The current tax return and exemption might have mistargeted the recipients as those who are too poor to file taxes would not benefit. It is critical that all the children in poverty should receive financial support.

Second, policies should be tilted towards creating job opportunities for the poor people. Tax incentives and deregulation for employers operating in the poor areas could be potential options. The government also needs to strengthen training for the poor to enhance their skills and improve their resilience to shocks to the job market.

Third, the funding of schools needs to be reviewed. The dependence on property tax income to finance schools is flawed, and there must be sufficient and stable funding sources to ensure the provision of good quality education to all regions without regard to the income level.

Fourth, public safety should be improved to ensure a safe environment for all children. Since the poor people are more likely to be victims of violent crimes, they deserve more enhanced public services to ensure safety.

Last but not least, health services for those living in poverty need to be substantially improved. Continued reform of the health insurance mechanism is needed, and policies should be explored to reduce the cost of medicine. More resources should be allocated to hospitals located in the poor areas.



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