



On Doing an Analysis of Equity and Closing the Opportunity Gap

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Abstract: Is public education equitable and does it provide an equal opportunity to all children and youths? Equity in public school funding is a critical issue facing all communities and has been addressed by the courts in all but five states. A key focus is on funding gaps between rich and poor school districts. Recently, attention has turned to the relationship between funding gaps and the opportunity gaps that have real and important impacts on student outcomes. This research provides a comprehensive analysis of equity in a western state of the U.S.A. Fifteen quantitative statistics, weighted for high-cost students, sparsity, district population, and the cost of education, are calculated and discussed. It was found that there are large opportunity gaps among school districts and they are linked to local wealth. This makes the quality of education a function of local wealth that abridges equal opportunities to learn and to be successful, for children and youth in schools and classrooms. Implications for closing the opportunity gap are discussed in the final section.

Keywords: finance, policy, public schools, K-12, equity, equal opportunity, elementary, secondary, constitution, legislature, education

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Haciendo un Análisis de la Equidad y Achicando la Brecha de Oportunidades

Resumen: ¿Es la educación pública equitativa y da igualdad de oportunidades a todos los niños y jóvenes? Esta investigación aborda estas cuestiones mediante el examen de las desigualdades en el financiamiento entre distritos escolares más y menos ricos. Equidad en el financiamiento de las escuelas públicas es un tema crítico que enfrentan todas las comunidades y ha sido abordado por los tribunales en todos los estados excepto cinco. La atención se concentrará en las brechas de financiamiento entre los distritos escolares ricos y pobres. Recientemente, se ha prestado atención a la relación entre los déficit de financiamiento y las brechas de oportunidades que tienen efectos reales e importantes en los resultados de los estudiantes. Esta investigación ofrece un análisis exhaustivo de las disparidades en un estado de la región occidente de EE.UU. Quince estadísticas cuantitativas, ponderadas para estudiantes de alto costo, escasez, población del distrito, y el costo de la educación, se calcularon y se discuten. Se encontró que existen grandes diferencias de oportunidades entre los distritos escolares que están vinculados a la riqueza local. Esto hace que la calidad de la educación sea función de la riqueza local lo que implica la reducción de igualdad de oportunidades para aprender y tener éxito, para niños y jóvenes en las escuelas y en las aulas. Implicaciones para el cierre de la brecha de oportunidades se discuten en la sección final.

Palabras clave: finanzas, la política, las escuelas públicas, K-12, de equidad, de igualdad de oportunidades, de primaria, secundaria, constitución, promulgación de la educación

Fazendo uma Análise da Equidade e Reduzindo a Diferencias das Desigualdades de Oportunidades

Resumo: É a educação pública equitativa e dá oportunidades iguais a todas as crianças e jovens? Esta pesquisa aborda estas questões, analisando as desigualdades no financiamento das escolas de distritos mais e menos ricos. Equidade no financiamento das escolas públicas é uma questão crítica voltada para todas as comunidades e foi abordada pelos tribunais em todos os estados menos cinco. O foco será sobre a diferenciação de financiamento entre os distritos escolares ricos e pobres. Recentemente, a atenção tem sido dada à relação entre as diferenças de financiamento e da insuficiência de oportunidades que têm impacto real e significativo sobre os resultados dos alunos. Esta pesquisa fornece uma análise global das disparidades em um estado da região ocidental dos EUA. Quinze estatísticas quantitativas, ponderadas para estudantes de alto custo, a escassez, a população do distrito, e o custo da educação, foram calculados e discutidos. Descobrimos que há grandes diferenças de oportunidades entre os distritos escolares que estão ligadas a riqueza local. Isso faz com que a qualidade da educação é uma função da redução da riqueza o que implica a igualdade de oportunidades locais para aprender e ter sucesso, para crianças e jovens nas escolas e salas de aula. Implicações para fechar a lacuna oportunidade serão discutidos na seção final.

Palavras-chave: finanças, política, as escolas públicas, K-12, justiça, igualdade de oportunidades, primário, secundário, constituição, promulgação da educação

Introduction

In the American system of government, authority for education rests with the states. Each state's constitution addresses the role of government in education, although the U.S. Constitution is silent on education. In Nevada, a Western state, the Constitution says that: "... the legislature shall provide for a uniform system of common schools..." (Art. 11, section 2, 1938); and "the legislature shall encourage by all suitable means the promotion of intellectual, literary, scientific, mining, mechanical, agricultural, and moral improvements..." (Art. 11, Section 1, 1955). Although the constitutionality of the Nevada system of public education finance has not been adjudicated in the

courts, all but five states have had funding challenges to the equity and adequacy of their education finance system.

This raises a key question. Is financial support in Nevada uniform and reasonably equitable as required by the education article of the state constitution? This research addresses that question. First, equity is discussed, its evolution in theory and key principles are detailed; then research studies are reviewed and the Nevada funding system is examined. Next, the method for *doing an analysis of equity* is specified with attention to research and best practice. The study findings follow. The final section contains a discussion with recommendations for closing opportunity gaps and improving the education finance system for the future.

Equity: Its Evolution and Principles

Equity is a long held and widely affirmed principle of the American system of government, including public education (Brimley, Verstegen, & Garfield, 2016). One the nation's founders, Thomas Jefferson, explained in a letter to John Adams on October 28, 1813, when he said: "We want a system built on a natural aristocracy, based on virtue and talent, not an artificial aristocracy, built on inheritance and wealth" (in Verstegen & Driscoll, 2008).² At that time, the wealthy in Europe were able to purchase a quality education for their children that proved crucial in securing a job and being successful later in life. Jefferson reasoned that education was the key equalizer and focal point of equal opportunity; he proposed the first system of education at public expense, in the *Virginia Bill for the General Diffusion of Knowledge*. Providing free universal public education for all was championed by Jefferson because,

Worth and genius would thus have been sought out from every condition of life, and completely prepared by education for defeating the competition of wealth and birth for public trusts. (Jefferson 1787, in Cappon, 1971, p. 342)

The vision was that all children would have equal opportunities to learn; only their own hard work and motivation would hold them back or secure success – certainly not a government that would give some children more and better chances while consigning others to fewer opportunities simply because they were born into poverty and lacked parental resources to purchase quality schooling. This vision of equal opportunity became the foundation of the American system of schooling.

The vision of equity espoused by Jefferson is embedded into the first of three principles that have come define it: *horizontal equity*. It holds that all children similarly situated should be treated the same. In education, a pupil in a classroom should receive the same opportunity as any other child. Jefferson believed that a child was born with a certain nature and the role of the school would be to discover or select those that had received superior gifts. Thus, "education could improve on the nature of man, or the failure to provide an education could deny such improvement, but education could not create these abilities or talents." (Jefferson, 1787, in Koch & Penden, 1944).

Almost a century later, John Dewey took issue with this vision of equity and inverted the Jeffersonian argument of providing an equal opportunity by treating all individuals similarly. According to Dewey, to grant all individuals the same opportunity was "to perpetuate the inequalities of the past" (in Brick, 2008, p. 8). Dewey recognized nurture and environmental influences on learning as more decisive than innate gifts. These influences would continue to favor the children of the wealthy rather than foster equity unless redressed by government (Brick, 2008).

According to Dewey's (1944/1916) vision of equity, equal educational opportunity implied governments not only would provide access to learning but also compensate for the differences on basis of environmental inequality. This concept is incorporated into the second principle of equity,

² This section draws on and revises that work.

vertical equity, which holds that children in dissimilar circumstances can be treated differently but only for legitimate and justifiable reasons. This was later given voice by John Rawls (1971) in *A Theory of Justice* through what he called the Difference Principle. It held there should be no differences between individuals unless they favor the less fortunate. According to Rawls (1971):

All social primary goods – liberty and opportunity, income and wealth, and the basis of self-respect – are to be distributed equally unless an unequal distribution of any or all of these good is to the advantage of the least favored. (p. 303)

The third principle of equity, equal opportunity, is defined by *wealth neutrality*, a negative principle. It holds that the quality of a child's education should not be a function of wealth other than the wealth of the state as a whole. It is intended to provide a fair competition and equitable resources for all children regardless of their family's circumstances – a point that was underscored at the founding of the nation.

Equity Studies

Overtime, equity studies of state public education finance systems have been performed although the methodology has been varied, with few studies incorporating the key principles of equity as a guide. Studies of Nevada education finance have also used various methods and mixed findings have resulted. Augenblick, Palaich, and Associates (2006) performed an adequacy study of Nevada's school finance system that contained a brief review of equity in the final chapter of the report. Descriptive statistics were calculated, together with the coefficient of variation, for actual spending and spending adjusted for weighted students, with and without a "Location Cost Metric" (LCM). The LCM adjusted funding for differences in the cost of living between school districts. Findings indicated that the coefficient of variation was poor (0.473) for actual student spending but dropped (0.235) for weighted students and (0.283) for weighted students when the Location Cost Metric was added to the analysis. The analysis deleted districts with 5% to 10 % of the students, which, the authors stated, makes the system "appear to be almost perfect with a [very low] coefficient of variation" (.031) (Augenblick, Palaich, & Associates, 2006, p. 106). Because of the deletion of the smaller, wealthy districts, containing 5% to 10% of students, questions remain concerning the equity of the finance system for all school children in Nevada.

Baker, Sciarra, and Farrie (2012), in "Is School Funding Fair? A National Report Card," graded the states in four areas: Funding level, funding distribution, state effort and coverage. The category, funding distribution, examined school funding in relation to poverty concentrations with adjustments for regional wage variations and district size/density. Although the data lag considerably, the study provided important information on support for students in poverty. Nevada was the only state to receive an "F" on funding distribution in both years of the report. However, questions persist about the equity of the system for all students.

Another 50-state review, by Editorial Projects in Education (2013), graded the states on finances including equity, using four statistical measures: the restricted range, coefficient of variation, McLoone Index and wealth neutrality. Funding for students with disabilities and low income acknowledged higher costs (additional 90%, 20%, respectively) and regional differences in the cost of education were included. Nevada's grade was a "D" with only one state below it that received a D- (Idaho). The analysis is useful and includes several measures of equity together with important adjustments for cost and need. However, it appears that the object of analysis is school districts rather than districts weighted for student population, and no weight for English Language Learners (ELL) was included. These are important factors in Nevada given the wide variations in district size and large numbers of ELLs. How would Nevada rank if these factors were included?

Recently, an equity analysis addressed this question, and provided population-weighted statistics by district, with adjustments for student needs (including ELLs, low income and special

education) and sparsity. It found high inequity in the system that was linked to local ability-to-pay for schooling, thus compromising equity for the state's nearly half a million public school students (Verstegen, 2013). However, the study did not employ a cost-of-education factor, which is needed, given the high diversity of the state. This research builds on that study by providing a comprehensive analysis of equity, which employs a cost of education factor in addition to population and need weighted adjustments to state and local funding for public education.

Nevada State School Finance System

The system for funding elementary and secondary education in Nevada is called the Nevada Plan. It is a foundation program with adjustments for size, wealth and transportation (Legislative Counsel Bureau, 2011). Over 90% of the states finance education using a foundation program. A per pupil funding guarantee, referred to as 'basic aid' (\$5,192 per pupil) in Nevada, is provided by the state. Localities contribute to this amount through uniform taxes. Wealthy school districts raise more funds and less affluent school districts raise less. The state makes up the difference in locally raised funds and the state guarantee.

State aid is provided through Nevada's Distributive School Account (DSA); local sources include a property tax (.025 per \$100 assessed value of property) and a 2.25% sales tax, also called the Local School Support Tax (LSSI). Special student needs are recognized through supplementary funding for special education, based on a provision added in 1973, but there is no additional state assistance for children that are low income, ELLs or gifted and talented. Several funds are added to basic aid including local ad valorem taxes (property tax) at 50 cents per \$100 assessed value of property, motor vehicle privilege tax, unrestricted federal revenues, adult high school diploma funding and miscellaneous revenues. Capital outlay is locally funded.

Nevada is highly diverse. It has 17 school districts with boundaries coterminous with county lines that vary in size from over 300,000 students in Clark County, which contains Las Vegas, to fewer than 70 students in Esmeralda. Of the nearly 440,000 students, 48% are low income (eligible for federal free or reduced price lunches), 20% are Limited English Proficient, and 11% are in special education. Esmeralda and Pershing County have over 60% low income students. Esmeralda and Clark County (with Las Vegas) also have high percentages of the student population that are ELL. Esmeralda, Pershing and Clark Counties have large populations of special education students – well over the 12% national average (Nevada Report Card, 2010-11).³

Total state support of school districts and charter schools is \$2.505 billion (Legislative Counsel Bureau [LCB], 2011). Funding is derived from the state General Fund, comprised mainly of state gaming taxes (23.6%) and sales and use taxes (28.3%). Over half of general fund expenditures is directed to education, including the Nevada system of higher education (15.3%) and K12 public schools (37.5%) (LCB, 2011).

Nevada's average funding per pupil from all sources is \$7,946, well below the national average of \$11,305 (National Education Association [NEA], 2011). Total funding for elementary and secondary education is drawn from federal (8.0%), state (34.2%), and local funding (57.8%) (NEA Research, 2013). This compares to the national average of 11.3%, 45.5% and 43.2% for federal, state and local funds, respectively, indicating that state support is lower than average in Nevada and well below the 50% recommended by experts.

Table 1 shows district funding allocations for special populations and by allocation category: instruction, instructional support, operations and leadership. Note that all districts devote about

³ Only special education was funded at the time this research was performed. Recently the legislature funded English Language Learners and full day kindergarten for low income students.

60% or more to instruction, except Esmeralda (48.8%), a small and isolated district in the Southwestern portion of the state, where operations account for a higher (41.6%) than average (21.4%) portion of funding, likely for fixed costs and transportation that is used to take students to the next county for high school. Operations funding is also high in Eureka (24.2%) but relatively low in Washoe County, containing Reno (17.8%), and Carson City (17.2%). Leadership funding is varied; Clark County spends about 7.3% on leadership but it ranges from 4.7% in Carson City to 12.1% in Lincoln.

The Nevada finance system was created in 1967 when the state was rural with little diversity. Since that time nearly everything has changed but the funding policy for public elementary and secondary schools has remained largely the same.

Table 1
Spending Allocations and Special Needs Students by District

	Spending Allocation				Special Needs		
	Instruction %	Support %	Operations %	Leadership %	IEP %	LEP %	FRL %
State	60.1%	10.9%	21.4%	7.5%	10.8%	20.0%	47.9%
Carson City	64.1%	14.0%	17.2%	4.7%	10.3%	17.8%	43.8%
Churchill	65.1%	12.1%	16.6%	6.1%	14.3%	6.6%	45.4%
Clark	64.8%	9.6%	18.4%	7.3%	10.2%	23.0%	50.8%
Douglas	63.2%	10.3%	19.9%	6.6%	11.3%	4.8%	35.1%
Elko	62.7%	10.7%	20.2%	6.5%	10.0%	10.7%	35.7%
Esmeralda	48.8%	9.6%	41.6%	n/a	n/a	25.8%	66.7%
Eureka	60.8%	9.5%	24.2%	5.6%	7.9%	n/a	25.9%
Humboldt	65.8%	9.2%	17.8%	7.1%	14.2%	11.8%	37.9%
Lander	64.3%	12.7%	15.8%	7.2%	10.9%	9.6%	25.2%
Lincoln	65.3%	5.8%	16.8%	12.1%	8.1%	n/a	49.2%
Lyon	59.8%	13.1%	20.0%	7.1%	13.4%	6.8%	46.4%
Mineral	61.3%	9.4%	20.4%	8.8%	15.3%	n/a	47.2%
Nye	61.1%	10.0%	22.5%	6.5%	15.4%	7.6%	54.6%
Pershing	63.0%	11.1%	20.4%	5.4%	14.5%	7.8%	63.8%
Storey	58.3%	9.8%	20.5%	11.4%	19.3%	n/a	5.6%
Washoe	62.4%	13.2%	17.8%	6.6%	13.0%	17.4%	44.5%
White Pine	54.3%	14.1%	22.5%	9.0%	12.0%	3.5%	32.6%

Source: Nevada Report Cards (2011)

Note: IEP=special education, LEP=English Learner, FRPL=free/reduced lunches e.g., low income; n/a=not available

Methodology

The conceptualization and measurement of equity in school finance was elucidated by Berne and Stiefel in their seminal work (Berne & Stiefel, 1984). The Berne and Stiefel (1984) framework for doing an analysis of equity is responsive to the following questions: who, what, how and how much (Table 2). It is employed in this research with two additions – the first is the addition of need adjusted dollars to the object of analysis, which recognize new research on the cost of special student programs and services; the second adds a measure for the upper portion of the distribution to the univariate summary statistics, the Verstegen Index (Verstegen, 1996).

This research provides an analysis of equity and responds to the questions raised by Berne and Stiefel (1984) by focusing on children rather than taxpayers; using price, need, and size adjusted dollars for analysis; and employing 15 quantitative statistics and four relationship statistics.

Horizontal and vertical equity, and equal opportunity principles, are incorporated into the analysis; to determine equity. The analysis quantifies funding/opportunity gaps and determines whether they are linked to illegitimate factors, in this case, local (not state) funding for education. A linkage to local funding would indicate that equal opportunity is lacking. Recently, attention has turned to the relationship between funding gaps and the opportunity gaps that have real and important impacts on student outcomes (Carter & Welner, 2013). This research focuses on funding and opportunity gaps. The object of analysis is funding, the meta-variable that purchases opportunity and other resources such as teachers, leadership, special programs, materials and class sizes. State and local revenue is included with transportation, capital outlay and federal aid deleted, as is customary (Berne & Stiefel, 1984).

Table 2
A Summary of Alternative Equity Criteria

Component of Equity Concept	Measures	Alternative for Each Component	
Who? The Group		Children	Taxpayers
What? The Object	Inputs -Dollars -Price adjusted dollars -Need adjusted dollars -Physical resources	Outputs -Student Achievement -Behavioral output measures	Outcomes -Earning potential -Income -Satisfaction
How? The principle	Horizontal Equity -Equal treatment of equals; minimize the spread in the distribution	Vertical Equity -Unequal Treatment of unequals; more objects to the needier	Equal Opportunity -No discrimination on the basis of property (local) wealth in school district or other categories: minimize undesirable relationships
How Much? The summary statistic	Univariate Dispersion -Range -Restricted range -Federal range ratio -The McLoone Index -The Verstegen Index -Coefficient of variation -Gini coefficient -Atkinson's index -Theil's measure		Relationship -Simple Correlation -Simple Slope -Quadratic Slope -Cubic Slope -Simple Elasticity -Quadratic Elasticity -Cubic Elasticity -Constant Elasticity -Adjusted relationship Measured from Quadratic Regression -Adjusted Relationship -Measure from Cubic -Regression -Implicit Weight -Averaged Implicit -Weight

Source: Adapted from: Berne and Stiefel (1984, p. 9). Bold added.

Equity is a multidimensional concept thus multiple measures are utilized to evaluate the equity and wealth neutrality of the finance system, based on research and best practice. Table 3 includes a summary of the fiscal equity statistics and provides a brief description of each together with an equity target. For *horizontal equity* five criteria are included in the analysis. They are measures of: a) the extremes--the range, restricted range, and ratios of each, b) all objects of analysis – the coefficient of variation, Gini coefficient, Thiel Index, c) the upper half of the distribution – the Verstegen Index, d) the lower half of the distribution – the Atkinson and McLoone Index, e) other – the Federal Range Ratio. As these statistics increase, equity decreases (except for measures of the lower portion of the distribution, which increase with increasing equity including the McLoone Index and Atkinson Index).

Table 3

Measures of Fiscal Equity and Target Values

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1. The Range--The range in revenue is the difference between the highest and lowest revenue per pupil in the state. As the range decreases, equity increases.
 2. The Restricted Range--The restricted range is the difference between the revenue per pupil at selected percentiles, for example, the difference in revenue per pupil at the 95th percentile and 5th percentile. As the restricted range decreases, equity increases. Values of 1.25 or less are preferred.
 3. The Federal Range Ratio--The federal range ratio is the difference between the per pupil revenue at the 95th and the 5th percentile, divided by the value at the 5th percentile. As the Federal range ratio decreases, equity increases. Values of 0.25 or less are preferred.
 4. The Coefficient of Variation (CV)--The Coefficient of Variation is the standard deviation of a distribution divided by the mean, expressed as a percentage. The CV measures variability in a revenue distribution around the mean observation. As the CV decreases, equity increases. Values of 0.05 or less are preferred.
 5. The Gini Index--The Gini index indicates how far the distribution of revenue is from providing each proportion of pupils with equal proportions of revenue. This measures ranges from 0-1. As the Gini decreases, equity increases. (see also, Thiel Index). Values of 0.05 or less are preferred.
 6. The Verstegen Index--This index measures equity for the upper half of the revenue distribution only. It is expressed as the ratio of the actual revenue of all pupils above the median relative to the total revenue those pupils would receive if they were at the median. In practice, the Verstegen Index ranges from 1 to 2.0 (theoretically to infinity). As the Verstegen index decreases, equity for the upper half of the revenue distribution increases. Values of 1.05 and lower are preferred.
 7. The McLoone Index--The McLoone index measures equity for the lower half of the revenue distribution only. It is expressed as a ratio of the actual revenue of all pupils below the median relative to the total revenue those pupils would receive if they were at the median per pupil revenue level in the state. The McLoone index ranges from 0 to 1. As the McLoone index increases, equity for the lower half of the distribution increases. (see also, Atkinson Index). Values of 0.98 or higher are preferred.
 8. The Simple Correlation – The correlation indicates the relationship between per pupil revenue and a locality's wealth i.e., fiscal capacity. As the relationship between wealth and revenue decreases, equity increases as does fiscal neutrality.
 9. Regression – The percentage of variation explained in per pupil total state and local revenue (the dependent variable) by local per pupil property wealth i.e., ability-to-pay (the independent variable). As the coefficient of determination decreases, equity increases, as does wealth neutrality.
 10. Slope--The slope indicates the magnitude of the relationship between a locality's per pupil ability-to-pay i.e., wealth, and revenue for education, in absolute terms. As the slope decreases, equity increases as does fiscal neutrality.
 11. Elasticity--Like slopes, the elasticity specifies the magnitude of the relationship between revenue and local ability-to-pay i.e., wealth, but in terms of percentages rather than absolute units. The elasticity statistic is insensitive to equal percentage additions whereas the slope is not. As elasticity decreases, equity increases as does fiscal neutrality.
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Bivariate measures examine the relationship between local wealth (i.e. property and sales) and state and local education funding, to determine wealth neutrality. There should be no relationship between these factors if a funding system is wealth neutral. The correlation, regression,

slope and elasticity are used to calculate *wealth neutrality*. As these statistics increase, wealth neutrality decreases.

Vertical equity is incorporated into the analysis by weighting students according to research-based cost differentials associated with the excess cost of their special needs/programs, particularly for individuals in poverty (low income), students with disabilities, and ELLs. A weight is the ratio of excess costs above the base to the basic per pupil funding amount. Research on the excess cost of education for children in special education indicates that an additional 90% is required above average funding used to educate the typical general education student without disabilities. Adding spending for school facilities to the excess cost of educating students with disabilities, the additional cost is 108% (Chambers & Parrish, 2004). Thus, a special education student would be weighted between 90% and 108%. For this study, the midrange, 100%, was used. Students with disabilities are counted as 2.0; first as a general education student (1.0) and then as a special education student (1.0). A separate weight was not included for gifted and talented students because they are included in special education.

Research on the excess costs of educating low income children and children who are Limited English Proficient (LEP) varies. Baker (2005) finds that LEP costs are 100% more, with a range of an additional 35% to over 100%. Alexander and Wall (2006) provide data showing that excess costs for low income children vary between an additional 25% and 250% while pointing out that low income may be long-term and intense versus an annual fluctuation thus raising questions about the use of a single weight. In their study, an excess cost of 100% was employed (Alexander & Wall, 2006). This study uses a midrange estimate of an additional 50% for children who are low income, as measured by federal free and reduced price lunch eligibility, as is the customary eligibility criterion. A 50% weight is also used for ELL students as there is a paucity of evidence to indicate that costs vary substantially between these populations.

Size can also impose higher costs for districts that are very small and very large, due to diseconomies of scale. Nevada employs an adjustment to the finance system based on size that modifies teacher allotments and salaries. Students in very small districts (Eureka and Esmeralda) were weighted 25%, the amount that very small district adjustments for salary vary from small district adjustments. However, allocations of teachers could not be disentangled from the funding variable indicating some legitimate variation is still present in the data.

Finally, a comparable wage index (CWI), developed by Taylor (2014), is used to address differences in the cost of education across the state. It measures geographic variations in the cost of education by calculating systematic variations in the earnings of workers who are college educated but are not educators. According to Taylor (2006),

If states were successfully directing additional resources to school districts in high-cost environments, then measured inequality within states should fall when differences in purchasing power are taken into account. (p. 349)

The analysis uses weighted pupils to address vertical equity and then proceeds using univariate and bivariate measures to calculate equity, simultaneously producing a horizontal and vertical analysis in a single procedure. The aim is to capture illegitimate variations in funding – opportunity gaps – among districts within the state.

Data Sources

Data are drawn from multiple sources available in the field. Student counts are found in the state report cards (Nevada Report Card, 2011). Tax base information for localities is available from the Nevada Department of Revenue (2011) including both the district property tax base and sales taxes, given the funding system considers both local revenue sources in the calculation of state aid.

Revenue (expenditure) information was obtained from the State Department of Education (NRS 387.303, 2011); it includes state and local funding but not capital expenditures, transportation or federal aid. Under the law, federal aid must supplement not supplant state and local sources; it should not be included in the analysis of equity. Transportation funding is deleted from the revenue variable, as is customary. The cost of education index used was taken from data available on-line (Taylor, 2014).

For special student needs, that generate higher costs for programs and supports, student weights are used that reflect research-based costs and best practice: low income (0.50), ELLs (0.50) and special education (1.0). The weights reflect an understanding that ELL and low income students require separate interventions and therefore should not be combined into a single weighted-cost category.

In addition to adjusting for high cost students and sparsity, all statistics reflect the *size* of the school district and were weighted for the student population in each district. This is a critical adjustment for Nevada public schools given the diversity across the state. A district that has 70% of the state's students, i.e. Las Vegas, influence the resulting statistics by 70%. In sum, a district's statistical data were weighted by its population to account for the number of students in the school district; additionally they were weighted for sparsity and student needs.

Finally, because the State of Nevada has a majority of the students located in the school district with the lowest funding in the distribution, the equity statistics based on the median – McLoone Index and Verstegen Index – could not be calculated. The Clark County school district, containing Las Vegas, enrolls about 70% of the students in Nevada, making its per-pupil spending the statewide median. It also has the lowest funding per pupil. Thus, funding in the district with the median student cannot be compared to funding for students in districts below the median – all students are within the same district with the same value. Equity statistics compare funding between school districts within a state, not funding between schools within a district. As result of the configuration of Nevada districts, a proxy for the McLoone Index, the Atkinson Index with high values of “I” is calculated to determine spending for the lower *portion* of the distribution.

All statistical calculations were performed using SAS with weighted student disparity statistics programmed by student population size to determine equity analysis for four data sets: the baseline analysis, a variation that includes student weightings for special needs, an analysis that includes a sparsity adjustment together with weighted students and a final data set that employs a cost of living adjustment, student weights and sparsity. All data are for fiscal year 2011, a time when Nevada was still experiencing the effects of the Great Recession, suggesting a compression of funding variances (Verstegen, 2013). It is also the latest year that all data elements are available for analysis.

Findings

Table 4 provides the results of the analysis, for four data sets/models: baseline, weighted pupils, weighted pupils and sparsity, and weighted pupils, sparsity and a cost of education index. In all models, the range in spending per pupil is unusually large displaying what may be referred to as “savage inequalities” (Kozol, 1999). Even when weighted pupils are used in the analysis, the annual difference between the highest and lowest funding among school districts is \$65,871 *per pupil*, still less than the baseline of \$78,621 *per pupil*. When the sparsity adjustment is added, the variation drops to \$51,780 per pupil – this is still extremely high but an improvement from the baseline. Overall, some localities have 14 to 20 times more funding per pupil than other localities. This is the highest variation for the range evidenced in the extant research across states to date.

Surprisingly, adding the cost of living adjustment *raises* the variation in measured equity. Funding at the extremes, the range, is an alarming \$74,203 per pupil, per year. In all cases, the lowest funding is found in large, urban areas; the highest funding is found in small, isolated school districts. For example, funding is \$3,816 per weighted pupil in Clark county and \$4,570 in Washoe county, compared to \$78,019 in Eureka and \$17,043 in Esmeralda. The restricted range ratio across all models indicates that when 5% of pupils are removed from both tails of the distribution, disparities fall between 1.29 (baseline) to 1.64 per weighted pupil (weights, sparsity, CWI). This is a substantial reduction from the range but remains unacceptably high by most standards.

Table 4
Univariate Measures of Fiscal Disparity: Funding Disparities Among Students in Nevada Public School Districts

Measure:	Baseline	Base & Weight	Weight & Sparse	Weight & Sparse & CWI (b/ Taylor [n.d.])
Range	\$78,621	\$65,871	\$51,780	\$74,203
Ratio	14.56	17.72	14.14	20.45
Restricted Range	\$1,691	\$1,659	\$1,659	\$2,442
Ratio	1.29	1.42	1.42	1.64
Federal Range Ratio	.29	.42	.42	.64
Mean	\$6,184	\$4,249	\$4,242	\$4,262
Median	n/a	n/a	n/a	n/a
Coefficient of Variation	0.3369	0.3784	0.3163	0.4415
Gini Index	0.0539	0.0625	0.0609	0.0885
Theil Index	0.0222	0.0267	0.0224	0.0384
Verstegen Index (a/)	n/a	n/a	n/a	n/a
McLoone Index (a/)	n/a	n/a	n/a	n/a
Atkinson Index:				
I8	0.9673	0.9597	0.9611	0.9355
I10	0.9636	0.9553	0.9568	0.9291
Enrollment; weighted enrollment	422,838	615,238	615,238	615,238
Number of Districts	17	17	17	17

Notes: a/ Cannot be calculated, Clark County school district has the lowest funding; it enrolls the over 70% of students in Nevada, making its per pupil spending the statewide median. Thus, no comparison of funding for districts below the median to the median is possible and neither the Verstegen Index, nor the McLoone Index can be calculated because they are based on the median funding amount.; b/ Taylor, L. (n.d.) Retrieved February 13, 2014 from [http://bush.tamu.edu/research.faculty/Taylor CWI/](http://bush.tamu.edu/research.faculty/Taylor%20CWI/). The Bush School of Government and Public Services. Texas A& M University, 4220, TAMU, College Station, TX.

For example, the federal Impact Aid standards from the U.S. Department of Education use a restricted range of 1.25 or less as the basis for determining an equitable distribution of funding within a state (ESEA Title VIII, Section 8009). States with a restricted range ratio of 1.25 or lower may reduce state aid payments to localities by the amount received under impact aid. However, when the restricted range ratio is above 1.25 the state may not reduce funding to localities based on

Impact Aid payments.⁴ Therefore, these results indicate that Nevada cannot reduce state aid payments by the Impact Aid amount localities receive given high disparities in funding.

The coefficient of variation (COV) for Nevada also is high. About two-thirds of all pupils are within a band of 32% to 44% of average per pupil funding. This is well above the 5% value that is in the preferred target range of values for the COV. The Gini Index is above the 5% or less preferred value in all cases but approaches the target for the baseline; and the Theil Index, is highest for the model including sparsity. The Atkinson's Index with high values of I, which measures equity for the lower portion of the distribution, is less than the desirable target of .98, ranging from .92 (weights, sparsity, and CWI) to .97 (baseline). Overall, the univariate statistics show systemic inequalities with the widest variation at the top of the distribution – the top 5% of school districts as suggested by the range versus the restricted range values.⁵

In addition, the analysis examined wealth neutrality using bivariate measures to determine the relationship between funding for education and local ability-to-pay for education, including property, net proceeds of mines and sales taxes (Table 5). There should be no relationship between these factors if the system is wealth neutral. The correlation coefficient is high, ranging between .92 and .94. This is a strong and positive relationship, i.e., as local ability to pay for education rises, so does funding. The regression shows that funding can be predicted accurately about 84% to 89% of the time, if local wealth is known. Again, this is high and statistically significant in all cases ($p \leq .0001$). The magnitude is also high as indicated by the elasticity: for every one-percent change in local wealth, funding rises over one-half of one percent. Overall the bivariate data indicate that the system is not wealth neutral and the quality of a child's education is a function of local, not state, wealth. Equal educational opportunity is abridged for children and youth in the Nevada by the inequitable state funding system.

Table 5
Bivariate Measures of Fiscal Disparity

	Baseline	Base & Weights	Base, Weights Sparse	Base, Weights Sparse CWI
Correlation (r)a/	0.9369	0.9421	0.9229	0.9178
Regression (r^2)	0.8777	0.8887	0.8517	0.8423
Slope	0.0108	0.0110	0.0090	0.0125
Elasticity	0.5464	0.5577	0.5544	0.6501
Probability	≤ 0.0001	≤ 0.0001	≤ 0.0001	≤ 0.0001

a/ Funding and local wealth (property tax base, net proceeds of minerals, sales taxes (2.6%).

⁴ Federal funding for Impact Aid provides assistance to localities in lieu of property taxes for children of families living or working on federal land who send their children to school but do not pay local property taxes.

⁵ Recall Clark County is at the bottom of the funding distribution with 70% of the students, indicating no variation when 5% are removed; thus the restricted range difference from the range is due to changes in the top of the distribution.

Discussion

This research examines opportunity gaps through an investigation of school finance equity in a western state in the United States of America. Multiple statistical measures that encompass diverse notions of equity were utilized including descriptive and inferential measures. The framework for examining equity was adopted from Berne and Stiefel (1984), with the addition of weighted pupils and a measure for the upper portion of the distribution. The inquiry was guided by three principles defining equity: horizontal and vertical equity, and equal opportunity. The object of analysis was per pupil funding for elementary and secondary public education adjusted for high cost students, district enrollment and sparsity. The data were also adjusted by a cost of education index, the comparable wage index (CWI), that accounts for the geographic variation in wages across the state that are outside the control of the school district. The goal was to capture illegitimate variation and determine whether it was linked to local (not state) wealth, thus abridging equal opportunity.

Study findings show systemic inequalities and wide disparities in revenue for schools that are linked to local wealth. A key finding of the study, the range in spending among local districts is over \$74,000 per pupil, was most disturbing. Funding supports opportunities (e.g., for quality teachers, smaller class sizes, instructional materials, administrative leadership, support systems and programs), which can and do make a difference to children in schools and classrooms (see Carter & Welner, 2013). Recent research shows that funding gaps are linked to opportunity gaps, which can effect achievement and ultimately life successes (Darling-Hammond, 2013). This study finds that opportunity gaps are extensive and favor wealthy districts in the Silver State. Poor districts, with low funding have about 14 to 20 times less funding available for educating students than do wealthy districts within the state. This is the highest variation for the range evidenced in the extant research to date.

Importantly, the widest variations in support across all districts are for the funding model analyzed that adjusts for the cost of education across the state, in addition to special need students, size and sparsity. This is unexpected as research suggests that a cost of education index would reduce the measured inequality between school districts (Taylor, 2006). While more research is needed to isolate the cause of this phenomenon, Taylor explains two scenarios where greater disparities may occur after adjusting for the cost of education. First is when a state is directing more resources to a low-wage market even if the state was perfectly equalizing the purchasing power for districts with comparable demographics. Second, even if the state was equalizing purchasing power, if low wage areas have more low-income students, variations would increase. Both scenerios are plausible. Currently the state does not equalize based on comparable demographics or purchasing power. Moreover the largest cities with the lowest funding have the highest numbers of low income students.

This suggests a need for state policy in several areas including assistance directed to low income students – something that is missing in current policy. Additional (weighted) funding for special needs students, including low income, ELLs, and special education students (including gifted and talented), was also recommended in a recent legislative study, *A New Method of Funding Public Education in Nevada* (Chambers, Levin, Versteegen, Jordan, & Baker, 2012). This research supports that recommendation given there were reduced disparities when weights were employed for these students in the analysis. The legislative study also called for research-based adjustments for small and sparse districts and an adjustment for uncontrollable geographic variations in wages across the state. The Comparable Wage Index, used in this research, provides such an adjustment but the research indicates that multiple, systemic changes need to occur together if equity is to improve.

Questions are also posed concerning the adequacy of the funding system as well as its equity, with very low funding per weighted pupil available in large, urban districts, containing over 88% of the student population. This may constrain the ability of the district to provide a sufficient education for all students under the Common Core State Standards that are currently being implement in Nevada (as well as about 40 other states). Most importantly, inadequate funding may abridge the opportunity for a quality education for urban children and youths with implications for graduation and future life chances.

The study findings are significant because a comprehensive equity analysis that includes a cost of education index has not been completed in the State of Nevada, despite the fact that equity is a major goal of the education system and education is a “basic constitutional right” in the Silver State (*Guinn v. Angle*, 2004). The Nevada constitution states that the “legislature shall encourage *by all suitable means* the promotion of intellectual, literary, scientific, mining, mechanical, agricultural and moral improvements....” (emphasis added). The Nevada Constitution also states that the legislature shall provide for a *uniform* system of common schools.... (emphasis added). This research finds that these constitutional commands are not being met. The funding system is not uniform and equal opportunity is a function of local wealth – not state support – which is the responsibility of the legislature under the Constitution. Whether the judicial system will be called on to remedy this situation remains to be seen. Nevada is only one of five states in the nation where the courts have not reviewed the funding system to determine its constitutionality. Hopefully, this study will result more attention to the fairness and adequacy of the school finance system, and a focus on equal opportunity for all children – rich, poor, special needs, gifted, rural and urban. This is crucial in Nevada, which has ‘savagely inequalities’ in funding and a lack of equal opportunities for children and youth, along with the highest drop-out rate and lowest per pupil funding among the 50 states in the nation (NEA 2013).

In sum, to close the opportunity gap and create equal opportunities for all children to learn at high levels, a New Finance is required. Although much is needed, as discussed previously, the New Finance would provide systemic change and would consist of at least three broad elements. First, funding structures would be linked to rigorous curriculum standards and assessment systems creating equal opportunities to learn. The implementation of the Common Core State Standards and assessments indicate that the time is ripe for the development and alignment of Resource Standards, assuring all school districts have sufficient funding to teach to high standards. School finance reforms and curricular reforms work more effectively together than either would alone. Next, high numbers of children in poverty suggest finance policies should be linked to services for needy children and families dealing with e.g., health, welfare, medical and dental services, juvenile justice, and social and rehabilitative services. This would extend the reach of reform beyond the classroom to address the multiple and interlocking needs many children bring with them to school that create effective obstacles to learning. The final set of linkages is between education policies and targets for equity and adequacy to guide and drive policy. This study provides research findings and equity targets that may serve as benchmarks. Equity targets would gauge the effect of change over time with the goal of creating a more just and equitable education system for the future.

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