



The Economic Consequences of Insufficient Child Care on Working Families across Tennessee

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Acknowledgements

About this Report

This report was commissioned by Tennesseans for Quality Early Education (TQEE), and incorporates survey data from Zogby Analytics.

Tennesseans for Quality Early Education is a statewide, bipartisan nonprofit that unites business, elected leaders, law enforcement, faith, education and civic organizations, and people in communities across Tennessee to make high-quality early learning, birth through third grade, an urgent policy priority.

Dr. Clive Belfield, Ph.D. is a Professor of Economics at the City University of New York and an Economist with the Center for Benefit-Cost Studies in Education, Teachers College Columbia University.

Zogby Analytics was commissioned by TQEE to conduct a new survey of Tennessee parents with a child under age 5. The survey is large-scale, new (administered June 8, 2019 through July 9, 2019), and has a sampling frame that matches to Tennessee household demographics (race, age, family size), labor market conditions in Tennessee (earnings, sector of work), and regional populations. Based on a confidence interval of 95%, the margin of error for the 2,330 surveys is +/- 2.0 percentage points.

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Hyde Family Foundation	The Urban Child Institute

This report builds on a similar national report by ReadyNation – Council for a Strong America issued earlier this year. We deeply appreciate the generous collaboration of the ReadyNation organization, and the Pritzker Children’s Initiative which funded their report.

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Executive Summary

Many working families in Tennessee do not have access to the child care they need when their children are very young. Each year the parents of nearly 200,000 Tennessee children under age 5 struggle to find suitable child care to support their employment and career advancement. Inadequate child care acts as a barrier to worker productivity and to economic growth.

Using new statewide survey data and economic analysis, we calculate substantial economic losses when families of children under age 5 do not have adequate child care. These families report reduced time at work, less productive work, and diminished career prospects. Almost every family with young children is affected.

Each year:

- Tennessee's working parents of children under age 5 lose on average \$4,690 in lost earnings, in reduced productivity at work, and in more time looking for a good job. The aggregate annual loss is \$850 million.
- Tennessee Businesses lose on average \$1,470 per working parent of a child under age 5 in reduced revenue and in extra hiring costs. The aggregate annual loss is \$270 million.
- Tennessee Taxpayers lose on average \$1,190 per working parent of a child under age 5 due to lower tax revenues. The aggregate annual loss is \$220 million.

Over the long term:

- Tennessee working parents lose on average \$16,020 due to lost earnings, reduced participation in the labor market, and in lower returns to experience.
- Tennessee businesses lose on average \$2,730 per worker due to reduced revenue and in extra recruitment costs.
- Tennessee taxpayers lose on average \$3,570 per working parent in lower federal and state/local tax.

Using local data, we also show how the burdens vary for six regions across Tennessee. The impacts and economic burdens vary by region but for each region the consequences of inadequate child care are significant.

For Tennessee, inadequate child care has substantial and long-lasting consequences, with effects felt by families, businesses, and the state's taxpayers.

1 Work and Child Care

Families in Tennessee need high quality, affordable child care. There is compelling evidence that this care helps children develop and thrive. However, child care also allows families to participate in the labor force. At a minimum, this care frees up parental time to work and secure training in new skills. But, to be most helpful, child care needs to be accessible, affordable, and of sufficient quality so parents can build successful careers and contribute to the state's economic vitality.

For families, decisions about child care are also decisions about work. Nationally, 60% of households give the primary reason for child care as “to provide care when a parent is at work”; and almost 90% of households emphasize that reliability—child care that allows them to meet work commitments—is “very important” (Corcoran and Steinley, 2017). The type of child care options families have strongly affects their work options.

Many families in Tennessee have a hard time finding suitable child care. State-wide, nearly half live in a “child care desert” (a region with less than one licensed child care slot for every three young children).

When families cannot secure the child care they need, their work opportunities are undermined. Family incomes are lower, workplace productivity falls and economic activity is reduced. Businesses suffer and tax revenues are lower. By helping working families, high quality child care boosts the economy. Inadequate or limited child care, by contrast, imposes burdens on workers, businesses, and taxpayers.

In this Report, we present evidence on the impacts of inadequate child care on these three groups in Tennessee. This evidence is based on a new survey of families across the state, asking parents about their child care and their work. Also, by combining this new survey evidence with labor market and business data for Tennessee, we calculate the aggregate economic burdens of inadequate childcare. Our analysis identifies substantial economic consequences for all of Tennessee when families cannot access adequate child care.

We report Tennessee-wide estimates as well as estimates for six regions across the state: Chattanooga, Knoxville, Memphis, Nashville, Rural Southwest and the Tri-Cities. For each region, we report the impacts of inadequate child care on workers and calculate the economic consequences. Regional estimates show how access to child care affects work in local labor markets.

2 Working Parents Survey

We present findings based on a new survey of 2,330 working parents of children under age 5 in Tennessee. This large-scale survey, administered in July 2019, has a sampling frame that covers all working parents with young children across the state. (Appendix 1 describes the survey design).

Working parents with young children are distinct from the state population in terms of age and labor market participation. Specifically, parents of young children are themselves younger than the general population; and working parents are more highly educated (with higher incomes) than non-working parents. Also, these parents are active in the labor force (either employed or actively looking for work); approximately one-quarter of primary care givers are out of the labor force.

The sample of respondents in this survey broadly reflects the population of working parents with children under age 5 in Tennessee. (Appendix Table A1 compares the sample to the state population).

The characteristics of the survey respondents correspond to Tennessee state-wide characteristics. Education levels are similar (31% of the sample have at least a Bachelor's degree; across Tennessee's working families the rate is 26%), although the sample does not include many high school dropouts. Age groups and racial groups also match. Notably, the survey includes working families from across all regions of Tennessee; each county is represented at a rate close to its total population. Notably, the sample is predominantly female and is mostly composed of primary care-givers.

The work status of the survey respondents closely resembles those of comparable workers across Tennessee. Over 85% of the respondents are employed, with the remainder either in training or looking for work. Across the survey average earnings per person are \$770 per week; this is very close to the average across the state (at \$810 per week, age-adjusted). The sample respondents work 38 hours per week on average. The national average is slightly higher at 42 hours (unadjusted for family composition). Hourly wages of the respondents are very close to those of the Tennessee workforce: the mean for the sample is \$29; the mean for workers in the state is \$31 (adjusted for education levels and in 2019 dollars (BLS, 2018 a,b)).

The sample is also broadly representative of industry in Tennessee. The state's economy includes high proportions of workers in food service/agriculture; health care; finance/technology; professional/business; transport/logistics; and education (Tennessee Department of Labor and Workforce Development, 2019). The survey includes large samples of workers from each of these sectors.

Overall, the survey accurately describes the characteristics and circumstances of families with young children across all of Tennessee.

3 Child Care in Tennessee

The survey evidence shows high reliance on child care by working families. Table 1 shows rates of child care usage and parental views about their child care options.

More than a third of Tennessee families rely on formal center-based care, Head Start or school-based pre-K. This is comparable to national estimates derived from the National Household Education Survey of 2016 (Corcoran and Steinley, 2017). Many parents in Tennessee and nationally cobble together multiple arrangements or have child care that is informal, with 42% relying on family members for at least part of the time.

Most of the families report receiving no direct support for their child care needs, either from their employer or from the Tennessee Child Care Payment Assistance program. Fewer than one-in-seven families has access to either of these sources of financial support; and more than one-third report being dissatisfied with support from their employer with regard to their current child care arrangements.

As in national surveys, when asked about their biggest challenges in finding suitable child care, half of Tennessee parents report difficulty finding child care that is high quality; 63% cited affordability; and 65% cited access (such as finding care that has open slots or accommodates a work schedule outside M-F daytime hours).

Table 1
Child Care in Tennessee by Parent Group

Percentages	All working parents	Younger parents	Rural residents	Single parents
Center-based care (incl. pre-K, Head Start)	36	34	29	33
Use Tennessee Child Care Payment Assistance Plan	13	19	9	19
Employer provides financial support	14	17	8	13
Dissatisfied with employer support of child care	35	32	38	37
Difficulty finding child care that is:				
Affordable	63	61	62	63
High quality	49	47	49	47
Accessible	65	67	64	67
Observations	2,330	1,138	510	1,090

These state-wide patterns of child care are broadly similar across parents who are younger (aged under 30), located in rural areas, or are single parents. Notably, rural residents report much lower rates of financial support (either through the state Child Care Payment Assistance Plan or through employer benefits).

Table 2 shows the child care patterns by sector of the Tennessee economy. There are some clear gaps across sectors. On the positive side, workers in the health care and business/professional sectors are able to access some center-based care and do receive support from their employers. However, workers in the agricultural sector and, especially in the retail sector, receive much less financial support for their child care. Workers in these two sectors report much more difficulty in finding child care that is affordable, high quality, or accessible.

**Table 2
Child Care in Tennessee by Sector**

Percentages	All	Health	Transport	Agriculture	Retail	Business
Center-based care (incl. pre-K, Head Start)	36	40	33	26	31	41
Use Tennessee Child Care Payment Assistance Plan	13	12	16	18	10	19
Employer provides financial support	14	17	14	12	1	19
Dissatisfied with employer support of child care	35	39	39	36	41	30
Difficulty finding child care that is:						
Affordable	63	64	60	60	70	62
High quality	49	52	46	43	50	52
Accessible	65	70	61	68	70	64
Observations	2,330	534	269	343	165	504

4 How Inadequate Child Care Affects Workers

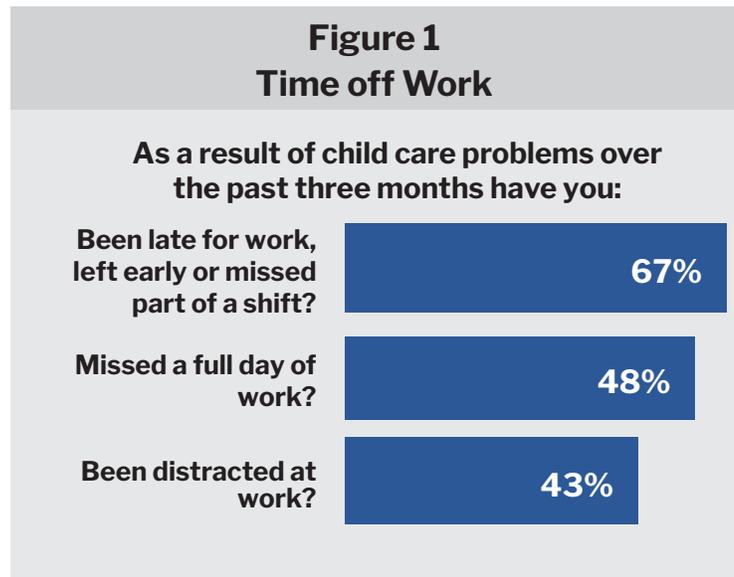
Families need child care that helps them be productive. If child care is inadequate, workers experience adverse economic impacts in terms of: time spent at work; work productivity and effort; and career opportunities. The survey responses clearly show how child care problems affect workers in each of these three ways. (For direct work time, respondents reported on impacts over the last three months. For work productivity and career prospects, the respondents reported on any impacts since their young child was born.)

Inadequate child care reduces the time and effort of parents at work.

Figure 1 shows how effort at work is disrupted because of child care problems over the past three months:

- Two-thirds of working parents report being late for work, leaving early or missing part of a shift.
- Almost half report missing a full day of work.
- Almost half report being distracted at work.

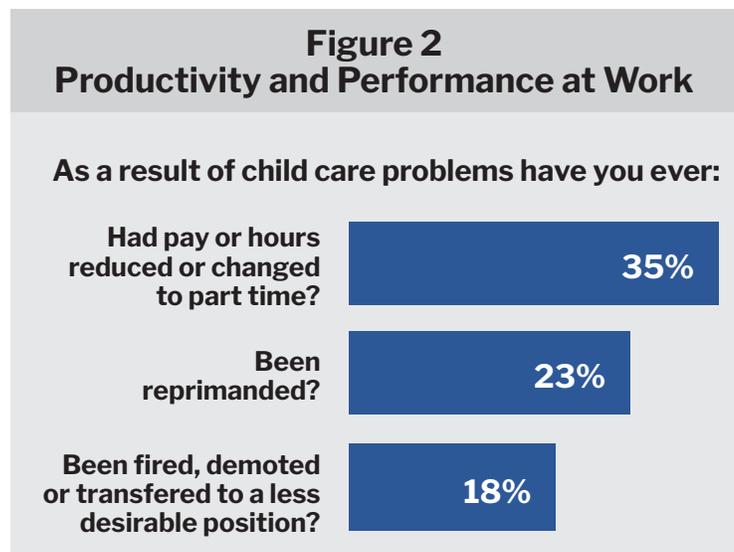
On average, parents in Tennessee whose child care was inadequate lost 3.1 hours per week of work time (approximately 7% of their effort across the work week).



Inadequate child care adversely affects workers' productivity and performance.

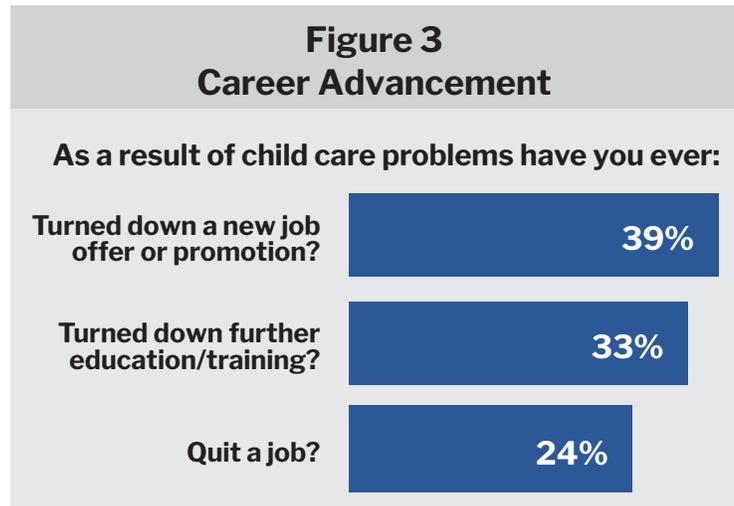
Figure 2 shows how the productivity and job status of working parents are negatively impacted because of child care problems:

- One-third of working parents had pay or hours reduced, or changed to part-time.
- Almost one-quarter report being reprimanded by a supervisor.
- Nearly one-in-five report the ultimate impact—being fired or demoted.



Inadequate child care diminishes workers’ career prospects. Figure 3 shows how the career opportunities of working parents are impaired and restricted because of child care problems:

- More than a third of working parents report turning down a promotion or new job offer
- A third also turned down opportunities for further education or training.
- A quarter actually quit a job due to child care problems.



The impact of inadequate child care is substantial; it influences workers’ time and effort commitments to their jobs, their ability to be productive when at work, and their future career opportunities. These influences are felt in different ways – fewer hours of work, more distractions, fewer promotions, and even job terminations. When the effects are aggregated, the survey shows that most workers face some disruptions or adversities. The effects are stronger for primary care-givers and for female working parents but they are high across all population groups in Tennessee.

Inadequate child care has a cumulative impact on almost all working families. For these working parents:

- Nine-in-ten report at least one adverse impact on their time and effort at work
- Almost one-half report impaired workplace productivity
- Two-thirds report diminished career prospects

The evidence for Tennessee is consistent with national evidence and survey evidence in other states. Notably, the high quit rate is identified in a 2016 National Survey of Children’s Health; it is also reported in a national survey of working parents. The rates of cumulative impact—and notably the quit rates—are very similar to those from national and state-level sources of evidence (Montes and Halterman, 2011; Davis et al., 2017; Talbert et al., 2018).

5 Impacts on the Tennessee Economy

When workers' time, productivity, and careers are impacted by low quality child care, there are adverse consequences across Tennessee. The boxes below show the main burden for working parents, Tennessee businesses, and taxpayers across the state.

Working Parents	Businesses	Taxpayers
<ul style="list-style-type: none"> • Lost earnings now (lower productivity/experience) • Extra cost of job search (to match work with child care) • Lost future career earnings (less experience, fewer skills) 	<ul style="list-style-type: none"> • Lost revenue now (lower output) • Extra workforce costs (disruptions/absences, hiring) • Lost future revenue (lower workforce capital) 	<ul style="list-style-type: none"> • Lost tax revenue now (lower incomes) • Smaller state/local tax base • Lost future tax revenue (weaker economic growth)

For individual workers and their families, the economic consequences from inadequate child care are clear and immediate. The primary consequence is reduced earnings; but there are additional losses in terms of more time spent looking for work that fits in with their child care arrangements. Importantly, with less training and less experience, working parents face constrained career prospects: this reduces their future earnings.

For firms and businesses, having a workforce with lower productivity and shorter tenure has economic consequences. A "churning" workforce can affect product quality, workplace morale, and customer relations. (Firms may pay workers less, but the offset is not complete: wages do not instantaneously and perfectly adjust; and firms would prefer more productive workers). Directly, firms must pay for recruitment, hiring, and induction as the workforce turns over; they also incur extra managerial costs if there are disruptions attributable to child care inadequacy. These output losses and extra costs are immediate; but there are future losses and costs when workers are not optimally trained and have too little experience.

For taxpayers, the economic impacts on individuals and businesses cause lower tax revenues. At the state level, there are losses in tax revenues, primarily through sales taxes. In addition, there are local taxes; although low on average, these are an important source of revenue. Tennessee has a zero income tax rate but a high state sales tax (at 7%) plus an average local tax rate of 2.47%. With lower incomes, all tax revenue sources fall. In total, Tennessee's state/local tax burden is almost 10% of state income (a rate slightly higher than the national average). At the federal level, reduced incomes mean lower tax payments and these depend on the federal tax code. (The marginal federal tax rate for this population is derived as 14%, based on average income taxes paid and 2018 income tax brackets). Importantly, most federal taxes are spent in the state in which they are levied: lower federal tax revenues therefore mean lower government spending in Tennessee. For each year of lost working family income, there is a corresponding loss in tax revenue.

6 Economy-Wide Impacts of Inadequate Child Care

We calculate the economy-wide impacts of inadequate child care for the three main groups affected—workers, businesses, and taxpayers (Workman and Jessen-Howard, 2018). These calculations combine evidence from the survey on the extent of disruptions with economic data on earnings, business activity, and tax rates in Tennessee. We report amounts per working parent both as annual amounts and over the long-term. Also, we report aggregate amounts for Tennessee: each year there are 181,440 working parents of children under age 5 whose labor market contributions are constrained.

Our approach is similar to that used in prior studies of inadequate child care (Davis et al., 2017; Talbert et al., 2018; Goldberg et al., 2018; Belfield, 2018, 2019). The full methods for calculating these impacts are reported in detail in Appendix 2.

6.1 Annual Losses from Inadequate Child Care

Annual losses occur each year when a child is aged under 5. These annual losses are shown in the boxes below.

Losses per working parent amount to \$4,690 per year. Each year when a child is aged under 5, we estimate on average an economic burden from inadequate child care of \$3,890 per working parent. The largest component of that loss is due to lower earnings whilst in work; there are also significant losses because of time unemployed.

Annual Economic Burdens per Working Parent

Working Parents	Businesses	Taxpayers
Earnings \$3,890	Lost revenue \$380	Federal Tax \$710
Job search \$800	Hiring costs \$1,090	State Tax \$480
Total \$4,690	Total \$1,470	Total \$1,190

Losses to business amount to \$1,470 per year for each year when a worker has a child aged under 5. This burden comes from: reductions in revenue; lower productivity that is not offset by lower wages; and extra hiring costs.

Reduced taxpayer revenues amount to \$1,190 per year. These reductions arise because lower incomes lead directly to lower income tax contributions and indirectly to lower consumption taxes paid (based on the federal and Tennessee tax codes, see Appendix 2). For each year a child is aged under 5, we estimate significant losses in federal and state/local taxes. Federal losses are caused by lower earnings only; state/local losses arise from lower earnings and lower consumption of taxed goods.

6.2 Total Losses from Inadequate Child Care

There are long-term losses as well as short-term losses. Long-term losses from inadequate child care occur for two reasons. One is that children are ‘young’ for more than one year: losses occur each year a child is under 5. Another is that lost earnings, lost experience, and lost skills accumulate and influence career pathways over time. After multiple years of inadequate child care, parents’ career trajectories are flatter; this has adverse impacts even after children enter elementary school. These losses should be added to the annual effect. So, in total, each parent experiences annual burdens when the child is under age 5 and future burdens when the child is older but the parents’ lost experience and skills still matter.

We calculate the total losses (short- and long-term) as lumpsum present values: that is, they represent the total amount of money in the year when the working parent has a child under 5. (Appendix 2 describes the methods used to calculate these long- term losses). These dollar amounts are summarized below.

Economic Burdens over Childhood per Working Parent

Working Parents	Businesses	Taxpayers
Ages 0-5 \$14,850	Ages 0-5 \$2,490	Ages 0-5 \$2,840
Ages 5-8 \$1,170	Ages 5-8 \$240	Ages 5-8 \$730
Total \$16,020	Total \$2,730	Total \$3,570

Working parents face a total economic loss of \$16,020 from inadequate child care. This career burden includes the annual burdens as well as a lower trajectory of earnings over an eight-year period. Most of the burden is when the child is aged 0-5. But there are persistent effects afterward; these are caused by the lower skills and less experience of working parents.

Businesses experience a total economic loss of \$2,730. This lump sum captures the period when the child is under 5 plus future losses in productivity, as well as additional hiring costs. These amounts include only minimal pay distortions: businesses are assumed to adjust wages and work allocations over time to match workers’ productivity.

Total losses in taxes are \$3,570 from inadequate child care. Both federal government revenues and local government revenues are impacted over the full period of young childhood.

6.3 Aggregate Losses from Inadequate Child Care

Across Tennessee, there are more than 181,400 working parents with children aged under 5. The aggregate consequences of inadequate child care for these families is therefore substantial.

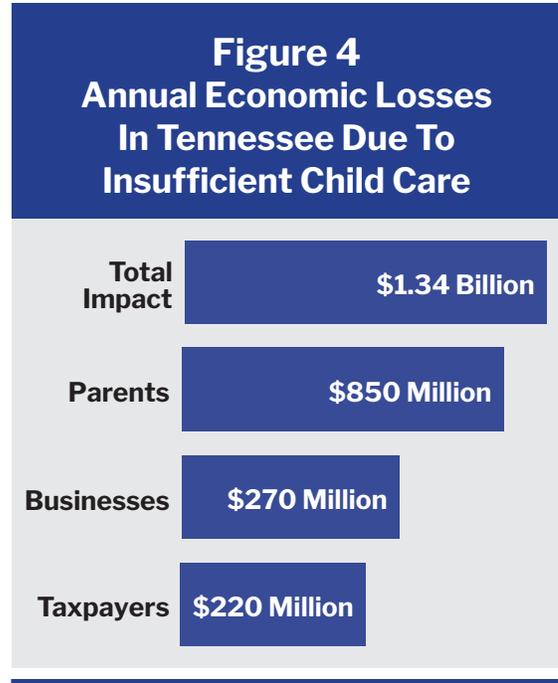
Figure 4 shows the aggregate losses from inadequate child care across Tennessee. Each year, \$0.85 billion is lost from lower earnings, lower productivity, and increased job displacement. In addition, businesses lose \$0.27 billion; and tax revenues across Tennessee are lower by \$0.22 billion. As context, state GDP is \$366 billion; state government spending is \$13 billion. Thus, as a result of inadequate child care, state government revenue in Tennessee is lower by approximately 0.3 percent each year.

Looking across the span of early childhood, the losses appear even greater. Working families will have lost \$3 billion; businesses will have lost \$0.5 billion; and Tennessee tax revenues will be lower by \$0.5 billion.

6.4 Sensitivity Testing

These calculations show significant burdens from inadequate child care. The calculations are based on this survey evidence and Tennessee-specific or county-specific data. They represent a best estimate of the losses.

However, the estimates are likely to be conservative. First, the survey is directed at working families: families that are unable to secure adequate child care may not be working at all and so experience even greater losses. Second, the survey only asks one working parent; it is likely that both parents—and other family members—are affected when child care is inadequate.



These estimates for Tennessee align with estimates from national models and state-level analyses. Recent studies do find substantial economic consequences of inadequate child care (Davis et al., 2017; Talbert et al., 2018; Belfield, 2018). However, this survey is notable in that it is considerably larger than other surveys directed at similar populations. This likely reduces the margin of error.

This survey does reveal greater burdens than prior studies. One reason is that the survey is predominantly of female workers and of primary care-givers. These groups are likely to face greater work dislocation than male parents or non-primary care-givers. Another reason is that this survey includes information about children aged up to 5. Other studies focus on younger children who are less likely to be covered by public programs. Yet, this survey finds significant adverse impacts even for parents of children ages 4 or 5, for whom public pre-school might be available.

Generally, variations in the dollar amounts of these burdens depend on many factors: how much child care is available; the quality and reliability of that child care; the job market for working parents; and the state/local tax code. Relatively, Tennessee has a limited supply of child care: according to the National Institute for Early Education Research's Yearbook for 2018, almost no three-year-olds and less than 25% of four-year-olds have access to voluntary pre-K. Most families across the state must therefore search for private or informal arrangements where these are available and affordable.

7 Regional Impacts of Inadequate Child Care

We now divide the survey by region to identify the worker impacts and to calculate the economic burdens for selected regions across Tennessee. These regions are Chattanooga, Knoxville, Memphis, Nashville, Rural Southwest, and the Tri-Cities. Because the overall survey is large at 2,330 respondents state-wide, the sample sizes for these regions allow us to make predictions about child care impacts.

Table 3 shows the difficulties families face in finding child care that meets their needs. For each region, high proportions (majorities) of families report difficulties finding child care that is affordable, high quality, and is conveniently accessible.

**Table 3
Child Care Challenges by Regions**

	TN	Chattanooga	Knoxville	Memphis	Nashville	Rural Southwest	Tri-Cities
Difficulty finding child care that is:							
Affordable	63%	60%	71%	54%	66%	57%	62%
High Quality	49%	54%	61%	43%	48%	44%	43%
Accessible	65%	61%	73%	59%	70%	74%	62%
Observations	2330	131	166	304	186	84	197

Table 4 shows the impacts of inadequate child care for each region. The impacts are for time and effort at work, productivity, and career prospects for workers in each region.

In every region the survey respondents report adverse impacts from inadequate child care. Some regions—Knoxville and Nashville in particular—do appear to report stronger impacts. But in each region there are significant consequences of inadequate child care. For example, a quarter of respondents in four regions, and a fifth in two regions, report quitting a job because of child care problems.

Similarly, the economic consequences of child care are substantial for each region. The economic consequences are modeled using the same method as per the state-wide results: in conjunction with region-specific impacts of inadequate child care, we adjust for earnings and population demographics in each region.

These economic burdens are given in Table 5. Families in each region face large economic burdens from inadequate child care. The variations across regions reflect the respective levels of earnings, as well as the variations in impacts and incidences of inadequate child care. Aggregate economic burdens reflect the size of the working parent population in each region (multiplied by the total family, business, and taxpayer burden for each region).

**Table 4
Impacts of Inadequate Child Care by Region**

	TN	Chattanooga	Knoxville	Memphis	Nashville	Rural Southwest	Tri-Cities
Over past three months have you:							
Been late for work, left early, missed part of a shift	67%	67%	71%	66%	72%	65%	58%
Missed a full day of work	48%	50%	52%	47%	54%	51%	40%
Been distracted at work	43%	44%	47%	37%	48%	45%	43%
Have you ever:							
Had pay/hours reduced, or changed to part-time	35%	40%	32%	35%	43%	32%	34%
Been reprimanded	23%	19%	24%	21%	25%	26%	23%
Been fired or demoted	18%	18%	14%	18%	23%	23%	17%
Turned down a job offer or promotion	39%	42%	49%	39%	45%	45%	34%
Turned down training or education	33%	34%	37%	30%	39%	35%	28%
Quit a job	24%	21%	25%	25%	28%	25%	20%

Table 5 Annual Economic Burdens by Region

Per Working Parent

Region	Working Parent	Business	Taxpayer	Total
Tennessee	\$4,690	\$1,470	\$1,190	\$7,350
Chattanooga	\$4,130	\$1,300	\$1,040	\$6,470
Knoxville	\$5,290	\$1,660	\$1,340	\$8,290
Memphis	\$5,150	\$1,620	\$1,310	\$8,080
Nashville	\$6,460	\$2,040	\$1,640	\$10,140
Southwest	\$4,320	\$1,370	\$1,090	\$6,780
Tri-Cities	\$3,180	\$1,000	\$800	\$4,980

Aggregate for Region (\$Millions)

Region	Working Parent	Business	Taxpayer	Total
Tennessee	\$850	\$270	\$220	\$1,340
Chattanooga	\$47	\$15	\$12	\$74
Knoxville	\$78	\$24	\$20	\$122
Memphis	\$165	\$52	\$42	\$259
Nashville	\$150	\$47	\$38	\$235
Southwest	\$23	\$7	\$6	\$37
Tri-Cities	\$28	\$9	\$7	\$43

8 Conclusions

Early education to promote child development may be viewed as a right for all children. This analysis adds another argument: adequate early child care is a way to promote economic development.

Working parents without adequate child care are forced to commit less time to work; they also report barriers to productivity and career advancement. Some of these working parents lose or quit their jobs because their child care is inadequate. Over time, they experience diminished career prospects.

These significant and persistent economic burdens for individuals lead to significant and persistent burdens for Tennessee businesses and the state as a whole.

Across Tennessee many parents are unable to access child care that meets the demands of their jobs. If these parents had access to adequate child care, their work productivity would improve, business activity would grow, and government revenues would increase (Cascio, 2018). All three outcomes clearly indicate there would be a strong, and shared, return on investment for sufficient child care for working families in Tennessee.

Appendix 1: Sampling

The survey is representative of persons in Tennessee who are in the workforce and have a child under age 5. The survey was performed by Zogby Analytics, Inc.

The survey was conducted between 6/8/19–7/9/19. The survey was a hybrid of online and live operator telephone interviews of 2,330 parents with a child under 5 years old in Tennessee.

Adults across Tennessee were randomly invited to participate in the interactive survey. Telephone samples were randomly drawn from random telephone lists. Up to four calls are made to reach a sampled phone number. Respondents that were not available but qualified to respond were allowed to set appointments to be recalled within the time frame of the field work. Each invitation was password coded and secure so that one respondent can only access the survey one time.

The sample was drawn from a weighted population—using information based on census data, voter registration figures, CIA fact books, and exit polls—to best represent the demographics of the population being surveyed. Examples of weighted variables include age, race, gender, region, party, education, and religion.

Based on a confidence interval of 95%, the margin of error for 2,330 is +/- 2.0 percentage points. This means that all other things being equal, the identical survey repeated will have results within the margin of error 95 times out of 100. Subsets of the data (below 50-75 respondents) have a larger margin of error than the whole data set.

Appendix Table A1 shows the descriptive frequencies for the sample and descriptive frequencies for all employed population with young children across Tennessee. This comparison establishes that interviews were conducted with a broad-based sample of Tennessee residents based on location, age, gender, race, household income, and education.

Appendix Table 1: Descriptive Statistics

	Survey Sample Tennessee Frequencies (%)	Tennessee Population (%)
Race:		
White	74	78
African American	17	17
Hispanic	6	6
Education:		
No HS diploma	3	12
Bachelor's degree+	31	26
Age:		
18-24	19	14
25-29	30	24
30-34	26	28
35-39	15	23
40+	11	11
Gender:		
Male	24	49
Female	76	51
Sector:		
Education	8	5
Healthcare	23	17
Hospitality Transport/logistics	8	12
Food services	12	10
Professional business	10	14
Observations	2,330	181,400

Sources: Census, March Current Population Survey 2018; fred.stlouisfed.org; www.tn.gov/- workforce/reports/Continued-Growth-for-Tennessee's-Economy-2017-Reference-Guide.pdf.

Notes: Sample is Tennessee parents or guardians who are the caregiver (not paid) of at least one child currently under five years of age, and who has either worked or been in school/training program during the past year at a minimum. State of Tennessee number includes all persons over 25. CPS sample: weighted frequencies for employed persons aged 16+ with children under age 6. Non-response rate for Hispanic status question > 5%. Age for parents with children under 18.

Appendix 2: Economic Model

We apply a static economic model to calculate losses caused by inadequate child care in Tennessee. The model includes estimates across each of the elements in the main Tables and Figures.

Calculations are per worker, based on the survey numbers as representative of the Tennessee population. These calculations are then aggregated across the state's population of working parents with children aged under 6. Immediate consequences are annual amounts; future consequences are modeled for the "typical" parent of a child aged 5 years old.

All figures are in 2019 present value dollars with a discount rate of 3.5% (Moore et al., 2004).

Earnings and Output Losses:

- Income losses (Y) are expressed as a proportion (y) of total earnings, where this proportion depends on the extent of the disruption caused by child care problems. We use the survey estimates of hours of work and employment lost to calculate the time burden as hours lost times the wage rate. (These estimates are based on disaggregated survey responses regarding 1-3, or 4+ disruptions). We use the survey estimates of job performance and career pathways to derive a small immediate wage penalty of 5%. Individuals incur a proportion ($x=90\%$) of these lost hours and lost earnings; the remaining proportion is incurred by businesses. Earnings are from the survey data; BLS earnings are within 5% of survey data earnings.
- Output losses (Q) are derived from: the proportion ($1-x=10\%$) of lost hours and lost earnings; and direct employment on-costs payable by the business firm per worker; conservatively, these on-costs are 19.2% of Y (7.1% in paid leave, 3% in supplemental pay, and 8.8% in health insurance); see www.bls.gov/-news.release/ecec.nr0.htm.

Federal Income Tax Revenue and State/Local Tax Revenue:

- Losses in federal income tax (FT) are derived from values for Y applied through the NBER tax calculator TAXSIM version 27 (updated January 2018). For marginal income and consumption taxes in Tennessee, see taxfoundation.org; on allocations of federal taxes to states, see <https://itep.org/whopays/>; and on TAXSIM, see users.nber.org/~taxsim. Taxes are per household with joint filing, single child and child care expenses of \$2,500 in Tennessee. Marginal tax rates of 14-16% are applied.
- State/local income and consumption/sales tax losses in Tennessee are derived from the estimates of Y applied through TAXSIM version 27 and taxfoundation.org. State income tax rates of 0% are applied (dividend income tax is not included); marginal state/local taxes are applied at 9.5% (adjusting for tax-exempt consumption).

Business Turnover and Management Costs:

- Businesses pay for turnover in various ways, including reduced worker morale. For this model, the firm turnover cost TVC is estimated at $tvr=21\%$ of annual salary per affected worker (Y). This turnover rate estimate (tvr) is derived from summaries of evidence across two reviews and is the lower bound of reported estimates (Boushey and Glynn, 2012; Work Institute, 2017).
- Managerial costs are estimated as a fraction of total earnings losses Y. No reliable estimate of managerial costs attributable to low worker performance are available; to be conservative, these managerial costs are therefore excluded.

Future Incomes, Output, and Income Tax Revenue:

- Future economic consequences are composed of two parts. For both parts, the extrapolations are proportionate to the immediate losses Y, Q, and FT.
 1. Each working parent experiences on average another 2 years of disrupted work patterns (until the average child becomes 5).
 2. Each working parent has lower skills and less experience and these are proportionate annuities based on published estimates of the returns to experience and the returns to education/training (4% and 8%, respectively, (Carneiro et al., 2011). These annuities are lost for workers who experience child care problems and are assumed to decay to zero after five additional years.

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