Continuity of Child Care Subsidy Receipt: Why Definitions of Spells and Gaps Matter
Technical Brief

Caroline Krafft, Elizabeth E. Davis and Nicole D. Forry
University of Minnesota and Child Trends

EXECUTIVE SUMMARY

Instability in child care arrangements has been associated with poorer outcomes for children. For children in low-income families who receive child care subsidies, policymakers are concerned that short spells of subsidy use and cycling on and off the program may be disruptive to their child care arrangements. Thus, it is important to understand the dynamic patterns of subsidy use: how long children receive subsidies, and whether and how quickly they return to the program after they leave.

In order to understand how long children continuously received subsidized care services, a "spell" of participation is defined as a series of consecutive months (or weeks) in which a child received care paid for in full or in part by a voucher (i.e., a child care subsidy), without a break. States vary in how they collect data on subsidy participation, typically using weekly or monthly units of time (although some have daily or biweekly data). The operationalization of the spell concept differs across studies because of the different time units.

In this brief, we use administrative data from one state's child care subsidy program to demonstrate how the overall patterns of subsidy continuity are influenced by the time unit used and by the definition of the end of a subsidy spell. The examples presented here demonstrate that the proportion of children with short spells varies depending on the spell definition. The length of subsidy spells can vary substantially based on the definition of a break, because many children have short interruptions in subsidy receipt. Furthermore, we show that one must be cautious in comparing results about subsidy continuity across states that use different time units. In our example, the median spell length using monthly data was longer by approximately one month compared to the median based on weekly data. Additionally, a four-week break in subsidy participation is not equivalent to a break of one calendar month when developing measures of continuity.

These findings have important implications for policymakers concerned about subsidy continuity and for administrators designing subsidy data systems. Conclusions about the extent and speed of cycling in and out of the subsidy program will depend on the unit of time and the definition of a subsidy spell used in the analysis.

The key recommendation is that cross-state comparisons of continuity measures like median subsidy spell length should be based on the same time units; measures based on weekly data should not be compared to measures based on monthly data. Secondarily, we suggest that states move towards collecting and analyzing subsidy data on a weekly basis, as this would allow for additional and nuanced understanding of the continuity of children's subsidy participation. Based on our findings, we conclude that it is critically important that subsidy administrators and researchers be cognizant of the way subsidy spells are measured and avoid comparing continuity measures based on different time units.

INTRODUCTION

Instability in child care arrangements has been associated with poorer outcomes for children.[1] For children in low-income families who receive child care subsidies, policymakers are concerned that short spells of subsidy receipt and cycling on and off the program may be disruptive to their child care arrangements.[2] Thus, it is important that we understand the dynamic patterns of subsidy use: how long children use subsidies, and whether and how quickly they return after they leave.

Recent research on the continuity of subsidy receipt almost exclusively uses monthly data on subsidy participation. In most studies, a subsidy spell is defined as an uninterrupted string of months during which the child received subsidized child care, and the spell ends when there is a break in receipt of subsidized services of one month or more.[3] However, some states collect data on subsidized services on a weekly, biweekly, or even daily basis. In this brief, we use weekly data from one state to demonstrate how the overall patterns of subsidy continuity are influenced by the time unit used and by the definition of the end of a subsidy spell. We address two research questions:

1) Does the continuity of subsidy receipt vary under different definitions of a spell?   Specifically, how does the median spell length change when different-length gaps in service are used to define the end of a spell?

2) Are spells based on different units of time comparable? Specifically, can spells based on weekly data be compared to those based on monthly data?

This brief is intended for researchers and policymakers who are interested in administrative data and definitional issues related to the study of continuity in the child care subsidy program. The results have important implications, because cross-state comparisons of subsidy continuity based on different spell definitions or different time units are likely to be invalid. This brief is part of a larger study of the continuity of subsidy participation in Maryland, which includes extensive analyses on the length of spells, frequency of repeat spells, and the factors associated with leaving and returning to the program. The focus of this brief is on the technical aspects of measuring continuity in the child care subsidy program, rather than the findings (visit http://mdmnresearchpartnership.com/ for additional research reports).

METHODS

Data

The data were provided by the Maryland Department of Education and Towson University Regional Studies Economic Institute (RESI) under a data sharing agreement with Child Trends and the University of Minnesota. The subsidy administrative data used in the study include approximately five years, from 2007 to 2012. The dataset is structured such that each observation is one voucher. A voucher provides information on the child care subsidy authorized for one child for a specific time period and a specific care provider. A child may have multiple vouchers simultaneously (if the child is receiving care from more than more

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[1] de Schipper, J.C., M.H. Van IJzendoorn, and L.W.C. Tavecchio. (2004). Stability in Center Day Care: Relations with Children's Well-being and Problem Behavior in Day Care. *Social Development* 13 (4): 531-550; Howes, C., and Hamilton, C. (1992). Children's Relationships with Child Care Teachers: Stability and Concordance with Parental Attachments. *Child Development* 63 (4): 867-878; Morrissey, T. (2009). Multiple Child-care Arrangements and Young Children's Behavioral Outcomes. *Child Development* 80 (1): 59-76; Tran, H., and M. Weinraub. (2006). Child Care Effects in Context: Quality, Stability, and Multiplicity in Nonmaternal Child Care Arrangements During the First 15 Months of Life. *Developmental Psychology* 42 (3): 566-582.

[2] "Child Care and Development (CCDF) Program; Proposed rule" 78 Federal Register 97, Part II (20 May 2013), pp. 29442-29498.

[3] Some researchers have compared spell lengths with one versus two-month breaks defining the end of a spell.

provider). The administrative data also include variables indicating the week(s) in which the child received subsidized child care under each voucher. Additional technical details on the methods can be found in the appendix.

Definition of subsidy receipt

In the Maryland data, a non-zero voucher payment value indicates payment was made to a child care provider under that particular voucher for services provided during that week. The child may not have actually received services from the provider in a given week, if, for example, the child was ill and did not attend (the data do not include information on attendance). However, the provider was paid for the services and so we count this as receipt of subsidy for the child. The measures of subsidy receipt used in this study are based on when service was received, not when payment was dispersed to the provider.

Length of a subsidy spell

In order to understand how long children continuously received subsidized care services, a "spell" of participation is defined as a series of consecutive weeks in which a child received care paid for in full or in part by a voucher. Note that in contrast to much of the literature on this topic, we use weekly rather than monthly data. The length of a period of subsidy receipt is defined by the starting and ending points of a spell, but in the administrative data there is no inherent definition for when a spell ends, that is, when there is a definitive break in subsidy receipt. If a child is receiving subsidy for a number of weeks, is off for a week, and then receives subsidy for a number of weeks after that, it is unlikely that this week off represents a break in subsidy receipt. The child may get sick and stay home for a week, be away on vacation, or receive no care for any of a number of different reasons that cause a brief interruption that is not a true end of subsidy participation. Most observers would agree that a one-week gap in subsidized care is not a true break in participation, and that eight- and 12-week gaps are quite long, probably longer than ideal for the definition of a break in subsidy participation. Yet, depending on how long a break is used to define the end of a subsidy spell, subsidy spell lengths can vary substantially. Below we demonstrate how these different definitions lead to changes in the measurement of subsidy continuity.

RESULTS

1) How does the continuity of subsidy receipt vary under different definitions of a spell?

We begin by calculating the length of each spell of continuous subsidy participation for each child, based on different definitions of the end of a spell. We compare the patterns of spell lengths using one, two, four, six, eight, and 12 consecutive weeks of no subsidized care to define a break in subsidy participation. Table 1 summarizes these distributions by showing the percentiles of subsidy spell lengths for 25%, 50%, and 75% of spells, using the different definitions for what constitutes a break.[4] As seen

in Table 1, the median spell length increases as the number of weeks used to define a break in service increases. When we define a spell as ending when the child misses at least one week of subsidized care, the median spell length is 20 weeks. The median increases slightly to 21 weeks if a two-week gap is used instead. However, increasing the gap to a minimum of four weeks results in a median spell length of 26 weeks, or half a year. The median continues to increase as we lengthen the period of non-participation used to define the end of a spell. As the definition of a break gets longer, shorter breaks of subsidy receipt no longer constitute the end of a spell, therefore, there will be more longer spells and the median spell length increases.

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[4] The analysis uses Kaplan-Meier estimation to account for the right-censoring of some spells.

The other percentiles of the distribution show similar patterns. Using a one-week break to define the end of a spell, the 25th percentile indicates that one quarter of the children experience spells of nine weeks or less. The 25th percentile increases to 12 weeks based on a four-week break. At the upper end of the spell distribution, the longer spells follow a similar pattern. The longest quartile of spells (the 75th percentile) is 40 weeks when we use a one-week break definition, and 52 weeks long with a four-week break definition. In other words, if we define a break in subsidy participation to be at least four weeks without subsidized care, 25% of the children have spells of subsidy receipt that are one year or longer.

Table 1. Subsidy spell length distribution using different definitions of a break

Number of weeks used to define a break in subsidy participation	Length of subsidy spell (in weeks)		
	25th percentile	50th percentile (median)	75th percentile
One	9	20	40
Two	10	21	43
Four	12	26	52
Six	13	28	58
Eight	14	30	64
Twelve	15	32	73

Figure 1 illustrates basically the same information as Table 1, by showing the proportion of children remaining on subsidy after a certain number of weeks. Each curve illustrates a different definition of a break in subsidy receipt. Under all definitions, it is clear that some spells end quickly, with a quarter of children having ended a spell of subsidy use after 15 weeks (less than four months), regardless of the length of break used. Under longer definitions of a break, more children have longer spells, and the differences across definitions are most noticeable for spells lasting one to two years. For example, nearly twice as many children remain on subsidy after a year under the eight- and twelve-week definitions of a break, as compared to the one- and two-week definitions of a break. Overall, under all definitions, many spells of participation end fairly rapidly but a substantial number of children participate for longer periods as well.
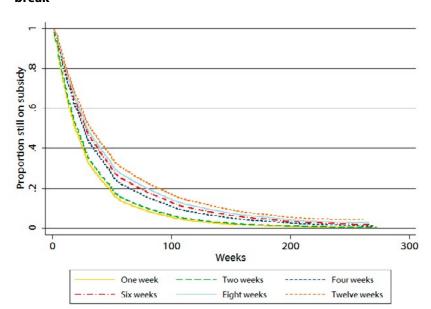
Figure 1. Proportion of children continuing to use subsidized care under different definitions of a break

2) Are spells based on different units of time (e.g., weekly versus monthly data) comparable?

Federal reporting requirements for the Child Care and Development Fund (CCDF) block grant require states to provide case-level data on a monthly or quarterly basis about children and families receiving child care subsidies. However, state information systems differ, and many issue subsidy authorizations and/or payments on a weekly or biweekly basis rather than on a monthly basis. The time unit of data collection for child care subsidy services is determined primarily by the payment policies of the state. Payment policies have important implications for providers and may influence their willingness to accept subsidy payments on behalf of families.

If units of time are easily converted, it would make little difference whether one reported subsidy participation in terms of weeks or months. However, using different time units can generate different findings in terms of the length of subsidy use. Table 2 demonstrates the challenges of comparing weeks and months for several hypothetical cases. Case 1 is on subsidy for four weeks, from week one to week four, all of which fall in one calendar month. Thus, Case 1 has a four-week spell or a one-month spell. However, Case 2 is also on for four weeks, from week four to week seven, but because of the timing of these weeks, has a spell length of two months, twice as long in months as Case 1. Case 3 is on for seven weeks, from week 10 to week 16, which includes three calendar months, but Case 4, also on for seven weeks, has a spell that only includes two calendar months. Cases 5 and 6 have 14-week spells, but they cover three and four months, respectively. As these examples illustrate, using months as the time unit for spells increases the apparent length of spells, and does so more for shorter spells than longer spells.

Additionally, spells may have different ending points based on weekly versus monthly data. While Case 7 and Case 8 both have four-week spells and a six-week break, only Case 7 is off for an entire month, so if monthly data were used, Case 7 would have a break, but Case 8 would not. Case 7 would have two one-month spells, while Case 8 would have one four-month spell. Thus, the analyst's decision to use monthly or weekly data (if both are available) will strongly influence the findings.

Table 2. Examples comparing spell length using weekly versus monthly data

	Month 1					Month 2					Month 3					Month 4				Spell Length	
	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	# Wks	# Months
Case 1	X	X	X	X																4	1
Case 2				X	X	X	X													4	2
Case 3										X	X	X	X	X	X	X				7	3
Case 4													X	X	X	X	X	X	X	7	2
Case 5	X	X	X	X	X	X	X	X	X	X	X	X	X	X						14	3
Case 6				X	X	X	X	X	X	X	X	X	X	X	X	X	X			14	4
Case 7	X	X	X	X							X	X	X	X						4,4	1, 1
Case 8				X	X	X	X							X	X	X	X			4,4	4

Note: Each "X" indicates a week of subsidy receipt while a blank box indicates no subsidy.

While the hypothetical data in Table 2 illustrate the potential problems in measuring spells, we next use actual data on children's subsidy participation to compare spell lengths using weekly versus monthly data. From the Maryland weekly data, we constructed spells of subsidy participation and breaks based on the calendar month of participation. A child was considered to have received subsidy during a calendar month if they had subsidized care during a week with a start date in that month.[5]

Table 3 illustrates how using monthly rather than weekly data results in somewhat different conclusions about subsidy spell lengths. Based on monthly data, at four months one-quarter of children in Maryland had ended their subsidy spells. Half ended after seven months, and 75% after 15 months. We multiply the number of months by 4.33 to convert to weeks. The median spell length using monthly data (converted to weeks) was (4 x 4.33=) 30.3 weeks. While we might (naively) think that a four-week break ought to be roughly equivalent to a one-month break, we find that the estimate of each percentile is inflated using monthly data relative to the weekly data. The median spell length using weekly data is 26 weeks, but is 30 weeks based on monthly data. The differences are greater for shorter spells. For example, the 25th percentile is 12 weeks using weekly data and a four-week break definition, compared to 17.3 weeks using monthly data. As seen with the hypothetical data, we find that using months as the time unit for spells increases the apparent length of spells, and does so more for shorter spells than longer spells.

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[5] The data do not include information on the exact start day of the services. If subsidized services were received in a week, we use the first day of the week to determine the month in which the child began receiving subsidy.

Table 3. Comparison of subsidy and gap spell length distributions using monthly versus weekly data

	25th percentile	50th percentile (median)	75th percentile
Spell length based on constructed number of months	4 months	7 months	15 months
Equivalent weeks (multiply months by 4.33)	17.3 weeks	30.3 weeks	65 weeks
Spell length based on a four-week break (from Table 1)	12 weeks	26 weeks	52 weeks

CONCLUSION

Most studies of continuity in the child care subsidy program have used monthly data and one (calendar) month of non-participation to define a break in subsidy receipt. These studies have found median spell lengths ranging from three to about 10 months across states, and have also found that many children return to subsidy after a short hiatus.[6] Most of the technical discussion to date has focused on the importance of using the correct statistical methods to estimate spell lengths in order to have comparable results across studies.[7] This brief expands on earlier work to examine, in depth, the structure of the data and the variation in results that occurs under different definitions of a spell.

The examples presented here demonstrate that the proportion of children with short spells varies depending on the spell definition, and specifically, with how many weeks off subsidy are used to define the end of a spell. It is because many children have short interruptions in subsidy receipt that the length of a subsidy spell depends on the definition of a break in subsidy receipt. If children did not return for another spell of subsidy participation or only returned after very long breaks, it would not matter how the end of a spell is defined.

Using weekly data on subsidy receipt and a one-week break to define the end of a subsidy spell, the estimated median spell length is 20 weeks, while it increases to 26 weeks using a four-week break definition. However, when we use monthly data, the median spell is 30 weeks (seven months), which is longer than the median of 26 weeks (six months) found using the four-week break. This difference suggests that one should be cautious in comparing continuity results based on a four-week break with those based on a one-month break. Furthermore, analysis using monthly data on subsidy receipt will result in longer spell durations than those based on weekly data, particularly for shorter spells.

[6]Ha, Y. (2009). Stability of child care subsidy use and earnings of low-income families. *Social Service Review*, 83 (4), 495-523; Ha, Y., Magnuson, K., & Ybarra, M. (2012). Patterns of child care subsidy receipt and the stability of child care. *Children and Youth Services Review* 34 (2012) 1834–1844; Meyers, M.K., Peck, L., Davis, E.E., Collins, A., Kreader, J.L., Georges, A., Weber, R., Schexnayder, D.T., Schroeder, D.G., & Olson, J.A. (2002). *The dynamics of child care subsidy use: A collaborative study of five states.* Report. New York: Columbia University, Mailman School of Public Health, National Center for Children in Poverty; Grobe, D., Weber, R.B., & Davis, E.E. (2008). Why do they leave? Child care subsidy use in Oregon. *Journal of Family and Economic Issues,* 29 (1), 110-127; Witte, A.D., & Queralt, M. (2005). *An examination of the duration of child care subsidies in Rhode Island: Impact of policy changes and cross state comparisons.* Wellesley, MA: Wellesley College, Department of Economics; Davis, Elizabeth E., Krafft, Caroline, Blasberg, Amy, Carlin, Caroline, Forry, Nicole, & Tout, Kathryn. "Continuity of Care and Participation in the Child Care Assistance Program." Bethesda, MD: Child Trends, 2013; Forry, Nicole, Welti, Kate, Davis, Liz, Krafft, Caroline, & Daneri, Paula. "Subsidy Continuity in Maryland." Bethesda, MD: Child Trends, 2012.

[7]Davis, Elizabeth E., Grobe, Deana, and Weber, Roberta B. (2012). "Common challenges in the study of continuity of child care subsidy participation." Methodological Brief OPRE 2012-55. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services. http://www.acf.hhs.gov/programs/opre/resource/common-challenges-in-the-study-of-continuity-of-child-care-subsidy

Researchers have generally agreed on using one month without subsidy to define the end of a subsidy spell when using monthly data. The availability of weekly data in some states can provide a more detailed picture of how quickly children cycle in and out of the subsidy program. Yet, as shown here, estimates of spell lengths based on weekly data are not comparable to those based on monthly data. There is no easy conversion between weeks and months, as a four-week break is not equivalent to a one-month break. Of greater concern is that spells estimated using monthly data will tend to be longer than those based on weekly data. Shorter spells will be inflated more than longer ones, so that comparisons between groups will differ depending on whether one uses weekly or monthly data.

Administrative data from states' management information systems can provide important insights into the dynamic patterns of subsidy participation of children and families. Weekly data on subsidy participation offer the opportunity to look more closely at the extent and length of interruptions in subsidized care. Many children experience short breaks in subsidized care, and researchers and policymakers are concerned about the reasons for these disruptions and how they may impact children and families.

States may want to consider collecting and analyzing subsidy data on a weekly basis, as this would allow for additional and nuanced understanding of how recipients participate in the subsidy program. For instance, weekly data can allow researchers and policymakers to examine whether there is a disruption in subsidy receipt of a week or two when families change providers or recertify eligibility. These disruptions, while short, may present a challenge for families in terms of providing care and maintaining employment. For the purposes of federal reporting, states can convert weekly data to monthly based on actual receipt of subsidized care during a calendar month. In these cases, cross-state comparisons of subsidy continuity measures based on monthly data would be valid, assuming appropriate statistical methods are used. However, states that use weekly data to create subsidy spell measures should avoid comparing their continuity measures with those from states with monthly data.

Conclusions about the extent and speed of cycling in and out of the subsidy program will depend on the units of time and the definition of a subsidy spell used in the analysis. Thus, it is critically important that subsidy administrators and researchers be cognizant of the way subsidy spells are measured and avoid comparing continuity measures based on different time units.

APPENDIX: ADDITIONAL TECHNICAL ISSUES

Multiple vouchers. In order to understand how long children continuously received subsidized care services, a "spell" of participation is defined as a series of consecutive weeks in which a child received care paid for in full or in part by a voucher. Each voucher is for a specific child care provider, and so a child may have more than one voucher during a spell of subsidy participation if the parent changed providers or used more than one provider. A spell was defined based on use of subsidized care in each week, regardless of whether there was a different voucher. Additionally, a child may have simultaneous vouchers if using more than one provider concurrently in a week, but these providers are all part of the same spell for this analysis.

Left- and right-censored spells. Although the study period covers five years, some children began receiving subsidized care before the start of the study and others continued after the study's end. Spells that began before the start of the study period (6/25/2007) are "left-censored." It is not possible to know the full length of these spells. We excluded these spells from our analyses, as is standard practice in event history analysis. Spells that continue up until the end of the study period (9/28/2012) are "right-censored." These spells may continue after the study period, but their full length is unknown. Right-censored spells are included in the analysis, with appropriate statistical techniques to account for right-censoring. For each definition of subsidy spells using the different length breaks, the definition of right-censored and left-censored has to be adjusted. For example, for a child who did not receive subsidy in the first two weeks of the data, it is not possible to know if they received subsidized care within the four weeks prior to the start of the study period. Likewise, we do not know if a child definitively ended subsidy receipt or might return within four weeks if we only observe three weeks without subsidy before the end of the study period. Therefore, we adjusted the definitions of right- and left-censored depending on the length of break we used. Over the five years of data, children may have had more than one spell of subsidy participation. For this analysis, we used the first observed spell for a child that began during the study period (i.e., that was not left-censored).