Who is Minding the Children? Gender Equity in the First Two Years of the Pandemic

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Abstract

The wholesale changes brought about by the COVID-19 pandemic to men and women's "paid work arrangements and work-family supports" (Carlson et al., 2020) provides a natural experiment for exploring individuals' time-use in the home. Distinct from evaluations of social policy, the pandemic provides an opportunity to examine to what extent the presence of both parents in the home has influenced the movement toward a more equal gender distribution of household labor; in particular, childcare responsibilities. To do this, the current study analyzes time-use diary data from the American Time Use Survey (ATUS) (Bureau of Labor Statistics, 2022). Unlike some of the initial analyses of pandemic effects, the current study does not limit itself to the year immediately prior to the pandemic and the year during it. We use over ten years of prior data, which allows us to model the secular and quarterly trends and predict what would have occurred in the absence of the pandemic, contrasting this to what indeed happened. This study informs long-standing social questions of gender equity. We also examine the question of "social reversion" after a major shock with the just released 2021 ATUS. The analysis moves from the aggregate to the individual, using methods of sequence analysis, clustering, and matching to pose and answer the following questions: was there an increase in the childcare hours of primary and secondary childcare starting in 2020 vs the same period in 2019 taking into consideration the historical trend; was the mean change in childcare hours the same for women and men; what was the variation in individual-level changes in time spent on childcare and did it differ by gender; was the increase in time spent on childcare at regular intervals or more sporadically throughout the day; did 2021 show signs of reversion, and if so, was there parity across genders?

Introduction

Gender inequities in the workplace have long been recognized and researched, from salary pay scale differentials (Blau & Kahn, 2017; Cohen & Huffman, 2007; Oaxaca, 1973; Weichselbaumer & Winter-Ebmer, 2005) to glass ceiling effects on high level advancement (Babic & Hansez, 2021; Cohen & Huffman, 2007; Cotter, et al., 2001; Hultin, 2003). They also have been recognized in the home where women, relative to men, have been known to take on disproportionate responsibilities for childcare and other domestic chores even while holding full-time paid employment (Bianchi, et al., 2000; Bianchi et al., 2012; Fuwa, 2004; Greenstein, 2009; Pew Research Center, 2015; Tai & Treas, 2013; Yavorsky, et al., 2015). With the Covid-19 pandemic and the shuttering of schools and daycare centers along with a shift to a remote work environment, there has been an increase in research and reporting on the extent to which these changes have impacted the balance of household responsibilities for men and women.

Reports in the media provide ample testimony on the pandemic's effect on job loss as well as on balancing work and family for men and women (e.g., Cohen & Hsu, 2020; Donner, 2020; Koh, 2021; Kenny & Yang, 2021; Lewis, 2020). With respect to the issue of domestic labor, with both men and women at home during the pandemic, Kenny and Yang (2021) estimated that the gender gap in childcare responsibilities would be reduced by half during the pandemic as

compared to beforehand and would lead to greater equality in childcare time allocation between men and women. Even were this estimated reduction to occur, using pre-pandemic global OECD time-use data, these same authors further estimated that during the first six months of the pandemic, women would still have “a fifty-plus hour additional childcare workload per capita” over men. In other words, both genders would do more childcare, but the gap would begin to close.

Drawing from the time-use diary data obtained during the pandemic from the U.S.-administered American Time Use Survey (ATUS) (Bureau of Labor Statistics, 2022), Casselman and Koeze (2021) reporters for *The New York Times* were able to estimate the extent to which men and women shouldered childcare responsibilities during the pandemic in the U.S. They also were able to compare that estimate to relevant pre-pandemic amounts. In particular, the they found that, in the aggregate, women not only spent two additional hours per day on child care in 2020 vs 2019, they spent two and half more hours than men—who experienced an approximate increase of 1 hour and 20 minutes over 2019 - and thus, the extant gap increased. Of those two additional hours, 48 minutes coincided with work indicating that women were juggling work responsibilities with household responsibilities. It should be noted that time-use diaries for measuring time spent in various activities throughout the day are “considered the gold standard for accuracy and detail” as they are known to produce less biased responses than other methods (e.g., self-reports of surveys) in the domain of time-use measurement (Wray, 2020; Yavorsky, et al., 2015).

Given the greater time lag involved in academic publishing and the greater effort required to complete a large-scale study, to date, many fewer large-scale studies have been published on this topic in journal outlets. One study (Shafer, et al., 2020), based on retrospective self-reports of perceived sharing of household and child care responsibilities, compared data on housework and childcare from before and during the early part of the pandemic in Canada. Consistent with Kenny and Yang (2021), Shafer, et al. (2020) reported that mothers perceived there to be a small shift to a more equally-shared responsibility for housework and childcare and that fathers perceived themselves to have a greater involvement in these activities during the pandemic than they did prior to it. As a caveat to this finding, Shafer, et al. (2020) noted that the perceptions of task sharing produced by these retrospective self-reports may have been biased, on the one hand, by mothers not knowing to what extent fathers actually were involved and, on the other, by fathers overestimating their involvement so as to “make themselves look like ‘good’ dads” (p. 528).

Another large-scale study (Carlson, et al., 2021) examined changes in the relative participation of mothers and fathers in housework and childcare during the early days of the pandemic using data collected in late April 2020. The authors report "an overall increase in domestic responsibilities for mothers who already were doing most of the household labor" (p. 1), and find that driven by increases in contributions by fathers, "both mothers and fathers report a general shift toward more egalitarian divisions of household labor" (p. 1). The study was based on the responses of 1,025 U.S. parents to a non-probability online survey that asked male and female partners to report, among other things “on how their time, and their partner’s time, in domestic tasks changed since the start of the pandemic [using a 5-point scale]” with respect to a number of specific tasks (e.g., looking after the child, reading, playing, organizing). The authors acknowledged the limitations of using data based on perceived estimates of their own and their partners' time spent on domestic activities and found "discrepancies in parents' reports ” (p. 1238) regarding who was doing more domestic work. It is interesting that "[f]athers were more likely to report that they were doing more than to report their partners were doing more" (p. 1232), whereas mothers were more equitable in their allocations of time spent. Such unevenness in reporting in this case may reflect a social desirability bias in participants'

responses, especially among fathers and raise questions about the accuracy of the data. In addition, the authors noted that because the scale of measurement used was based on rating "stylized questions" (p. 1238) in terms of only five qualitative categories, actual estimates of time spent in domestic tasks were not possible.

In a third large-scale study, Craig and Churchill (2021) surveyed dual-earner couples with children under the age of 17 from a national survey in Australia, n=1536. Among other topics, the authors were interested in determining how many hours per day each spent in childcare activities that included both “active care,” requiring hands-on involvement and “supervisory care,” requiring being responsible for children, but not engaged in direct interaction with them. The survey, which was conducted from May 7, 2020 to May 20, 2020, asked respondents to recall their childcare time allocations in relation to both before and during the pandemic. Craig and Churchill (2021) found that “[a]bsolute increases in unpaid labour were higher for mothers than for fathers, but compared to their average input prior to the pandemic, the proportional differences were higher for fathers” (p. 75). Basing their interpretation of results on these differences in proportions of time spent on childcare, the authors concluded that “during COVID-19, Australian fathers significantly narrowed the gender gaps in both active and in supervisory care of children” (p. 75). This conclusion is similar to that of some of the other studies described previously in this paper. Likewise, the format of the survey used in this study, not unlike that used by some of these other studies, is vulnerable to limitations of recall and social desirability.

Finally, a fourth study by Yerkes, et al. (2020) used retrospective data from a representative sample of Dutch parents in April 2020 to explore differences between mothers and fathers in three areas, paid work, the division of childcare and household tasks, and quality of life. Two variables were created to obtain whether (yes/no) the relative share of childcare and household work of each of 868 respondents from 643 households increased from before to during the pandemic lockdown. Based on these and other variables, the authors found "limited evidence of a reduction in gender inequality in the division of childcare and household work" (p.16). In particular, they found that "[w]hile mothers continue to do more household and caregiving tasks than fathers, the gap decreased somewhat as fathers report doing (somewhat) more during the lockdown than before" (p.16). Limitations of this study as cited by the authors include that not only are the data self-rated before-after comparisons and are subject to issues of recall and social desirability, but that they are not longitudinal and only "allow for a snapshot of a unique situation" (p.19).

While focused on the influence of the COVID-19 pandemic on the domestic division of household labor, these media reports and large-scale studies are part of a long history, beginning at least as early as 1963 with the publication of The Feminine Mystique by Betty Freidan, on the social movement toward gender equality in the home. Freidan’s book, which gained great popularity, challenged the “feminine mystique” that “[f]ulfillment as a woman had only one definition for American women after 1949 -- the housewife-mother” (Friedan, 1963, p. 36). It sparked a second wave of feminism in the United States in the 1960s and 1970s that elicited “new conditions for the development of gender consciousness” (Sullivan et al., 2018, p. 266) that were more acutely focused than earlier movements on the unequal gender distribution of household labor “in the face of women’s entry into paid employment” (Sullivan et al.; 2018, p. 264). Among these conditions, Sullivan et al. (2018) cites research that identifies both individual gender ideologies and social policies as being influential and mentions parental leave as one of the social policy “opportunities for the continuation of the gender revolution in unpaid work and care” (Sullivan et al., 2018, p. 265).

The wholesale changes brought about by the COVID-19 pandemic to men and women’s paid work arrangements and work-family supports provides a natural experiment for exploring individuals’ time-use in the home. In contrast to studying the effects of a parental leave policy on

shared household labor, the pandemic provides a unique opportunity to examine to what extent the presence of both parents in the home has influenced the movement toward a more equal gender distribution of household labor, and, in particular, childcare responsibilities. Like the report by Casselman and Koeze (2021), because of its reliability and accuracy, the current study analyzes time-use diary data from the ATUS. Unlike their report, however, the current study does not limit its analysis to only two years of data, one from prior to the pandemic and the other from during the pandemic, but to over ten years of data. This allows us to use prior secular trends in time use to establish what would have most likely occurred in the absence of the pandemic and contrast this to what indeed happened two years from its onset. We also pose and answer questions reflecting potential changes in individual behaviors, including time of day features in work and childcare activities.

Because time use can be understood as a sequence of activities, we make us of sequence analysis (see Abbott, 1995) to address the questions posed in this paper related to time use. Through these and related methods, we also document any qualitative changes in time use as Covid became part of individual lives. While the literature on sequence analysis applied to gender differences in childcare is somewhat limited, related work provides some insight and guidance for us. For example, Lesnard (2008) found that dual-earners were the modal married-couple, and their time spent parenting together decreased during from the late 1980s to the late 1990s in France. Vagni & Cornwell (2018) document eight distinct patterns in daily time use using sequence analysis, establishing a framework for comparative studies. Vagni (2019) discusses gendered time use with respect to household labor, and measurement discordance (cf.). Gerontologists have explored time use as a predictor of later health (Lam & Garcia, 2021). Our study employs some of the methodology established in those studies.

The Current Study

Exploiting the natural experiment created by COVID-19, we utilize cutting-edge methods of social sequence analysis introduced in Abbott (1995) and developed over the next three decades by social scientists and statisticians (Aisenbrey & Fasang, 2010; Ritschard & Studer, 2018), to analyze more than a decade of data (2004 to 2021) from the large-scale nationally-representative American Time Use Survey (ATUS). We construct a counterfactual for the gender gap in time-use in the absence of a pandemic, and build typologies of time use to describe changes in their composition and distribution. In so doing, the current study improves upon *The New York Times* report by Casselman and Koeze (2021) by providing a more comprehensive examination of the movement toward gender equality in the domestic sphere, with a particular focus on childcare. It tests to what extent the movement toward gender equality in the sharing of childcare responsibilities is influenced by the wholesale institutional and structural changes related to parents' working conditions (i.e., the shift to working from home for both mothers and fathers) brought about by the exogenous shock of the COVID-19 pandemic.

Research Questions

The research questions examined in this study are the following:

- **RQ1:** Was there an increase in the childcare hours of primary and secondary childcare in 2020 vs the same period in 2019 taking into consideration the historical trend based on prior years?
- **RQ2:** Was the mean increase in childcare hours the same for women and men?
- **RQ3:** What is the distribution of *individual-level* changes in time spent on childcare? Are there notable differences between males and females in these distributions?

- **RQ4:** Going beyond average change, does the *pattern* in childcare and other activities change from 2019 to the first year of the pandemic? Are there noteworthy emergent patterns, or is one pattern more or less prevalent?

Data

The American Time Use Survey (ATUS) (Bureau of Labor Statistics, 2022) from which we obtain time use estimates, is a nationally representative continuously running cross-sectional survey of time use in the United States. It includes approximately 228,000 interviews conducted from 2003 to 2022 covering activities from sleep to work to childcare. It is sponsored by the Bureau of Labor Statistics and conducted by the Census Bureau. Although the ATUS reports minutes spent by individuals in each of a large variety of daily activities, in this study we focus only on the activities of work and childcare.

The survey covers all individuals living in United States households who are at least 15 years of age, excluding active military and institutionalized persons. The ATUS sample is drawn from the Current Population Survey (CPS). Households become eligible for the ATUS after completing eight months of CPS surveys. The sample size is approximately 12,000 households annually after accounting for nonresponse. The survey is administered via telephone to a randomly selected person aged 15 or older within each sampled household. The selected respondents report their activities, timing, and duration for the previous day in a 24-hour diary recorded from 4am to 4am. Simultaneous activities are not recorded (only the primary activity) except for secondary childcare which is separately recorded. The repeated cross-sectional surveys over ten years provide robust information on trends in these activities, ending in 2020 with an external shock that allows us to assess what would have happened, a counterfactual, in the absence of the pandemic, via the trend.

It should be noted that, not surprisingly, the Covid-19 pandemic caused the closure of Census Bureau data collection operations in 2020, ceasing the collection of data between March 18, 2020 and May 9, 2020. As a result, full-year time use estimates were not available for 2020. Although our analyses are primarily based on ATUS time use estimates that have been aggregated on a quarterly basis, those that are based on estimates aggregated annually only include data collected in May-December of their respective year.

The full ATUS dataset consists of 228,455 respondents over the 19-year period from 2003 to 2022. For each of the analyses we perform, we restrict the data to best match our research question of interest. To answer research questions 1-3, which evaluate childcare activity differences, the data are restricted to households that contain children that are under the age of 13.[1] For research questions 1-2 (RQ1-2), which compare means, data from the first and second quarters of 2020 are removed due to the aforementioned break in data collection. The resulting sample size is approximately 64,000 across the years, 2003 to 2021. For RQ3, which is conducted at the individual level, the first year of the pandemic (2020) is compared against the previous year, both restricted to respondents that were surveyed in May or later, to ensure comparability given the break in the data collection process. Matching relies on demographics, so respondents with missing information on education, geographic location, and metropolitan vs. rural status are also excluded – resulting in approximately a 5% loss in respondents. This

[1] This differs from Casselman and Koeze (2021), who do not include children 0-5 years old. Our choice reflects the potential additional burdens to parents due to the closing of childcare centers during the pandemic.

results in 614 matched pairs across 2019 and 2020. To answer RQ4, respondents are not restricted to households with children. However, since we wished to examine demographics for each cluster, we applied the additional filters from RQ3. The resulting sample sizes for 2019 and 2020 are 2,779 and 3,136 respectively.

The survey records ‘sex’ based on participants’ response to ‘What is your sex?’. Only three answers are allowed: ‘Male’, ‘Female’, or ‘Don’t know, refused’. There are no observations with the latter response included in the analysis. In this study, this recording of sex is all that we have available, so we use it in place of a more nuanced measure of gender.

Methods

To answer RQ1 & RQ2, we establish the counterfactual via an interrupted time-series analysis of primary and secondary childcare (PCC, SCC, respectively) over more than a decade. The analysis will allow us to show any change in total time spent in childcare in 2020 among men and women, on average, without consideration of any underlying shifts in demographics or time-of-day habits. SCC changed the most in the pandemic, so we focus on it for the next two research questions.

To answer RQ3, we perform Mahalanobis' matching across cohort years, constructing matched paired observations pre-COVID and during COVID that are purged of demographic differences. This allows us to estimate the change in total time spent on secondary childcare at the individual level between 2019 and 2020. Finally, we perform cluster analysis of the time-use sequences to understand the timing and co-occurrence of secondary childcare with other activities such as work and to reveal any emerging patterns.

Interrupted time series

Time series document the course of a particular measurement over time, such as world population or a stock market index. When such measurements are made over time on different populations they may inform social processes and policy. For example, life expectancy at birth, infant mortality rates, or per capita GDP may inform comparative studies of nations. When there is variation in policy or changes over time across the groups studied, time series may become even more informative through examining the relationship between different policies and their measured outcomes. The notion of an interrupted time series, in its most basic form, is the analysis of a single series after an exogenous “shock.” The period prior to the shock forms the basis for the counterfactual, “what would have occurred” and the following period documents what actually does occur. While this design is subject to the usual threats to validity, it is often robust to them, particularly when the shock is far reaching, so that the entire population is affected.

When time series for two or more groups are examined over time, it is often to understand a “gap” between them, such as a gender gap in wages or a racial gap in educational attainment. Gaps between groups have long histories, but measurement of such gaps are more contemporary activities. In the US, gender pay gaps and racial educational attainment gaps were made public due to congressional actions and reports in the 1960s (e.g., Coleman, et al., 1966). After public awareness grew, organizations tracked the trends in these to assess policy initiatives, or in the case of interrupted time series, to note a change directly following a shock, such as new legislation. As mentioned, external shocks tend to yield more robust evaluations of change. The focus of this study is to use an interrupted time series to examine the impact of the exogenous shock of COVID-19 on the gender gap in time spent on childcare.

The onset of the pandemic was quick, unexpected and unplanned for – conditions that describe an ideal natural experiment (Shadish, et al., 2002). We can assess its impact by modeling the

trajectory of a continuous variable, such as time spent doing childcare, over time. Assuming we have a good model for the trajectory before the shock, we can make a projection into subsequent years that reflects the counterfactual, “what would have happened, had the shock not occurred.” The shift in the outcome – typically a level shift, but sometimes a slope change as well – immediately following the shock may be taken as its effect on the population, subject to the usual threats to validity.

When additional observations are collected after the intervention, it is possible to assess both the shift in level and any change in slope, depending on the number of post-intervention time points. Kontopantelis, et al. (2015) describe the primary assumptions of an interrupted time series design (ITS), and Shadish, et al. (2002) provide detailed examples across many variations. The primary assumption is that the functional form (e.g. linearity) of the pre-intervention trend is plausible and that it would have continued over time. In the case of our analysis, our primary assumption is that the gender gap in childcare and household activities would continue over time, and that seasonal effects would persist, which we view to be quite plausible. A key threat that we account for through matching is the stability of the population over time. We use weights supplied by ATUS when possible.

In this study, we have ATUS data through 2021, so the interrupted time series design also allows us to study the extent to which time spent in childcare (the outcome) “reverts” or not (Bonanno, et al., 2011) to pre-intervention levels, or how more generally, the trend itself changes. In our study, we examine the initial change in time use following the onset of COVID and one and a half years into the pandemic.

Matching to identify within-person change

Average differences between groups, such as men and women, provide important, aggregate understanding of social processes, but they are limited in that they do not provide us with individual experiences of change, nor the variation in activities. For example, an average increase in childcare activities of two hours per day for women is equivalent to eight additional hours for one woman out of four, or identical two-hour burdens for all women. This led us to research questions that explore a more nuanced comparison. Given the cross-sectional nature of the ATUS study design, we decided to use a statistical matching technique to construct synthetic longitudinal cohorts of individuals spanning the pre- and post-COVID time period.

In brief, this technique takes individuals in 2020, identifies those in 2019 with the same demographic features (sex, race, and age +/- 2 years) and then uses a set of remaining features to identify a “matched pair” in 2019 that most closely resembles the 2020 individual across: education level, the number of children in the household, age of the youngest child in the household, geographic region, the presence of an elder in the household, metropolitan residence or not, family income, and if the respondent has a (working) partner. Matched pairs provide us with a better sense of how individual lives changed during the pandemic.

Emergent patterns through social sequence analysis

While the focus of this analysis is on childcare, that activity occurs in the context of other activities, and it is important to document whether this context changed during the pandemic. We wish to characterize patterns in key activities (e.g., work, leisure, caregiving) over time, and Sociologists have used what is called sequence analysis (Abbott, 1990; Aisenbrey and Fasang, 2010; Ritschard and Studer, 2018) on data such as ours to identify normative pathways, their variants, and more recently, the implications of these pathways on later outcomes (Rossignon, et al. 2018). Sequence analysis is an unsupervised machine learning technique in which patterns in nominal categorical data (the statuses) over time are grouped, or clustered, yielding

a typology. Blanchard, et al. (2014) and Cornwell (2015) synthesized the ideas, methods and new approaches commonly used to analyze sequence data regardless of the time scale, and the field is now often referred to as social sequence analysis.

Sequence analysis is not restricted to situations in which the time scale is in years. When the time scale is shorter than a year, one may be interested in examining, for example, individuals' statuses with respect to activities such as work, schooling, childcare, eldercare, exercise, socializing, and leisure obtained from time use diaries over the course of a week or even day. By clustering sequences into roughly similar “types,” common patterns of daily activities may be organized to uncover a typology of daily living that might otherwise be overlooked.

Vagni and Cornwell (2018) analyzed diaries from the Multinational Time Use Study to show that contrary to conventional belief, individual lives can be grouped into eight typical behavior types. These are roughly primarily working (5 types, depending on the start of the shift), unpaid work (2 types, depending on the amount), and leisure. These three broad categories correspond roughly to those that we will identify in our data from ATUS. Once such types have been established, two important questions emerge: who is in each cluster (demographics) and does this population change with different cohorts? The latter question is quite nuanced and is pertinent to a study of gender differences that may have been changing prior to the pandemic, but perhaps underwent more drastic changes immediately following its onset.

In this study, we use sequence analysis to identify patterns in the timing and sequencing of childcare and work activities during the work week, pre- and post-COVID to unpack mean and variation changes into time-of-day differences. First, we form basic typologies of daily activities analogous to the work of Vagni and Cornwell (2018). Questions of interest include whether there has been a qualitative change in these typologies across the span of COVID. For example, does a whole new relationship to work across the workday evolve, leaking outside what was once the traditional work hours of 9 to 5, or does the typical workday now simply include a wider range of activities, with childcare being our focus? Sequence analysis applied to pre- and post-COVID periods can address the question of emergent (new) typologies or qualitatively divergent but familiar types. Since we are interested in how the workday may have changed under COVID, a short list of common experiences and their relative frequency can provide us with a concise but thorough comparison, as sequence analysis distills the information that we need into easily summarized components.

Central to most clustering techniques is the measure of distance between the profiles of different subjects. With nominal outcomes, this question becomes inherently more challenging, but substantial work has been done to guide researchers toward a methodology guided by their research questions. The choice of distance and its implications for the analysis are discussed in Studer and Ritschard (2016). Common to most distance measures used is an algorithmic technique that allows for minor perturbations within a sequence in a manner similar to the error term in a linear regression model. The rules surrounding sequence comparisons form the basis of optimal matching methods in sequence analysis (Kruskal & Sankoff, 1983; Abbott, 1995; Abbott and Tsay, 2000; Aisenbrey and Fasang, 2010).

Sequence analysis details

Childcare is defined as non-paid care for household children under age 13. This includes children that may not be direct descendants but as part of the household unit. Childcare must be performed during the waking hours of the respondent and the child – as captured within the survey. Therefore, activities such as packing lunch for the school day while the child is asleep is not included. Common activities included as childcare are physical care, reading, playing,

sports, talking, etc. Any travel related to childcare activities is included. Time associated with paid childcare services is not included – e.g. daycare related activities.

We split this definition into two categories: primary and secondary care. Primary childcare is defined as the total number of minutes spent providing childcare as the primary activity – i.e. the activity the respondent listed for a given time period. Secondary childcare is defined as the total number of minutes spent providing childcare during another activity — e.g. looking after children while also cooking dinner. Only primary childcare is recorded if the respondent includes both primary and secondary childcare during the same period.

There are over 400 distinct time use activities recorded within the ATUS. We aggregate the activities according to 15 activities: Sleep; Personal Care; Household Activities; Caring for Household Member; Caring for Nonhousehold Member; Work; Education; Consumer Purchases; Professional & Personal Care Services; Eating & Drinking; Socializing, Relaxing, & Leisure; Sports, Exercise, and Recreation; Religious & Spiritual; Volunteering; and Other. This closely follows the ATUS hierarchy. Activities involving travel include this travel time in the activity's time[2].

Sequences are defined by the modal activity occurring every 30 minutes (on the hour and half-hour) starting at 4am. Summarizing the data with the mode has some necessary computational advantages but may remove some activities with short durations. Prior to this summarization, the mean length of time per activity was calculated to 53 minutes, excluding sleep. 16 respondents were removed from the analysis due to not having a full 1440 minutes of diary data.

Each activity is further split to distinguish between activities including or excluding secondary childcare. If the respondent is providing at least one minute of secondary childcare during the 30 minute period, then the activity is further designated as secondary childcare. The 15 activities combined with binary indicators for secondary childcare result in 15x2 or 30 unique states that we call "tokens," as they represent activities.

Results

Prevalence of childcare

As described in the preceding subsection, we split the measures into primary and secondary childcare. To allow for seasonal differences, we estimate the mean daily time spent on primary and secondary childcare from 2005 to 2021 on a quarterly basis. We fit interrupted time series (ITS) models – these include a time trend, quarter indicators, and an indicator for the Covid period – to estimate the change in prevalence of the measures beginning in 2020, as compared to previous years. Given the potential for the Covid effects to wane over time, especially as policies, preventative measures and treatment change, we include separate indicators for 2020 and 2021. We note that the first and second quarters (Q1 and Q2) of 2020 are excluded due to insufficient data collection previously mentioned.[3]

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[2] We mostly adhere to aggregating the activities at the 2-number prefix level provided by the BLS. We adjust their method by including travel to each activity within the activity value rather than separate.

[3] This decision enforces consistency across years as we establish quarterly effects in our models. It is a small departure from the analysis in Casselman and Koeze (2021), who use six weeks from late May and June. This may account for some of the differences in our findings.

The ITS models are fit as generalized least squares models allowing time-correlated errors (auto-regressive of order one). The exact components of the model are selected from a set of increasingly complex model specifications (main effects and interactions) via Bayesian Information Criterion (BIC; Schwarz, 1978), first pooling across the sexes, and then allowing for sex-specific interactions. BIC is a penalized likelihood approach to model selection that prefers parsimonious models and can be used with a non-nested class of models. The parameters included indicators for Covid year (2020/21), for quarter, and, where applicable, for sex-specific trend and change in trend.

Primary childcare

We find the trend for primary childcare pooling males and females has remained remarkably constant from 2005-2019, with the mean daily time spent on primary childcare of 1 hour and 18 minutes for households with children under age 13. To establish this analytically, we fit a baseline model that pools effects across sex, controlling for quarter and Covid. We identified a small but significant increasing trend of about ¾ of a minute per quarter, and some clear seasonality, with less childcare in Q2 & Q3 (these include summer months). The Covid quarters Q3 & Q4 in 2020 saw a significant but small increase of 6½ minutes in childcare, followed effectively by a reversion to pre-pandemic levels of primary childcare in 2021. Errors in this and subsequent models allowed for first-order autoregressive errors to capture any remaining seasonal variation (however such errors were only preferred by BIC in disaggregated SCC model). This analysis serves only to document the broader trend and shock.

Disaggregated, we can readily see in Figure 1, that the childcare burden has not been equally distributed across females and males. Females, on average, spend approximately 1 hour, 40 minutes daily on primary childcare while males spend about half that amount of time. We estimate separate Covid effects in a model to follow, but the figure suggests that the pandemic initially had a larger effect on females. There is some indication that males lagged behind females in their response to the pandemic. Note that the dark line represents the predicted regression line from a model that includes quarterly effects, and thus yields a jagged shape.

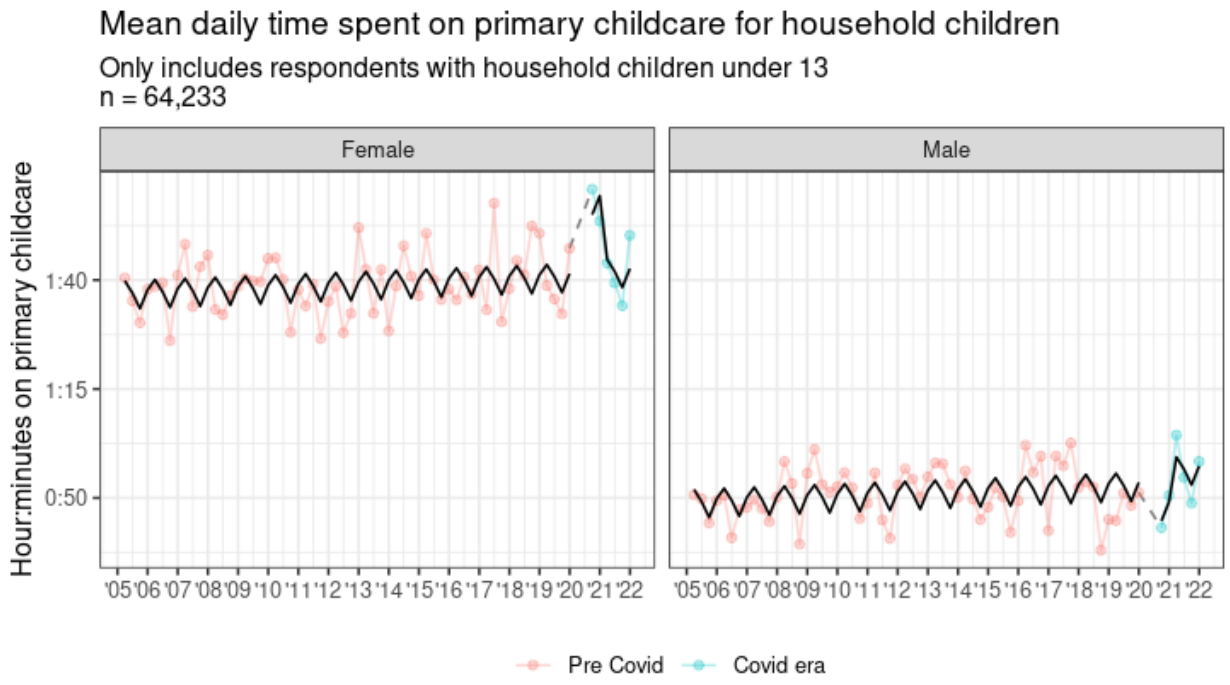

Figure 1

We report in Table 1 the estimates from a model that allows for a male-female differential in childcare, as well as different effects in the Covid period. This was the best model, in terms of BIC, out of all of the models examined, and provides us with a more nuanced understanding of the impact of Covid by sex. First, there is an overall increasing trend of ⅔ minute per quarter, and males on average report 48 minutes less time spent on childcare. This holds from 2005-2019. The quarter with the least childcare reported is Q3, and it is significant at traditional levels. Notably, in 2020, females reported spending almost 18 more minutes, on average, per day on primary childcare as compared to what they were predicted to report based on the trend and seasonality in the prior 15 years. There was no significant difference by 2021, however. For males, the model estimates about 5 minutes less time spent on childcare in 2020 and about 3 minutes more in 2021, but neither is significant. We conclude that men's participation in primary childcare was essentially unaffected by Covid, on average, while the opposite was true for women.

Table 1

Coefficient	Beta	Standard error	p-value
Time (in quarters)	0.67	0.03	0.03**
COVID:2020 [ref: Female]	17.6	4.27	0.00**
COVID:2021 [ref: Female]	0.64	3.16	0.84
Second quarter	-2.81	1.44	0.05

Third quarter	-6.51	1.43	0.00**
Fourth quarter	-2.28	1.43	0.13
Male	-47.9	1.16	0.00**
Male:COVID:2020	-22.4	5.84	0.00**
Male:COVID:2021	2.57	4.20	0.54

Secondary childcare

Although primary childcare, defined as a sole or predominant childcare activity, is an important indicator of time spent on childcare, it is incomplete as an accounting of time spent on childcare. This is especially the case in 2020 when many individuals' lives were upended. Workers, who were able, stayed home and performed their jobs remotely. Young students made similar adjustments. Childcare centers were temporarily closed. Parents found themselves spending much more time during the week simultaneously managing their day-to-day job and other responsibilities along with childcare, making it important to include secondary childcare as an indicator of time spent in childcare over and above primary childcare.

The ATUS defines secondary childcare as having at least one child in the respondents' care while performing some other activity besides primary childcare. The other activities are often household or leisure related. Similar to our primary childcare sample, we only include households with household children under the age of 13.

We found a pattern of decreased secondary childcare (SCC) at the rate of ⅓ minute per quarter in the years 2005-2019, followed by a clear tick up during the pandemic. We report in Table 2 the results of fitting a pooled ITS model identical to the baseline model used for primary childcare. Notably, the quarterly effects are positive in Q2 & Q3, suggesting that in summer months, secondary childcare increases relative to other times in the year. The Covid effects are quite similar for 2020 and 2021, at over 30 minutes per day additional secondary childcare reported, and the estimates are significant.

Using the same BIC-based ITS model selection process as we did for the primary child care analysis, we find the best fitting model to include sex-specific Covid effects and an auto-regressive error structure (\rho estimated at 0.28). The estimates quantify what is visually apparent in Figure 2. Specifically, time spent on secondary childcare for females in households with children under the age of 13 is approximately 6 hours daily in Q1 2005 decreasing to approximately 5.5 hours daily in Q1 2019.[4] The dark line represents the predicted regression line. There is a small but significant trend down in the amount of SCC, with men estimated to report nearly two hours less time spent on this activity, on average. We do not report the

[4] We note that 2021 Q2 was a 17-year high for SCC – the entire time period of the survey – but declined thereafter.

constant, but the overall magnitude of SCC is much higher than primary childcare, with over 5 hours per day reported for women in the 2005-2019 period. The quarterly trends mimic the pooled findings in terms of which quarters tend to involve more SCC. What is most striking is that both men and women report about 30 minutes more SCC in 2020 and 2021. There *is no gender gap in the change* experienced, but the overall pattern of a male-female gap in *total* SCC persists. There is apparently no reversion in SCC in 2021, on average.

Table 2

Coefficient	Beta	Standard error	p-value
Time (in quarters)	-0.33	0.09	0.00**
COVID:2020	37.9	9.28	0.00**
COVID:2021	30.4	7.03	0.00*
Second quarter	10.4	4.27	0.02**
Third quarter	25.3	4.24	0.00*
Fourth quarter	5.72	4.25	0.18

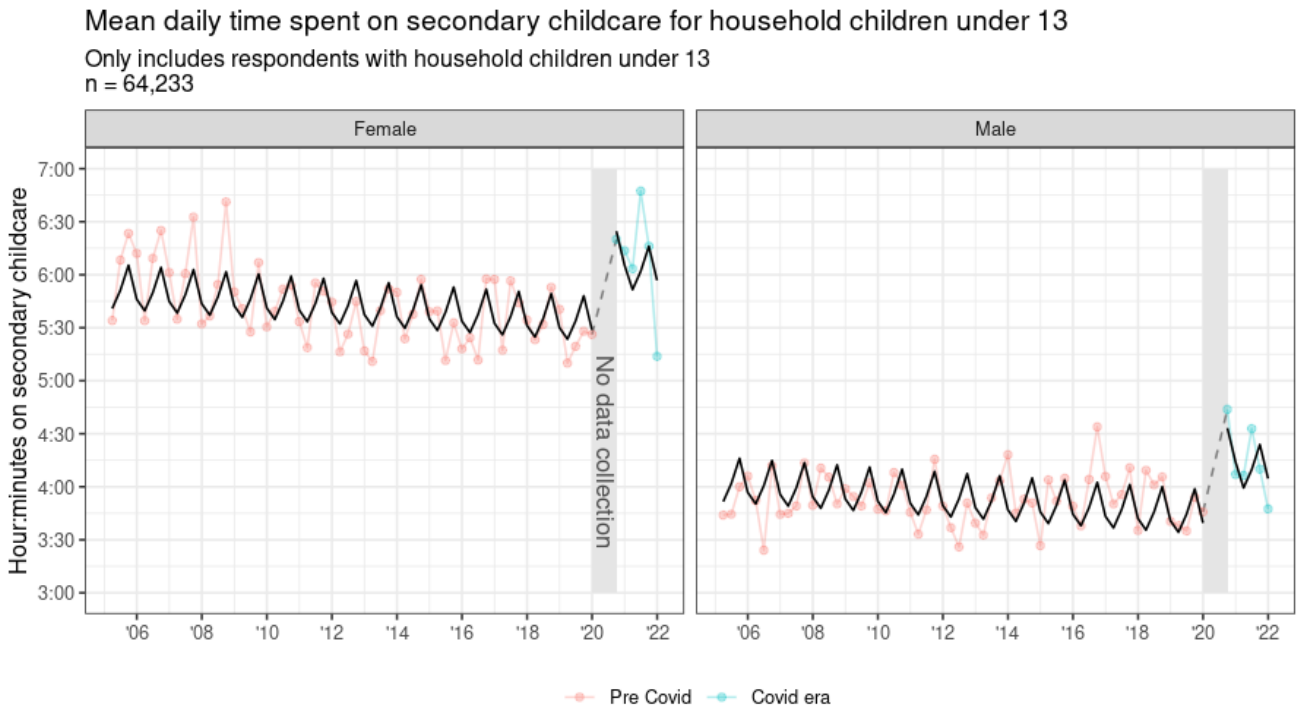

Figure 2

Table 3

Coefficient	Beta	Standard error	p-value
Time (in quarters)	-0.31	0.11	0.00**
COVID:2020 [ref: Female]	37.8	13.1	0.00**
COVID:2021 [ref: Female]	30.5	10.6	0.00**
Second quarter	10.4	3.30	0.02**
Third quarter	25.3	3.62	0.00**
Fourth quarter	5.72	3.34	0.00**
Male	-109.0	3.77	0.00**
Male:COVID:2020	-2.11	17.8	0.91
Male:COVID:2021	-2.93	13.9	0.83

Synthetic within-person differences

While the average trends are quite compelling, we were interested in unpacking the findings to identify individual experiences. This is challenging with pooled cross-sectional data, but by establishing matched pairs from 2020 back to 2019, we approach a counterfactual of interest: what would have been the experience of a particular (type of) person before and then during the pandemic? We focus on the first year of the pandemic and on secondary childcare, for which the pre/post differences are larger. This approach uses ideas similar to those of Vagni and Breen (2021), who use pair matching to identify the effect of childbirth on women's career trajectories. From these pairs, we can examine the distribution of change, which captures more closely how individual lives were affected. Will these average differences remain at the individual level? For example, the average increase in secondary childcare for women could be one hour, but this could have arisen from everyone experiencing a one-hour shift or at another extreme, one-eighth of women experiencing an eight hour increase while all others do not change. We wish to establish what actually happened, somewhere between these two extremes, and examine the distribution of such differences by gender. Matching provides synthetic within-person comparisons across years, but it does more than this. While we know that every attempt was made by the ATUS administrators to maintain the same target population each year, a restriction of the analysis sample to matched-pairs serves as a further robustness check, in the unlikely case that the population surveyed changed during the pandemic.

Matching is performed from 2020 to 2019 many-to-one (i.e. with replacement), as the 2020 respondents are our population of interest (akin to assessing a treatment effect on the treated,

e.g., ATT). We use Mahalanobis distance to determine the matches and calculate the distance based on family income (topcoded at $150,000, presence of partner, education (Did not graudate HS, HS, Some college, Bachelors, Masters, Doctoral/Professional), number of children, age of youngest, region of US, partner working status, elder in household status, metropolitan status (cf. King and Nielsen, 2019). Matches are first blocked on sex, race, Q3/Q4, and age +/- 2 years to ensure perfect matches for these privileged variables. The package StatMatch and the function mahalanobis.dist were used to carry out the matching. We restrict the sample to only include households that have children under 13 and who took the survey in the third or fourth quarter of 2019 or 2020.

Match quality is generally strong due to the comprehensive sampling methodology employed in the American Time Use Survey. In other words, the same “types” of people are surveyed each year. Moreover, we find that empirically, the Mahalanobis distance is conditionally independent of differences in SCC within the pairs (i.e., larger differences are not associated with poor match quality). We also performed a sensitivity analysis to evaluate whether the findings in 2019-2020 are an artifact of something inherent in the matching process or not (e.g., noise). We built matched pairs across non-pandemic periods, e.g., 2018-2019, as these constructed individual-level differences in SCC provide us with expectations for differences when there can be no pandemic effect. This analysis confirmed that the matching did not induce bias in either direction, so that observed differences in 2019-2020 are not an artifact of the methods used.

While the average change in SCC for the unmatched sample suggested men and women both experienced an increase in 2020, the matched pairs analysis reveals more subtle differences. Within-pairs, the average change for women was 84.2 minutes while it was 78.7 for men, about 5.5 minutes different, somewhat consistent with the regression analysis, which did not reveal a significant gender difference. We show the *distribution* of these differences for males and females in Figure 3. They are quite dramatic: for males, most of the change is centered between +/- 4 hours, while for females, the range is much wider, with some right skew related to a second mode. There appears to be a fairly distinct second mode around 8-10 hours – which is roughly equal to a standard workday.

This analysis informs our RQ3: The increases are not equally distributed across men and women. Women, on average, only had a modestly larger increase than men. The dissimilarity is in the distribution – many women saw an increase of about 8 hours per day, corresponding to the second mode in Figure 3.

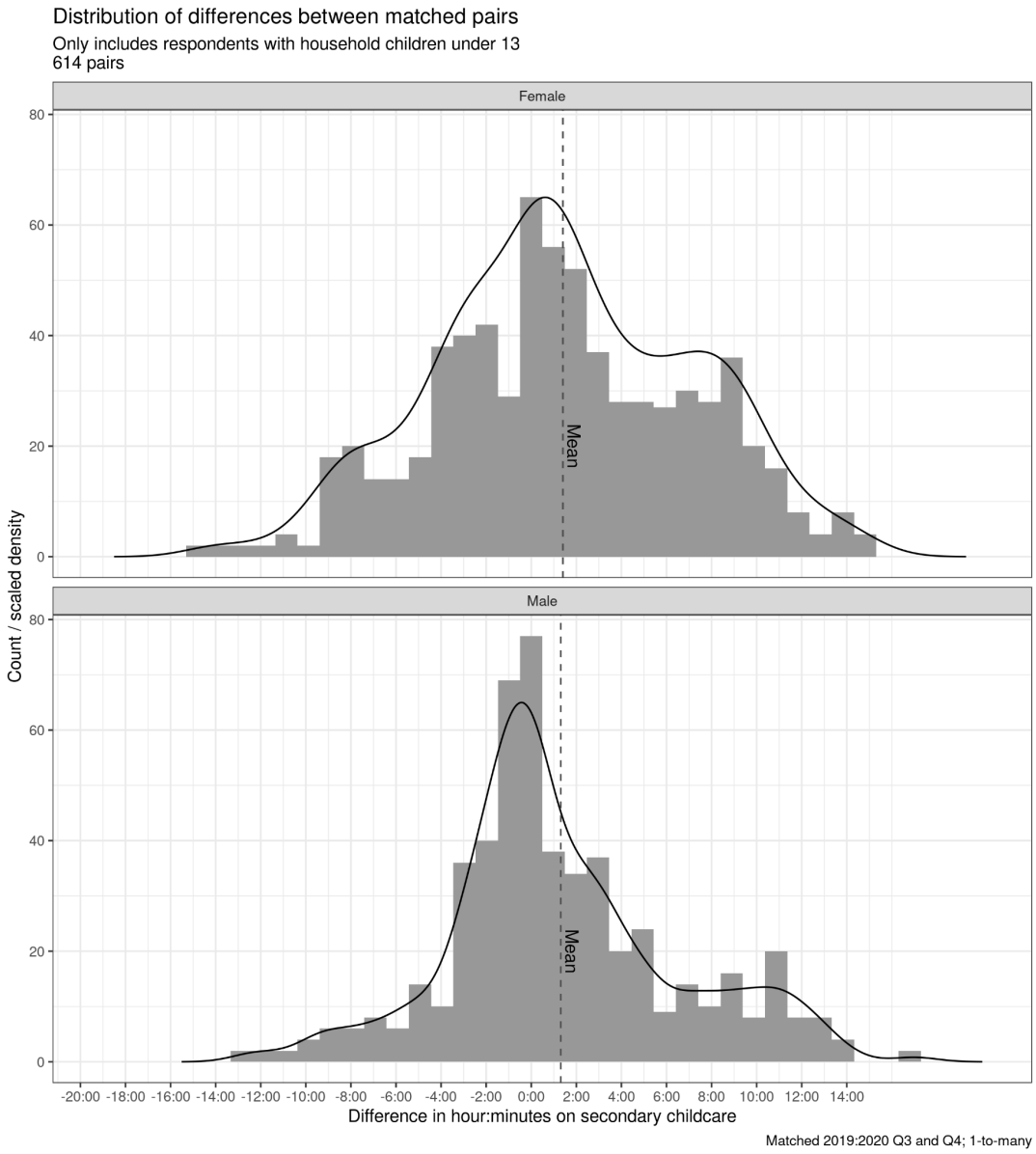

Figure 3

We witness an uneven change in childcare work for women, so it behooves us to examine whether these individuals are disproportionately in one demographic group or another. To do this, we contrasted the (synthetic) individuals who experienced an increase of 6-10 hours of SCC to those with -2 to 2 hours change (effectively no change, as some amount of change is induced through inexact matching). While we contend that an addition of 8 hours is consistent with being home during the workday and essentially watching your child when they are in "Zoom school," we could not find any indication that these parents were wealthier or poorer, more or less educated, with more or fewer children than those who experienced no change. We then controlled for sex and still could not identify a clear characterization of those who experienced the shock of eight additional hours of SCC in 2020. One thing is clear about this group, however, which is that they are predominantly female, with about 70% of this population so

identified. When we look at those who have been identified as combining work with SCC responsibilities, we find that the hours that include SCC *are* during 'typical' work hours.

We note that while PCC was not the focus of this analysis, we did examine it using this same methodology. We identified a group of female respondents (5% of women) who reported approximately 8 additional hours of PCC. This suggests that the average difference of 17 minutes masks great variability in individual experiences.

The within-person changes in time use associated with childcare from 2019 to 2020 suggest that rather than an across-the-board shift in time spent doing childcare, a set of women and men, but women in particular, found themselves doing much more childcare during working hours.

Patterns in time use

We now use the whole sequence to understand the context surrounding childcare – what other activities are present, what is their patterning, and do any new patterns emerge that were not present in the decades preceding 2020? The individual sequence plot, as implemented in function seqiplot in the R package TraMineR (Fasang & Liao, 2014; Gabadinho, et al., 2011), conveniently maps types of time-use to colors and graphically represents the sequence as a multicolored line. By sorting by a meaningful characteristic of the sequence, such as entropy (Elzinga, 2010), patterns become more apparent. We return to the full dataset for this analysis, so that we may quantify and identify changes or emergent patterns in the full population.

Faced with a wide variety of patterns in time use for the whole population, we seek to summarize `typical` patterns to determine whether 2020 was just another year like any other, with the caveat that the fraction of the population using their time one way or another may have changed. The work of Vagni and Cornwell (2018) demonstrates that across many different countries, people tend to spend their time in a manner that can be characterized by eight distinct typologies, using cluster analysis of time use sequences. We will do a similar analysis of our ATUS data, collapsing activities into those most relevant to our study. By clustering time use patterns across the entire day, we develop both a typology and a partition of individuals into those types. We will compare typologies over time, noting whether the number of individuals in each type (and of course the types themselves) changed during the pandemic. At one extreme, the work day itself could have shifted (earlier or later) to accommodate the extra childcare, while on another, more people have regular work days, with more instances of SCC. There is of course the possibility of a mixture of these characterizations. In sum, we want to uncover any new ways that individuals are spending their workday.

We use cluster analysis to understand patterns in daily life that are otherwise elusive, due to the variation in timing and content of sequence data. This allows us to sort respondents into a small set of patterns that reveal structure that can be characterized. Following Lesnard (2010) and Studer and Ritschard (2016), we chose the longest common subsequence (LCS) distance, which privileges the timing or ordering of the patterns of activity so important in our study. We used hierarchical clustering approaches common to this field, and Ward's distance method of agglomeration. The number of clusters was determined via the highest mean value of the normalized silhouette width, Calinski-Harabasz index, and Hubert & Levin C index (cf. Hubert and Levin, 1976; Hennig and Liao, 2013). The number of clusters tested ranged from 3 to 10. We of course examined other metrics as a robustness check, and our findings are very robust to the choices typical of a sequence analysis.

The sequence analysis clustering of men and women results in three distinct clusters. These clusters are characterized as workers not participating in secondary childcare (Cluster one), a mixture of activities with a strong contingent of individuals providing secondary childcare (cluster 2), and individuals participating mostly in leisure activities (cluster 3). These three clusters fit very naturally into Vagni and Cornwell (2018)'s typology, as they are in fact what their types would collapse into, when many activities are collapsed into a single state, as we have done. We did this in 2019 and every year prior, and found patterns that are consistent with Vagni and Cornwell (2018). In 2020, we do not identify an emergent pattern so much as a qualitative shift; an existing pattern changes somewhat and becomes more prevalent. As an important robustness check, we repeated this exercise in prior years, and none resembles the emergent time use pattern of cluster 2 in 2020.

Essentially, what appeared to be a "household activities" pattern in all previous years became a combination of those activities and SCC or of daytime work and SCC. Moreover, the group of workers without workday childcare decreased from 47% to 40%, while those at home, multitasking, increased from 9% to 12%. This indicates a change in Vagni and Cornwell (2018)'s typology, as the formerly "unpaid work" cluster emerged with a substantial subpopulation that combines work and unpaid work in the home. See figure 4. Given that the remaining 4% change is into the leisure cluster, it is also possible that the "Great Resignation" is evident in these data as shedding of "traditional employment" patterns.

Figure 4

The natural next question is who are the people in each cluster, and as per the focus of this study, we focus on gender differences. In Figure 5, we use a resampling technique to portray the “column percents,” or portion in each gender represented in the cluster. Focusing only on the 2020 clusters, we immediately see that women are slightly underrepresented in cluster 1 (43% female), but are substantially overrepresented in cluster 2, (75% female) which is the cluster with substantial SCC activity. The actual percentage for each cluster is 40%, 12%, and 48%, respectively. We see that females are disproportionately doing SCC, perhaps having “moved out” of the working without SCC cluster during this initial period in the pandemic.

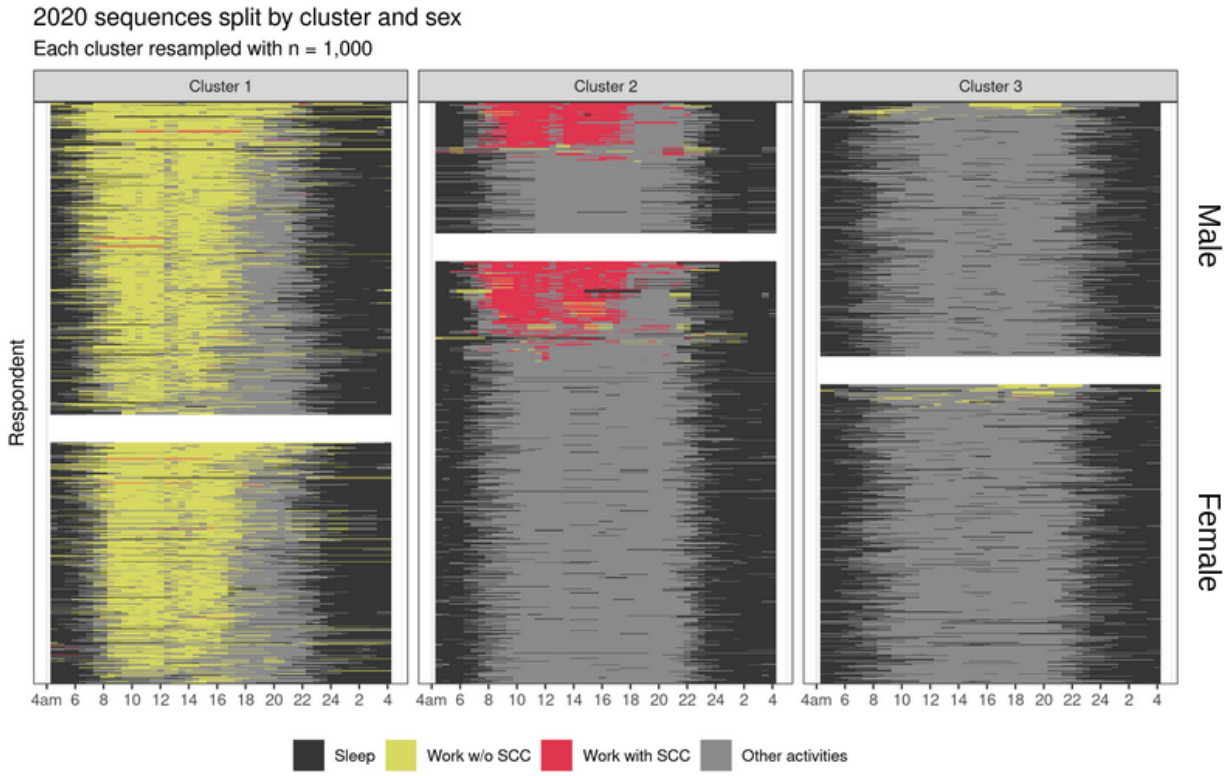

Figure 5

We note that in 2021, this typology still holds, and the pattern of increased work with SCC remains for both genders.

Discussion

With women’s entry into paid employment outside the home, a new set of norms has emerged for fathers that defines them to have a greater involvement with their children in addition to being a financial provider (Gerson, 2010; McGill, 2014; Taylor, et al., 2013; Townsend, 2002). According to McGill (2014) “[t]hese ‘new fathers’ are expected to be more equal partners in parenting (and other household work), spending time nurturing children and performing both interactive and physical caregiving activities” (p. 1090). A survey by the Pew Research Center (2013) also found that expectations for fathers had changed. In their report, *The New American Father* (Pew Research Center, 2013), based on a survey, Pew found that the new father was now expected “to be more of a moral teacher and emotional comforter than a breadwinner or

disciplinarian” (p. 1). The report also noted that "from time use data, fathers’ time with children rose from 2.5 hours per week in 1965 to seven hours per week in 2011, nearly a threefold increase. During the same period, fathers’ time spent doing household chores has more than doubled (from an average of about four hours per week to about 10 hours)" (p. 5).

Several studies (Craig & Mullan, 2012; Hook & Wolfe, 2012; Yeung, et al., 2001) also based on time use diary data reported results consistent with this new norm; that is, fathers engaged more equally in childcare, and they did so especially on weekends when they were not otherwise occupied at work away from home. Fathers’ lack of availability to spend time in the home due to their employment outside the home also was found by Gaunt (2006), Roeters, Lippe, & Kluwer (2009), and Townsend (2002) to contribute to a decreased involvement by fathers in childcare inside the home. By contrast, other studies found little or no such relationship between time spent in employment outside the home and time spent in childcare inside the home (Hook & Wolfe, 2012; Pleck & Masciadrelli, 2004), leaving the question open to further inquiry.

Capitalizing on the natural experiment provided by the COVID-19 pandemic, the availability of recent time use data from the nationally representative American Time Use Survey, and the use of cutting-edge statistical methods, the current study was able to estimate, over a seventeen-year period, the trend in time spent on childcare and household work by both mothers and fathers and to investigate whether, in fact, the division of childcare responsibilities became more equitable as a result of the pandemic when many of the cited workplace barriers (Boston College Center for Work and Family, 2019; Lenhart, et al, 2019) have been removed.

The results of our study are consistent with many other studies, as cited in this paper, on the pre-pandemic division of time spent on childcare between mothers and fathers. In particular we also find that mothers continue to bear the burden of primary childcare compared to fathers and provide empirical evidence for that, beginning with the year of data analyzed by our study, 2004 and onward. In addition, by decomposing childcare into two important components, primary childcare and secondary childcare, and by analyzing each separately, we provide additional insight, beyond other studies, into these two aspects of time spent on childcare by mothers and fathers. With respect to primary childcare, our data consistently show from 2004 onward, that mothers spent an average of twice as much time per day as fathers (1 hour and 40 minutes vs. 50 minutes); and with respect to secondary childcare, we find that the difference to be even more dramatic over this same time period. Mothers spent an average of approximately six hours per day on secondary childcare, while fathers spent an average of only approximately four hours per day on secondary childcare, a two-hour daily gap.

When we examined the change in time spent on childcare as a result of the pandemic, our results are not consistent with those of other studies in this area. While other studies have reported trends toward a more equitable division of time spent on childcare by mothers and fathers (Carlson, et al., 2021; Craig & Churchill, 2021; Shafer, et al., 2020; Yerkes, 2020), our study does not. We find, by contrast that while the pandemic increased the childcare time-use burden for both mothers and fathers, it did so far more for mothers than fathers. Our models, based on time-use diary data and controlling for secular and seasonal trends, indicate that during the initial year of the pandemic, we witnessed an increase in mothers' daily time spent on primary childcare by about 20 minutes and no increase for fathers. This difference faded by 2021, but the pre-existing gap between men and women, estimated to be about 45 minutes of primary childcare per day, remained. With respect to secondary childcare, increases are more comparable across genders. Parents increased their time spent on secondary childcare by almost 40 minutes per day in 2020, while that increase diminished to about 30 minutes in 2021.

Taking both years and both types of childcare into account, our results suggest that contrary to other studies in this area that have used retrospective, self-report data from surveys, the division of childcare responsibilities were not found to become more equitable as a result of the pandemic, but rather less, in 2020. The gap returned to its pre-pandemic levels by 2021, which is over two and half hours in total, based on our models.

In the introduction section of this paper, we pointed out that self-report response data from surveys are subject to social desirability and recall bias. In addition to these limitations, surveys also have been described as lacking in their ability to provide for the estimation of time spent in "multiple brief activities" (Yavorksky, et al., 2015, p. 665). Consistent with these deficits, methodological studies that have compared surveys with time-use diaries (Lee & Waite, 2005; Press & Townsley, 1968) have shown the former to be less accurate and less reliable than the latter in providing time use estimates. Because time-use diary data are not based on perceptions or retrospective thinking as they are for surveys, but rather on the objective and frequent recording of actual time spent in activities, research (Juster, et al, 2003) has shown that time-use diaries provide unbiased estimates of time spent on activities. Methodological studies such as these bolster our own findings that based on time-use diary data the pandemic did not reduce the uneven division of time spent on childcare (primary and secondary) by mothers and fathers, but rather appears to have increased it on average, at least during its first year.

Unlike other studies in this area, which only report estimates of time spent on childcare in the aggregate, as an average, our study, strengthened by a pair-matching process, also provides insight into the individual experience of change over the course of the pandemic on time spent in childcare. The results of this approach reveals that a smaller subset of the population, more often mothers than fathers, take on a greater burden. That is, while the overall increase for secondary childcare was about 40 minutes more per day more, on average, there is evidence as shown in Figure 3 that this is driven by approximately 17% of the population increasing time spent in secondary childcare in 2020 by about eight hours. This amply shows how averages mask important heterogeneity – the workday shifted to the home and secondary childcare joined it in 2020 rather than all parents doing the additional care. Moreover, sequence analysis was able to pinpoint the timing of secondary childcare by gender, and in particular to uncover any emergent trends. Qualitatively, a small cluster involving household work and perhaps some childcare, formerly called “unpaid work” has now shifted to one which includes a subpopulation for whom childcare takes place at the same time as paid work.

We note that by using over fifteen-years of time series, adjusted for seasonal trends, we were able to investigate whether the increases in time spent on childcare reverted following the initial year of the pandemic. We find that, a “reversion” to pre-pandemic behavior occurred for primary but not secondary childcare.

In sum, using these different statistical techniques, this study answers more definitively the question as to whether by virtue of the pandemic and being at home, fathers in fact spent more time involved in childcare and household work, both absolutely and relatively when compared to mothers than they did pre-pandemic. There is evidence that childcare activity increased for both genders. Although the existing gap appears to have grown for primary childcare during the height of the pandemic, the additional burden of secondary childcare appears to have been borne equally by women and men throughout the pandemic.

In tackling each research question, we encountered some limitations that we now discuss. For the analyses of the interrupted time series of primary and secondary childcare activities,

incomplete data in the first and second quarters of 2020 leave unknown the precise experience particularly in the second quarter. Perhaps men did initially contribute more to primary childcare, although it is just as possible that women bore an even greater initial burden. Our model-based comparisons control for a quarterly trend, so we can say with confidence that the gender gap increased in the third and fourth quarters of 2020. The matched pairs analysis relies heavily on the quality of the matching process. We repeated this process in pre-pandemic years to be able to compare our findings to the "natural" level of year to year change that we can identity and found it to be smaller and perfectly symmetric in the absence of "shocks." Were we able to improve the match quality with a larger set of demographics, a larger sample (to potentially refine the geographic and demographic nature of matches), or better, longitudinal analyses, we would improve the precision of our difference estimates. Longitudinal analyses contain their own challenges for data collection during a pandemic, of course. To the extent that we can obtain longitudinal data without sacrificing the quality of the instrument in recording daily activity, we would be able to answer more definitely the question of movement within the time use typology. We have indirect evidence that individuals moved out of the traditional work outside the home pattern to working within the home and doing secondary childcare, and our sequence analysis also suggests that some of these workers became the "greatly resigned," joining the "leisure" cluster. However, sample size, match quality, or lack of truly longitudinal data limit our ability to quantify this movement more precisely or to compare it to a normal level of "churn" between activity types in the absence of a shock. Future research, with longitudinal data, could build a more complete roadmap of movement between time-use types over the life course. Indeed, international data combined with information on more "regional" shocks, such as economic or migratory ones, would provide deeper understanding of how humans organize their households in periods of stability and disequilibrium.

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