

DIRECT VALUATION OF PERSONAL CARE BY HOUSEHOLDS

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Abstract

This paper valued the quantity of child, sick, and elderly care provided by households using a new, direct measure. Such measures add to the literature that estimates the size of the contribution of non-market work by household members, particularly women, and to literature about valuation of child care. This production remains unvalued in standard national income accounts. Traditional attempts to quantify this care multiplied care-giver hours by a wage rate, a method which suffers from several drawbacks, including omitting the contributions of anything but labor, the inability to handle joint production, and the use of an arbitrary wage rate. This study avoided these problems by valuing the amount of care with its market price based on data from a small urban area. The mean value was \$3,547 annually (97 percent of it child care) for all sample households and \$9,610 for those providing care. The results afforded evidence of scale economies in parental child care and quantified care furnished by different kinds of providers.

Key words: personal care, child care, household production

INTRODUCTION

This study directly measured and valued the quantity of child, sick, and elderly care, i.e. personal care, provided by households in a small urban area. It defined the quantity of care as the number of person-days of care where, for example, a child-day of care was the total care received by one child for one day of her life. Our ultimate goal is to obtain the closest possible measure of the true value of household production. This study focuses on personal care which comprises a significant portion of household production. Ideally, the value of personal care would be calculated following national income accounting convention, but since household production is not sold on the market, there is no public record of its quantity and value. However, household surveys can find the amount each household produces of various household production types, e.g. child care. Multiplying this quantity by the market price of equivalent production, i.e. direct measurement, yields a good estimate of value. We call this the direct measurement approach.

Both household production and its personal care component are important for a number of reasons. Since they use scarce resources and provide human satisfaction, they are conceptually if not officially part of national income and are sizable (Kuznets, 1946, p. 124; Nordhaus and Tobin, 1973, pp. 517-520). Growth rates in income are also biased as women increasingly move from home to market production (Weinrobe, 1974). The contribution of women, who perform the bulk of home production and care, to national production is significantly understated (Walker & Gauger, 1973). Poverty may be understated as well (Douthitt, 2000). For these reasons, a large literature has developed to measure household production (see surveys by Chadeau, 1992; Goldschmidt-Claremont, 1990). More specific to

our paper, information on personal care can be used to evaluate the contribution of various types of caregivers, such as schools in the case of child care, that go unmeasured.

In order to assess the size of the care contribution to a nation's income, logic prescribes that national income accounting principles be used to measure that care. These principles specify that the value of an activity such as personal care equals the total market value of the activity. Equivalently, the value equals the sum of the values added of all inputs used in its production. The traditional way of measuring personal care has been to record the time households devote to care and other household production. Researchers then multiplied these hours by a wage rate; hence it has been called the labor method. However, basing value on only labor violates national income accounting principles by excluding the contributions of other inputs such as capital, and choosing an appropriate wage rate may be arbitrary at best. Also, the labor method omits consideration of marketing and has difficulty apportioning value among joint outputs where participants do two tasks at once, e.g. child care and laundry. Even though the advantages of direct measurement were known, ease in data gathering and belief that direct measurement was unfeasible motivated continued use of the labor method (for example, see Schettkat, 1985). Fitzgerald and Wicks (1990) demonstrated the feasibility of directly measuring all types of household production except personal care.

In this paper we value personal care directly. This current study avoids problems specific to the labor method. Since the direct measurement approach measures total value, it must include contributions to its value by every one of its inputs. While the value added to the care by labor is included, the direct method does not require that we know the wage rates of those providing the labor or whether the labor might have been used to produce more than

one thing simultaneously. Direct measurement is not without its own problems. Gathering output data is somewhat more complex than gathering time data. As discussed later in the paper, parental child care is likely to be of higher quality than market care by non-parents. Both the direct output and labor value methods ignore this difference in quality. The former method ignores it by valuing parental care at the market price of day care. The latter method ignores it by valuing parental hours of care by the wage rate paid to day care employees. However, part of the increased quality of parental care could result from parents devoting extra time to their children. If so, the labor method could reflect a portion of the higher parental care quality while direct measurement would not.

The average annual child, sick, elderly days of care provided in the study's households was 46.82 care-days by mothers, 19.01 care-days by fathers, and 1.57 care-days by other household members. Nearly all of this was child care. Perhaps surprisingly, parents provided less than 40 percent of total child care. Schools provided as much care as parents. The amount per child was inversely related to the number of children in the household, the age of the youngest child, and the hours of parental market employment. Single mothers provided considerably more care than married mothers. Personal care's value averaged \$3,547 in our sample households and \$9,610 in the households which engaged in personal care. Measuring this care by the labor value method yielded a value one-third larger than the direct output values. Economies of scale were a likely explanation of this result. While the values obtained by the two methods were correlated, labor value was not a close approximation of child care quantity in individual households.

By directly measuring the quantity and value of personal care, this study fills a gap in methodology and shows the feasibility for direct measurement of all types of household

production. This method has much to recommend it. It avoids the serious accounting shortcomings of the labor value method and yields output quantity information which can answer questions about productivity and scale economies. For example, knowing that schools provide as much child care as parents has implications for government spending policy. The existence of scale economies in parental care which are unavailable in small families adds to the attractiveness of market employment to mothers of such families. Thus, the labor method could be preferred only if labor data were more easily gathered than quantity data, or if labor hours better reflected the quality of parental care. While both methods work toward providing a more complete picture of national income, the direct method emphasizes including all facets of household production.

SURVEY METHOD

This study's main purpose was to improve the measurement of personal care by measuring it directly. Direct measurement requires quantifying the care and multiplying the care by an appropriate market price.

The key to quantifying household production is disaggregating its components and carefully defining the unit of measurement for each component. Discussions with local child care experts led us to define child care as all activities which constitute the care or nurturing of a child, i.e. feeding, changing, playing, holding or any other activities with the purpose of enhancing the child's life or fulfilling the child's needs. Following legal convention, we assumed that only children aged 17 and under were eligible for child care.

We defined our measurement unit as a child-day of care along the lines of Mocan (1997) who used the concept of child-hours of care as a measure of output for day care centers. The full care of one child for one day of the child's life was one child-day of care.

For example, the child's mother might have provided 60 percent of that care, the father 30 percent, and a baby sitter 10 percent. Thus the mother would have produced 0.6 child-days and the father 0.3 child-days of care.

These child-days need not be proportional to the hours devoted by each parent to provide that care. For instance, consider a parent who spends two hours attending a basketball game in which his or her child is a player. The motive for attendance is to support the child, and, in cooperation with organizers of the game, the parent is responsible for only part of the care. The next day, the parent spends two hours playing with the child on a one-to-one basis. Clearly, the latter two hours would yield a greater quantity of child care than the previous two hours spent at the basketball game.

Surveys of 298 households in the Missoula, Montana urban area provided the quantity of child care data.¹ Households were selected by a pre-set geographic pattern based on the 1990 Census neighborhood boundaries. Interviewers administered questionnaires to the head of the household or spouse at the home owners' residences. A survey response form is available upon request from the authors.

To measure child care, the questionnaire identified each person in the household by age and relationship to other household members. For each child, we asked the portion of child care provided by a parent of the child, the other parent, other household members including older children, school, babysitter, child care facility, other friends and relatives, and self care for children five and older.² Responses for the first three caregiver types were the child care data for the household. For each caregiver, e.g. mothers, we summed the portion of care given to each child. The sum was the child-days (units) of care provided by

¹ Missoula, Montana was the interview site because two of the authors resided there and had skillful interviewers available to them.

² We have arbitrarily set the cut off for self care at 5 years old.

that caregiver on the average day. Multiplying this by 365 yielded the care he or she provided annually.

This procedure was used because the amount of care a child receives from various providers tends to vary considerably according to the day of the week and season of the year. For example, schools typically provide the most care for children over five school days, but they provide almost no care on weekends and school vacations. During the planning phase of this project, we conducted a number of trial interviews which variously attempted to deal with this problem. We found the easiest solution was to ask about the average amount of care over the past year. Discussions with these interviewees indicated that they did not believe that estimating these averages over a period as long as a year was a substantial problem.

Although only data from mothers, fathers and other household members was needed to compute the household's child care production, to increase the accuracy of the information reported for the parents, the questionnaire requested care contributions by all types of care providers. The initial testing of the questionnaire indicated a tendency for parents to overstate their care unless all care was included and total care was required to equal 100 percent (one child-day) for each child. The amount of non-parental child care was notable as reported later in this paper.

Our procedure omitted care provided to a child by a non-resident parent. This occurs because we have followed Reid's (1934) convention of limiting household production to those items used by the household that produce them.³ In eleven percent of the sample households with children there was a non-resident parent. The spouses of these non-resident

³ M.G. Reid, one of the early authors on household production, defined it as "... those unpaid activities which are carried on, by and for the members, which might be replaced by market goods or paid services..." (Reid, 1934).

parents reported that eighteen percent of them provided child care to one or more children in the surveyed household. In keeping with the household production definition, and because we had only limited information about these non-resident parents, we omitted their care from our household care results. Doing so reduced our measure of total child-days of care by about one percent and of fathers' child-days of care by about two percent. Care by step-parents who were members of our survey households was included in care by the household members.⁴

Our survey data included average daily caregivers' time on the days care was provided for each type of care. This information allowed computation of the labor value of the care for comparison with direct measurement results. To be counted, the time had to have personal care as its primary function. Merely having a child, sick, or elderly person in a household did not indicate personal care; individuals may care for themselves. Such self-care may involve little more than sleeping or watching television.

Most household production definitions include a requirement that a similar item be sold in the market place. The average market price of that item can then be used to price the household production version of the product. This study used the average price charged by child care facilities which accepted children of all ages to value household child care. Detailed personal interviews with the directors of eight day care facilities in Missoula, Montana furnished this pricing information. All of these care facilities served the general

⁴ Because of rising divorce rates, non-resident and step parenting are likely to be increasingly important and worthy topics of future work. Clearly, the definitional convention of limiting household production to care consumed only by residents of the producing household is outdated. The most logical way to include care to non-resident children and extended family members would be to treat it identically to care provided within the household. The same information would be gathered for the non-resident children as for children residing in the household of the interviewee.

public and were willing to provide care for children under two. Each director stated that her facility provided care which met fully this study's definition.

While parental care may occur at any hour of the day, Missoula's day care facilities are open only on weekdays from about 7:30 a.m. until 5:30 p.m. For this reason, the fee schedules of these facilities may not apply to all of a child's care. Each of eight facility directors considered this problem and then estimated what the facility would charge for 24-hour, seven-day-a-week child care. The medians of their estimates were \$70 per day for children under two and \$51 per day for children two and older. There would be a discount of \$5 per day for additional children from the same family.

We used similar procedures to measure the quantities of sick and elderly care and to price that care. Local nursing homes were the source of the pricing data, the mean of which was \$120 per day.

RESULTS AND ANALYSIS

Personal Care Output

The first purpose of the study was to measure the amount of personal care. Table 1 shows these amounts for the sample households. Nearly all of the output was child care, and

Table 1 about here

child care is the emphasis of the remainder of the paper. Table 2 disaggregates child care quantities for the sample households with minor children. One may note that mothers provided more than twice as much care as fathers, care per child was less in households with more than one child, the amount of care was greatest when young children were present, and

Table 2 about here

mothers' child care was inversely related to mothers' market employment. While the market employment figures show the net result of parents' behavior, they do not necessarily establish a cause and effect relationship because the amounts of child care and market work are interdependent.⁵ Recent work has indicated considerable difference in child care behavior between married and single mothers (Connelly & Kimmel, 2003). A disaggregating of the numbers in the first line of Table 2 reinforced this result. While the average daily amount of child care by married mothers in the study was 0.339 child-days, for single mothers it was 0.527 child-days. The corresponding figures on a per child basis were 0.245 for married mothers and 0.322 for single mothers.

The next step in the analysis was computing the value of the care. For each person in the sample, the value for child care was the product of three magnitudes:

- (1) the number of days during the year on which the person produced care;
- (2) the child-days of care the person provided on an average day; and,
- (3) the median provider price for that care.

The computation was analogous for sick and elderly care.

Table 3 shows the mean personal care values for the total sample and for those households doing personal care. The mean annual child care value in the sample was \$3,429. The average value of sick and elderly care was only \$118. For the 36.9 percent of the households that produced some type of personal care, the average child care value was \$9,290. The care value was considerably higher in married couple households than in those with single heads or in roommate households because there were more children living in the typical married couple household. For households with children present, the average care value was similar for households headed by two compared with one parent.

⁵ Wolf and Soldo (1994) examined this for elderly care.

Table 3 about here

Comparing Results from the Output and Labor Value Methods

Since child care has traditionally been measured by the labor value approach, we compared our directly measured values of personal care with the labor values of care in our sample. Labor values are the product of the hours a householder devotes to personal care and an appropriate wage rate for that care. As previously explained, our questionnaire obtained the time devoted to child, sick and elderly care by household members. Missoula child care facilities and nursing home facilities reported median hourly wages of \$6.50 and \$7.37 respectively for nonprofessional care providers. We used the former to value the hours spent at child care and the latter to value sick and elderly care.

Table 4 compares the output and labor values of personal care. Labor values were significantly greater than output values. The former exceeded the latter by 33.1 percent for all personal care and by 34.7 percent for child care. Paired sample t-tests show that the corresponding labor and output values differed at the one percent error level. At first glance, these results are unexpected. Fitzgerald and Wicks (1990) found that for household production excluding personal care, the output value exceeded labor value by 44 percent.

Table 4 about here

Economies of scale appear to be the most important reason for this difference. There is evidence that as more children are being provided care in one location, the resources such as labor needed to provide the care increase less than proportionally to the number of children. Powell and Cosgrove (1992) and Mocan (1997) found such scale economies in day care centers. In this study's sample households, there were similar economies which are

detailed subsequently. An example of this phenomenon is an adult being able to read to several children simultaneously.

Nearly all day care centers operate on a larger scale than households. Because of their scale economies, centers can produce a child-day of care with less labor than a typical household, i.e. their average output per worker (average product of labor) is higher. On the one hand, this higher productivity lowers the price of day care. This lower price reduces the value of home produced child care as measured by the output approach. On the other hand, the lower productivity in households tends to raise parental hours of child care. The greater the time parents devote to caring for their children, the higher the labor value estimate of their care's value.

For each of the 104 mothers and 91 fathers in the sample who provided child care, we divided the annual child-days of care by the annual hours devoted to care to compute their average product of labor. As summarized in Table 5, the mean average product was .086 for mothers caring for one child and .131 for mothers caring for two or more children. The

Table 5 about here

corresponding numbers for fathers were .088 and .149. The differences between the means were significant at the one percent error level for both mothers and fathers. The 47 percent (.131/.086) by which the average product of labor with two or more children exceeded the average product for those with one child was by itself more than enough to account for the excess of labor value over output value in the study.

There are two other variables, capital intensity and marketing, which may help to explain the fact that labor value exceeded output value. These variables entail costs included in output value that are ignored by labor value. However, they are smaller for personal care

than for most household production, thus adding to the excess of labor value over output value. Specifically, financial data furnished by the day care centers that provided the pricing data for the study showed that capital supplied only about 14 percent of the value added by these facilities. Fitzgerald, Swenson, and Wicks (1996) found that capital contributed about 23 percent of the value of household production other than child care. While marketing costs are significant for most of the market alternatives to household production, in the Missoula area marketing by day care centers consists of little more than a yellow page listing, so this matters little.

Quality almost certainly affects the value of child care, but it is less clear how it may affect the comparison between output and labor valuation. Because of what may be termed biological altruism, the standards of parental care seem usually to surpass the quality of care provided by a non-relative regardless of professionalism or motivation. As one who formalized this concept, Becker (1981) observed that reasons predisposing parents toward care of their children included genetic similarity, more readily available information, and a desire to make their heavy biological investment in their children worthwhile. There is also empirical evidence that people rate the quality of the child care they provide much higher than the market alternatives. Dulaney, Fitzgerald, Swenson and Wicks (1992) found that a sample of 175 Missoula area households judged their child care to be superior to the market version by a factor of 52 percent compared to 32 percent for all of their household production. In an ongoing Missoula area study, we collected data on attitudes toward child care. Interviewees expressed their opinions toward a series of statements about child care by placing a mark on a semantic differential scale ranging from plus 10 (much better) to minus 10 (much worse.) The mean response to the statement, "How would you compare the quality

of the child care that you provided to the average day care, nanny or babysitter?,” was 6.4. And there is evidence that the overall quality of market child care is mediocre. For instance, Mocan (1997) found day care quality to rank 4.01 on a scale where 1 was inadequate, 3 minimal, 5 good, and 7 excellent.

Because of the superior quality of parental child care compared to market produced care, our measurement of the value of child care understates its true value. The short measure exists regardless of the valuation method used. With output value, the understatement takes the form of a market price that is too low to apply to parental care. Day care facilities, the source for market prices, have the inherent disadvantage of providing a second best substitute for parental care. With labor value measurement of care, the wage rate is too low since day care employees are imperfect replacements for parents.

Whether quality has differing effects on output versus labor valuation of child care is less clear and depends on two things. The first of these is the percentages by which prices charged by day care centers and the wage rates they pay understate the value of parental care. The method with the lower understatement would not only have a higher value but would better reflect the superior quality of parental care. While the answer is unknown, the fact that day care employees are the main input providing the care suggests similar understatement. The second question is whether parents respond to biological altruism by devoting extra time to child care to improve its quality. If they do, then the extra time would increase the magnitude of the labor value measure. Labor value would exceed output value and simultaneously better reflect the higher quality of parental care. The shortage of time commonly experienced by working mothers would tend to limit the availability of such extra time. Unfortunately, empirical evidence on whether there is a positive correlation between

parental child care time and its quality (as contrasted with quantity) is lacking. These questions provide seeds for future research.

The discussion so far has compared aggregate values of personal care measured by the output and labor value approaches. If there were a consistent relationship between the two values for individuals, one could be used as a proxy for the other by simply adjusting for the average percentage difference between the two. This could be helpful if labor value were easier to measure than output. To examine this possibility, we regressed output value on labor value for wives and husbands for households with children. Table 6 shows the results. While the relationships were statistically significant, parental hours are clearly an imperfect proxy for child care output.

Table 6 about here

Child Care from the Child's Viewpoint

Traditional analysis has dealt with child care from the viewpoint of caregivers. A major reason for this focus has been that data measuring the amount of child care was limited to caregiver hours and contact hours with children. Information of this type is useful for such issues as governmental policy concerning day care for working mothers. On the other hand, it is the child herself who receives the care. The quality of different providers' care varies, so hours may not truly measure the care that a child actually obtains. Who provides how much care may also have policy implications.

One exception to the traditional practice of considering child care from the viewpoint of the providers has been the United States Census Bureau quantification of child care arrangements (Bureau of Census, 1996, 2000; Casper, 1995). This work reported the portion of children receiving care from the various types of care providers and the average weekly

hours of care received from the providers. From this information, one could compute the average percentages of total care hours that children in various age brackets receive from different provider types. While this data considers care from the viewpoint of children, it is limited to hours of care rather than the amount of care received. As discussed previously in this paper, the amount of care may not be proportionate to the number of hours of care.

The methodology used to measure child care by the output approach furnished the portion of that care provided by the various kinds of care providers. Table 7 shows the means

Table 7 about here

of these portions for the 154 minor children in the 90 sample households of married couples with minor children. The numbers are striking. For these 154 children, the average portion of care provided by parents was 36.5 percent. Only for children under six were parents the primary sources of care. For the total sample, schools provided 37.2 percent of the care, and their portion for children over six exceeded 46 percent. Applying the method used to value parental care to this figure yielded estimated annual values of schools' child care role to be approximately \$8,200 per youngster and \$13,900 per household with children.

Hours of care providers' time could give this information only if all providers were equally productive. Equal productivity appears unlikely. For example, an hour of care by a teenage baby sitter is unlikely to fit as many of the dimensions of child care as an hour of parental care. Care portions afforded by various providers may be important. For instance, the large portion of care which schools provide indicates that schools play a very major role in child care.

SUMMARY AND CONCLUSIONS

The underlying purpose of this paper was to demonstrate the feasibility of measuring

the personal care component of household production with output methodology rather than the traditional labor value approach. This closes a gap concerning the application of the output method for ascertaining the value of household production. Therefore, the accounting advantages of the output method, such as the inclusion of value added by non-labor inputs, are available for personal care valuation as well as other types of home production.

Child care comprised 97 per cent of all personal care. It averaged more than 66 child-days of care in the sample households. Mothers provided more than twice as much care as fathers. The quantity was inversely associated with age of the youngest child and hours worked by the mother in the marketplace. Average value of child care was \$3,429 in the sample households and \$9,290 in those households where child care was provided. The average quantity of child care per hour of parental time was significantly greater in households with two or more minor children than in one-child households. These results indicate that the scale economies, which have been found for day care centers, also exist at the household level. Schools provided 37 percent of the child-days of care; parents provided 36 percent. For children of school age, schools supplied about 46 percent of the care.

The value of child care calculated by the labor value method averaged \$4,619 per household, some 35 percent more than the output value figure. Accordingly, one may conclude that the output and labor approaches yield different results and that the difference varies among commodities. For many types of household production, the output values tend to be larger because of the importance of non-labor inputs such as capital which the labor approach omits. With child care, these omitted inputs are less important, but scale economies exist. The scale economies enjoyed by day care centers lower the price of day care which in turn is the price used to value household's child care output. The lack of these

economies in households with few children may raise the number of parental care hours per child and thus the calculated labor value of the care.

Because of biological altruism, both direct output and labor valuation likely understate the value of child care and thus all personal care. The quality of parental care is intrinsically likely to exceed the quality of child care by others. Thus, valuing the child-days of care determined by the output method using day care pricing will understate the value of the parental care. For the same reason, the hourly wage of day care employees used to value parental child care hours understates the worth of those hours. One might argue that a mother's biological drive to care for her children may increase the number of her care hours and that the labor value method will reflect these hours while the output approach will not. Even if true, however, this argument would only partially address the quality issue. The value of the parental care per hour will still be understated. We argue that the better approach -- and a worthy topic of future study -- would be to estimate empirically the quality of parental versus various other sources of child care. Previous work which asked respondents to estimate quality comparisons or to reveal their attitudes about quality indicates the feasibility of doing this.

The output method of valuing child care yields information which would otherwise be unavailable and which can be useful in considering a number of important issues. The key information is the quantity of care actually provided. Knowing this along with hours devoted to care as previously measured allows calculation of productivity, e.g. average product of labor and scale economies. The evidence of scale economies in this paper leads to the conclusion that the reduction in family size in recent decades has likely raised women's relative productivity in market work compared to work at home. These results seem relevant

for nations seeking to implement policies to influence family planning or family values. Further study of this phenomenon is warranted.

Quantification of child care helps move the perspective for considering child care from the viewpoint of the provider to that of the child. For instance, the fact that schools provided 37 percent of the care received by children is relevant for government spending policy. This information differs from and adds to the information about the time which parents devote to child care. The time information is relevant for issues such as day care to facilitate market employment of single mothers or to mitigate the burden of providing child care. Similarly, information about the quantity of care which children receive is appropriate to weigh the benefits or burden to children of policy changes influencing their care.

REFERENCES

- Becker, G. S. (1981). *A Treatise on the Family*. Cambridge, MA: Harvard University Press.
- Bureau of Census, United States Department of Commerce. (1996). *Who's minding our preschoolers?* P70-53.
- Bureau of Census, United States Department of Commerce. (2000). *Who's minding the kids? Child Care Arrangements* P70-70.
- Casper, L. (1995). *Who's minding our preschoolers?* Fall 1994 (Update). Bureau of Census, United States Department of Commerce P70-62.
- Connelly, R. & Kimmel, J. (2003). Marriage, work for pay, and child care, pp. 248-270 in: S. Grossbard Shechtman (ed.), *Marriage and the Economy: Theory and Evidence from Advanced Industrial Societies*. New York: Cambridge University Press.
- Chadeau, A. (1992). What is household's non-market production worth?, *OECD Economic Studies* 18: 86-103.
- Douthitt, R.A. (2000). Time to do the chores: Factoring home-production needs into measures of poverty, *Journal of Family and Economic Issues* 21(1): 7-22.
- Dulaney, R., Fitzgerald, J., Swenson, M. & Wicks, J. (1992). Market valuation of household production, *Journal of Forensic Economics* 3:115-126.
- Fitzgerald, J., Swenson, M. & Wicks, J. (1996). Valuation of household production at market prices and estimation of production functions, *Review of Income and Wealth* 42:165-180.
- Fitzgerald, J. & Wicks, J. (1990). Measuring the value of household output: A comparison of direct and indirect approaches, *Review of Income and Wealth* 36:129-141.
- Goldschmidt-Clermont, L. (1990). Economic measurement of non-market household activities: Is it useful and feasible?, *International Labour Review* 129:279-299.
- Kuznets, S. (1946). *National Income: A Summary of Findings*. New York: National Bureau of Economic Research.
- Mocan, H. (1997). Cost functions, efficiency, and quality in day care centers, *The Journal of Human Resources* 32:861-891.
- Nordhaus, W. & Tobin, J. (1973). "Is Growth Obsolete?", pp. 509-532 in Milton Moss (ed.) *The Measurement of Economic and Social Performance. Studies in Income and Wealth*, Vol. 38. New York, National Bureau of Economic Research; distributed by Columbia University Press, 1973.

Powell, I. & Cosgrove, J. (1992). Quality and cost in early childhood education, *Journal of Human Resources* 27:472-484.

Reid, M.G. (1934). *Economics of Household Production*. New York: John Wiley & Sons.

Schettkat, R. (1985). The size of household production: Methodological problems and estimates for the Federal Republic of Germany in the period 1964 to 1980, *Review of Income and Wealth* 31:309-321.

Walker, K & Gauger, W. (1973). Time and its dollar value in household work, *Family Economics Review* Fall:8-13.

Weinrobe, M. (1974). Household production and national product, An improvement of the record, *Review of Income and Wealth* 20(1):89-102.

Wolf, D. & Soldo, B. (1994). Married women's allocation of time to employment and care of elderly parents, *Journal of Human Resources* 29:1259-1276.

Table 1
 Mean Annual Days of Personal Care Output For
 Total Sample of 298 Households*

Personal Care Activity	Total Household	Mother	Father	Other Household Members
Child Care	66.58	46.13	18.92	1.53
Sick Care	.18	.13	.05	.00
Elderly Care	.30	.22	.04	.04

*One unit of output is the total care for one person for one day.

Table 2

Average Daily Child Care Output by Parents in
Households with Production of Child Care

Household Group	Mother			Father		
	N	Child Days	Amount per Child	N	Child-days	Amount per Child
All households with children*	104	.373	.255	92	.171	.116
Households with one child	59	.275	.275	53	.127	.127
Household with more than one child	45	.476	.225	39	.230	.110
Households where youngest child's age is less than 5	24	.577	.432	20	.192	.154
Households where youngest child's age is 5 or older	80	.298	.195	72	.165	.108
Mothers working more than 30 hours; Fathers more than 40 house per week	64	.302	.191	28	.203	.132
Mothers working between 10 and 30 hours; Fathers 40 hours per week	30	.388	.298	55	.154	.106
Mothers working 0 hours; Fathers less than 40 hours per week	10	.671	.479	9	.174	.131

* 104 out of 298 (34.9%) surveyed households had children. In Missoula county 34.2% of households had children (Source: Bureau of the Census, 1994. County and City Data Book, Washington DC: USGPO).

Table 3
Mean Values of Household Output of Personal Care

	Total Households	Married Households	Single Head Households	Roommate Households
Number of Households	298	163	42	93
Child Care Output Value	\$3,429	\$5,438	\$2,574	\$294
Total Personal Care Output Value	\$3,547	\$5,651	\$2,579	\$297
Number of Households with Personal Care	110	95	11	4
Child Care Value in Households with Personal Care	\$9,290	\$9,331	\$9,830	\$6,841
Total Personal Care Value in Households with Personal Care	\$9,610	\$9,696	\$9,846	\$6,903

Table 4
Comparison of Output and Labor Value Estimates for Households

	Sample Mean	Paired t Test, Output Value with Labor Value
Output value: child care	\$3,429	
Labor value: child care	\$4,619	t = 5.01*
Output value: total care	\$3,547	
Labor value: total care	\$4,722	t = 4.89*

* Statistically significant at the 1 percent error level

Table 5

Comparison of Parental Average Product of Labor Used in
Child Care in Households with One Versus Two or More Children

	One Child		Two or More Children		t value for Difference in Means
	n	APL*	n	APL*	
Mothers	59	.086	45	.133	3.58**
Fathers	52	.088	39	.149	2.78**

*Average product of labor

**Statistically significant at the 1 percent error level.

Table 6

Regression of Output Value on Labor Value of Child Care for
Married Householders with Children

	Coefficient of Labor Value	Constant	t Value of Coefficient	Adjusted r^2
Wives	.5247 (.0601)	1771 (636)	8.73**	.455
Husbands	.4965 (.0746)	1088 (392)	6.66**	.327

Standard errors are in parentheses.

**Significant at one percent error level.

Table 7
 Portions of Individual Children's Care Afforded
 by Various Types of Providers

Child's Age	Mother	Father	Other Family Member	School	Sitter	Child Care	Other Friend / Relative	Self	N
Less than 18	.244	.121	.006	.372	.034	.024	.025	.173	135
Greater than 13, less than 18	.112	.066	.001	.467	.000	.000	.002	.352	41
6-13	.220	.122	.009	.459	.030	.009	.016	.133	67
Less than 6	.504	.201	.004	.011	.010	.010	.083	.000	27

ID# _____

CHILD CARE defined:

Child care is all activities which constitute the care or nurturing of a child i.e. feeding, changing, teaching, exercising, entertaining, cleaning, transporting, nursing, sitting, coaching, discipline, playing, holding, or any other activity with the purpose of enhancing the child's life or fulfilling the child's needs.) Child care does **NOT** include a child caring for him/herself.

During last year, **portion** of total care provided by:

Child #1	<u>Person</u>	<u>ID# (p. 1)</u>	<u>% of total care</u>
age of	Mother	_____	_____
child	Father	_____	_____
_____	Other member of household	_____	_____
	School		_____
	Baby sitter		_____
	Child care facility		_____
	Other relative or friend		_____
	Total		100%

Child #2	Mother	_____	_____
age of	Father	_____	_____
child:	Other member of household	_____	_____
_____	School		_____
	Baby sitter		_____
	Child care facility		_____
	Other relative or friend		_____
	Total		100%

ID# _____

CHILD CARE continued:

During last year, **portion** of total care provided by:

Child # _____	<u>Person</u>	<u>ID# (p. 1)</u>	<u>% of total care</u>
age of	Mother	_____	_____
child	Father	_____	_____
_____	Other member of household	_____	_____
	School		_____
	Baby sitter		_____
	Child care facility		_____
	Other relative or friend		_____
	Total		100%

Child # _____	Mother	_____	_____
age of	Father	_____	_____
child:	Other member of household	_____	_____
_____	School		_____
	Baby sitter		_____
	Child care facility		_____
	Other relative or friend		_____
	Total		100%

ID# _____

CARE OF SICK defined:

Active care of any other person in the household who is injured, physically ill, or suffering from a disease. Just because someone in the household is sick does not mean that active care is being provided by anyone in the household. Common colds and the flu are not normally illnesses which require active care.

Below, please list only sick household members who received active care from someone else in the household during the past year.

<u>ID# (from p. 1)</u> <u>of sick person</u>	<u>Number of days</u> <u>care provided</u>	<u>Person</u> <u>providing care</u> <u>(ID# from p.1)</u>	<u>% of</u> <u>total care</u>
_____(ID#)	_____	_____(ID#)	_____
Description of care by household members: _____ _____		_____(ID#)	_____
		_____(ID#)	_____
		doctor(s)	_____
		other health professional(s)	_____
		other: _____	_____
		total	100%

_____(ID#)	_____	_____(ID#)	_____
Description of care by household members: _____ _____		_____(ID#)	_____
		_____(ID#)	_____
		doctor(s)	_____
		other health professional(s)	_____
		other: _____	_____
		total	100%

ID# _____

CARE OF ELDERLY defined:

Active care of any other person in the household who is elderly (i.e. feeding excluding preparation of the meal, entertaining, cleaning, transporting, nursing, dressing, supervising, shopping, or any other activity with the purpose of enhancing an elderly person's life or fulfilling an elderly person's needs.)

Below, please list only elderly household members who received active care from someone else in the household during the past year.

<u>ID# (from p. 1)</u>	<u>Number of days providing care person</u>	<u>Person % of (ID# from p.1)</u>	<u>elderly total care</u>
_____ (ID#)	_____	_____ (ID#)	_____
		_____ (ID#)	_____
		_____ (ID#)	_____
		other care provider	_____
		the elderly person	_____
		total	100%

_____ (ID#)	_____	_____ (ID#)	_____
		_____ (ID#)	_____
		_____ (ID#)	_____
		other care provider	_____
		the elderly person	_____
		total	100%

TIME SPENT ON PERSON CARE
by household members during past year

PERSON CARE TIME: This includes only the time spent actively engaged at child, sick, or elderly care when care was the primary activity. Merely being at home with the child, sick, or elderly person---awake or asleep---is **NOT** time actively spent at person care. If you are primarily doing something else (e.g. meal preparation or cleaning the house) that is **NOT** time actively spent at person care. See the child, sick, and elderly care definitions.

Person	No. of days during year actively	Average number of hours per day when actively providing care	<u>(from P.</u>
1) <u>provided care</u>		<u>was the primary activity</u>	

CHILD CARE:

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CARE OF SICK:

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CARE OF ELDERLY:

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