

N E A R T A

A fresh look at diapers

DIAPER COST COMPARISON



NHUNG T. PHAM & ERIC W. BROWN

P.O. BOX 3206

WAKEFIELD, MA 01880

Diaper Cost Comparison

Introduction

It turns out to be surprisingly difficult to determine the relative costs of disposable versus reusable diapers. While Pampers states on their FAQ, “A cost comparison shows Pampers diapers total expenditure for consumers range at the low end of the cheapest home-laundered cloth diapers, and cost roughly half the price of a cloth diaper wash service,”¹ they make no statement regarding how the cost comparison was conducted and they are certainly not an unbiased source. Unbiased sources tend to claim that reusable diapers are less expensive, only differing with regard to the exact amounts².

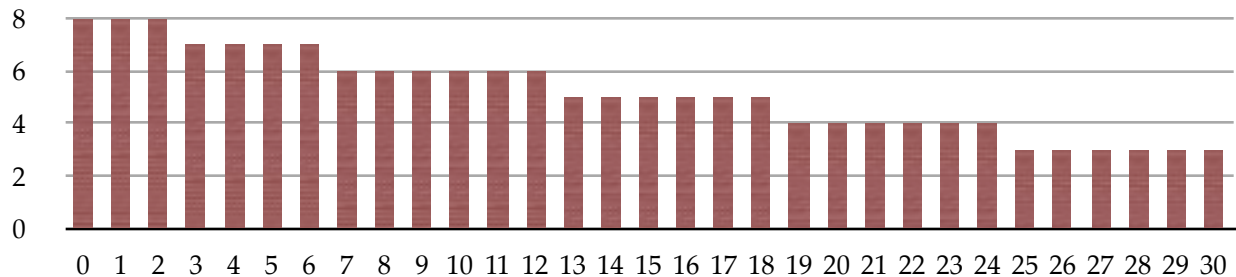
In this short paper we will discuss how one can calculate the cost difference of using disposable or reusable diapers for oneself. It is not too hard, and will produce the most accurate results for a given situation.

Basic Assumptions

For simplicity we will assume that prices will stay constant for a baby’s entire diaper wearing period. This is obviously a false assumption, but since prices will generally increase similarly for both disposable and reusable diapers, it will not harm the comparison in any way.

We will also assume that the reader is a reasonably dutiful caregiver who will change a diaper whenever it is noticed to be soiled, and that the typical healthy baby will thus usually need between three and eight changes per day with older babies on the average being closer to the low side and younger babies on the average being closer to the high side³. Averaging out the number of changes per day per month of life, we get something like the following chart:

Chart 1: Diaper Changes per Day at Different Ages (in months)



For simplicity we will also use a normalized number of days per month of around 30.4, and round fractional diapers up since a baby cannot only quarter-use a diaper.

¹ Downloaded from http://www.pampers.com/en_US/frequently-asked-questions October, 2009.

² In *The Complete Tightwad Gazette* on page 179 author Amy Dacyczyn notes that in 1990 reusable diapers saved \$7.00 per week over disposable diapers. Inflation will have increased this amount in the nearly two decades since then.

³ From *The Standardization of Terminology of Lower Urinary Tract Function in Children and Adolescents: Report from the Standardization Committee of the International Children’s Continence Society* by T. Nevéus et al, J of Urology, March, 2009. Note too that for comparison purposes we are deliberately using minimum numbers here and it should not be construed that a baby should only be changed this many times per day; for example the usual recommended number of diaper changes per day for newborns is ten, not eight.

Cost of Disposable Diapers

There are four key factors affecting disposable diaper cost: diaper type (different brands and models are priced differently from one another), diaper size (smaller diapers are less expensive than larger ones), baby age (younger babies require more changes per day), and purchase conditions (coupon clipping or bulk purchasing can reduce per diaper price).

For purposes of this comparison, we will consider economy mass-produced diapers purchased in bulk. Purchasing premium diapers, specialty brand name diapers, or diapers in grocery-store type quantities will significantly increase the cost. For our economy diapers, the cost per diaper ranges from around 18¢ (for the smallest size) to around 43¢ (for the largest size)⁴. This variability of price with size means that we cannot simply sum up all the diapers used by a baby and multiply by price; we instead have to combine the individual sums of diapers of each size used multiplied by the respective prices. Different babies are different sizes, of course, but their growth patterns are fairly predictable. When calculating for an existing baby, future sizes at future ages for boys or girls can be estimated with a regular pediatrician's growth chart for the appropriate sex⁵. For purposes of our sample comparison here we will use average sizes. Thus a baby 0 - 2 months old will need a minimum of $3 \times 30.4 \times 8 \approx 731$ of the smallest size diapers, $4 \times 30.4 \times 7 \approx 853$ of the next smallest size diapers, 1,096 of the next smallest size, 914 for the next smallest, and so on all the way up through the chart. Multiplying all of these by the respective prices per diaper we get $731 \times 18¢ = \$131.58$ for the smallest diapers, $853 \times 20¢ = \$170.60$ for the next smallest size diapers, $1,096 \times 22¢ = \$241.12$ for the next smallest size, $914 \times 24¢ = \$219.36$ for the next smallest, and so on. Summing all of these totals we get \$1,153.66 for the 30 months in the chart.

At this point a few facts must be noted. First, we reiterate that this is for a minimal number of diaper changes, and each additional change makes the number go up. Second, this is based upon not just bulk purchases of diapers, but makes the ridiculous assumption that we can purchase exactly the number of diapers we require. In reality, one will likely have to purchase based upon existing box sizes, and as box quantities drop the price per diaper goes up. Third, this assumes that the baby will be fully potty trained by the age of 2½. This is likely not the case for the typical baby using disposable diapers⁶. If potty training takes longer, add between another \$31.05 and \$39.26 (depending upon the baby's size) per month.

Cost of Reusable Diapers

There are four key factors affecting reusable diaper cost: initial set-up (there is a one-time cost associated with purchasing the diapers themselves along with maybe a diaper pail), washing cost (how much it costs to run one's clothes washer), drying cost (how much it costs to run one's clothes dryer), and washing frequency (all else being equal the more frequently you have to wash diapers the more expensive).

⁴ Based upon a quick check on Amazon.com. Prices will of course vary.

⁵ These are widely available and can even be freely downloaded from the Center for Disease Control Web site at: <http://www.cdc.gov/GrowthCharts/>

⁶ See "Why Is Toilet Training Occurring at Older Ages? A Study of Factors Associated With Later Training," by N. J. Blum, B. Taubman, & N. Nemeth; *The Journal of Pediatrics*, V. 145, July, 2004; "The Effects of Undergarment Type on the Urinary Continence of Toddlers" by J. L. Simon & R. H. Thompson, *Journal of Applied Behavior Analysis*, V. 39, Fall, 2006; "Bladder Control in 1-4 Year Old Children in the Eindhoven and Kempen Region in 1996 and 1966" by B. E. Horstmanshoff, G. J. Regterschot, E. E. Nieuwenhuis, M. A. Bennings, W. Verwijs, & J. J. Waelkens; *Nederlands tijdschrift voor geneeskunde*, January, 2003 for discussions on this topic.

The more diapers one purchases up front, the less frequently one will have to wash diapers. Since reusable diapers of any size can be purchased for roughly \$10 per diaper⁷, there is no economic incentive to purchase the exact closest fit for a child and larger sizes can be swaddled onto smaller babies meaning fewer purchases overall. As with the disposable diapers, bulk purchases and coupons can both reduce this per diaper cost.

If we thus assume three size gradations are purchased with a target wash period of every other day, we will have a total of 38 diapers to purchase, or \$380.00 total. We will also need some sort of diaper pail; these can be obtained for around \$20.00⁸. Our total initial set-up cost is thus \$400.00, and this is not purchasing in bulk as was done with disposable diapers.

We now have to factor washing cost. We will have around 15.22 extra washes to perform per month. We can calculate the average energy cost per wash⁹ and average detergent cost per wash¹⁰ to get a total washing cost of \$141.53 (with a conventional clothes washer) or just \$82.18 (with an EnergyStar rated clothes washer).

Finally, we have to consider drying cost. This can be virtually free in a place where clotheslines are practical. If a clothes dryer is needed, however, the cost will be based upon how long it takes to dry the diapers (which will vary with the specific kind of diapers used), the type of dryer (gas or electric), and the energy cost. Assuming a 5 kW/hr electric model run for 1 hr per load of diapers (which is longer than many types need) at a cost of 11¢ per kW we get a total cost of around \$251.11 for the full 30 months.

Summing all these totals we get \$733.29. This is \$420.37 less expensive than the disposable diapers¹¹.

Cost of Diapering Services

Diaper services provide curbside pick-up and drop-off of reusable diapers. They are being mentioned here for completeness, but in practice these days it is often hard to find them and many areas simply are not serviced¹². If they are available in your area, it is easy to calculate their cost as they have fixed per week or per month prices, so we will not go into any further details here.

Conclusion

Obviously reusable diapers are significantly less expensive than disposable diapers when viewed over the entire diaper-wearing period of a baby's life. Interestingly though in the very first few months of a baby's life, this fact is far

⁷ The price of a nearta reusable diaper via <http://store.nhungsnotions.com>

⁸ Again based on a quick shopping search on Amazon.com.

⁹ Using EnergyStar's Life Cycle Cost Estimator (version 1), we get around 16¢ per wash for an EnergyStar certified washer, and 29¢ per wash for a conventional washer. The EnergyStar calculations average out load size, so for small loads (as all the diaper washes will be) this will be an overestimate.

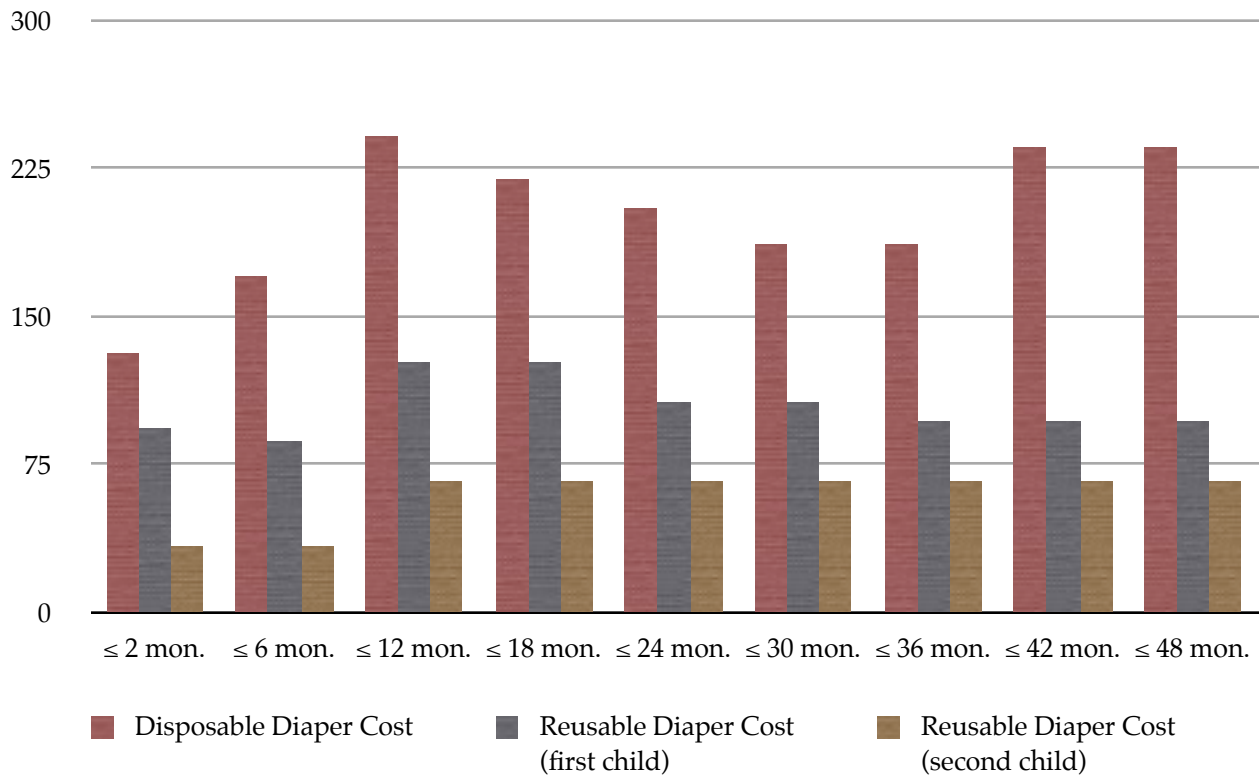
¹⁰ Based on some simple comparison shopping at a local BJ's Club store, we get a price of about 6¢ per full load or 2¢ per small load.

¹¹ Plus, as already observed we overestimated some of the costs associated with reusable diapers and underestimated some of the costs associated with disposable diapers. The more diaper changes, the more money is saved with reusable diapers.

¹² See "Why Are Diaper Services Disappearing?" by Linda Baker, *E/The Environmental Magazine* (downloaded from <http://www.emagazine.com/view/?997> on Oct. 12, 2009).

less obvious as the cost per disposable diaper is far lower for the small sizes and the reusable diapers have an associated start-up cost. Chart 2 below views the costs of disposable and reusable diapers not just over the 30 month period discussed so far, but for a hypothetical 48 month period¹³. The costs of the reusable diapers have been amortized over the period during which they are used in order to simplify comparison; the full cost of the diaper pail was added to the first measured period. Also, since much of the expense of reusable diapers can be used again for a second child, we have added a separate comparison for this case. The disposable diaper cost for a second child would be the same as the disposable diaper cost for the first. All costs assume an EnergyStar rated clothes washer and a dryer as previously specified. A conventional washing machine will increase the costs for the reusable diapers, and air drying diapers on a clothesline would reduce the costs for the reusable diapers.

Chart 2: Reusable and Disposable Diaper Costs for Given Periods



¹³ It is highly unlikely that a baby wearing reusable diapers will not be potty trained for such a long period. Footnote 6 mentions some studies that touch upon this point, but it must also be noted that while disposable diapers are available for this size, reusable diapers do not appear to be (based upon direct experience shopping for sample diapers for research).