

N E A R T A

A fresh look at diapers

DIAPERS AND MUNICIPAL GOVERNMENT



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Introduction

On the surface it may not be obvious that municipal governments should care about people's diapering habits at all. The truth of the matter though is that what may seem like a personal choice can have a measurable impact on a municipality. The choice of reusable versus disposable diapers affects sewage volume, public health, and (typically most significantly for average cities and towns) municipal solid waste (MSW) tonnage.

This paper will survey existing research on a variety of topics ranging from pediatrician diaper changing recommendations to manufacturer diaper production processes and pull out the disparate items that are important to municipal governments. It will show how diapering choice can help (or hinder) a community's answer to the EPA's Resource Conservation Challenge (RCC). Most importantly, it will show how the choice of reusable versus disposable diapers has an effect on a municipality's bottom line — it will demonstrate how to calculate the contribution diapers make to a community's annual expenses.

A Brief History

Diapers in some form or another have been in use all throughout human history. By 1968 disposable diapers accounted for more than 95% of the overall diaper market, and the percentage continued to rise over the next few years.¹ Ten years later the U.S. Environmental Protection Agency (EPA) contracted the Midwest Research Institute (MRI) to perform a study on the environmental impact of disposable versus reusable products. The resulting report was so widely criticized for its technical accuracy that the EPA chose not to review it but instead publish it with a disclaimer stating that it "should be viewed as technically incomplete and inappropriate for the development of policy"². Even though it has since been shown that (at least in the case of diapers) this report's conclusions were based on a series of errors³ and that throwaway items tend to be more environmentally harmful than reusable ones⁴, the general idea that washing things can be more harmful than recreating them persists.

The EPA hosted a diaper industry workshop pulling together both representatives from the diaper industry and government officials to try and identify areas for research that could help minimize the impact of diapers on the environment. P&G reported on a disposable diaper recycling program they had started in Seattle in 1990; it apparently has not gone anywhere⁵. Composting appeared to hold more promise, but also has not been able to take root in the subsequent years. The only economically sound options have thus been restricted to landfilling or incinerating diapers.

¹ This is reasonably well-known. See *Stealing Share* "Being First is Secondary" at <http://www.stealingshare.com/content/1147639142265.htm> for one reference.

² This disclaimer is covered in pages ii - iv of *SW-152c*.

³ For all the details see *An Analysis of the Diaper Portion of SW-152c* by Nhung T. Pham & Eric W. Brown; NEARTA, Saugus, MA, September 2009.

⁴ Of especial note here is *Diapers: Environmental Impacts and Lifecycle Analysis* by Carl Lehrburger, Jocelyn Mullen, & C. V. Jones; Energy Answers Corporation, Albany, NY, January 1991.

⁵ See *Project Summary: Diaper Industry Workshop Report* by Clyde Dial & George Wahl; EPA, Cincinnati, OH, June 1991.

The debate has continued throughout the whole interval with various studies funded by one side or the other (although notably mostly the disposable diaper companies) trying to prove its own case.

Real Impact to Municipal Governments

It turns out that much of this debate can be ignored by the typical municipality. As stated earlier, the disposable versus reusable diaper debate has an impact on public health, sewage volume, and MSW tonnage.

Assuming that one does not try to reopen the debate regarding the handling of human feces first settled (in Western cultures, at least) back in the Renaissance⁶ and identified today by the World Health Organization (WHO) as a key component of public health⁷, the health issue reduces to a matter of trying to minimize the quantity of feces that does not get properly processed by local sewage systems. This will in turn though lead to both an increase in sewage volume as more people flush out the solid contents of disposable diapers and (even more effectively) wash out their reusable diapers, and a decrease in MSW tonnage as this content gets diverted from regular MSW to sewage.

While this may appear to be a simple case of reducing the load on one system at the expense of another, there is an important further argument beyond that of public health to make both the flushing of feces and use of reusable diapers preferable for municipalities: typically residents pay for their sewerage based upon usage, while this is not true in many cities and towns for MSW, even with typical pay-as-you-thrown programs.

Looking at it from the other side, most communities subsidize disposable diaper use. They are just not aware of it.

The argument is made a bit stronger by the fact that studies have indicated the possibility that on the average children using reusable diapers toilet train more quickly than children using disposable diapers⁸. The fact that disposable diapers are available commercially in significantly larger sizes than reusable diapers⁹ would seem to back up this possibility. Not only do the children wearing reusable diapers generate much less MSW per year than the children wearing disposable diapers, they (possibly on the average) wear diapers for a shorter period overall, making for an even more pronounced difference in MSW generation when taken over the diaper-wearing period in the child's life.

⁶ England was later than most in trying to control sewage, and even there Henry VIII created a Commission of Sewers in 1622. The technology to create modern sewers did not come along until later, of course. Many references to early sewer history are available; see http://www.sewerhistory.org/chronos/middle_ages.htm for one.

⁷ See page 31 of the *Guidelines for the Design, Construction and Operation of Manual Sanitary Landfills* edited by Jorge Jaramillo; Pan American Center for Sanitary Engineering and Environmental Sciences, WHO, 2003.

⁸ Several papers hint at this; 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 just a few examples.

⁹ Based upon direct experience shopping for sample diapers for research. This is easily verified by comparing vendor catalogs.

Additional Considerations

The diaper debate is also worth considering with regards to the EPA's RCC¹⁰. While disposable diapers account for less than 5% of all municipal solid waste overall¹¹ (although the general public perception is that it is much higher¹²), solid waste budgets tend to be so high that even this small percentage can lead to a large overall expenditure. Plus this number has historically been growing over time¹³ and as recycling efforts improve in other areas, disposable diapers will inevitably account for an increasing percentage as they have a negligible recycling rate¹⁴. Ultimately disposable diaper waste must be considered if the RCC is to be met, and using reusable diapers is the most effective way to reduce diaper contributions to MSW.

Most of the exact same arguments apply to adult diapers for people with incontinence problems (approximately half of all nursing home patients¹⁵). Converting this segment of the population would result in even greater savings for the host community.

Calculating Potential Savings

There is an easy way and a hard way to estimate how much your community could save by not using disposable diapers. The easy way is to look at how much your community is spending on municipal solid waste disposal, and multiply it by 1.5% and 4% to get rough upper and lower soft bounds respectively¹⁶. Thus if your community is spending \$1,000,000 per year on municipal solid waste disposal, the amount of that going toward disposable diapers is likely somewhere between \$15,000 and \$40,000.

The more complicated (but potentially more accurate) way is to use census figures for your community to approximate your diaper-wearing population, and use this to figure out how many tons of solid waste are due to disposable diapers annually. A good approximation can be made by summing all of the children who are less than the age of three, 40% of the children who are between the ages of three and four, and 2% of the children aged four¹⁷. This will

¹⁰ See <http://www.epa.gov/waste/rcc/> for details on the RCC.

¹¹ This figure is much debated. The lower bound is given in *Municipal Solid Waste in the United States: 2007 Facts and Figures* by the Office of Solid Waste, EPA, November, 2008 as being 1.5%. This number was provided by Franklin Associates, Ltd. based upon (according to page 109) "confidential industry sources". Franklin Associates, Ltd. also performs studies on behalf of the disposable diaper industry, so they are perhaps not the most unbiased of sources. The World Health Organization cites a number of "over 4%" based upon empirical analysis of household waste in "Waste disposal and landfill: Information needs" by R. Taylor & A. Allen in *Protecting Groundwater for Health: Managing the Quality of Drinking-Water Sources*, WHO, October, 2004.

¹² The "National Customer Service Conference Focus Group Project", EPA, December, 1999 found that many people believed soiled disposable diapers were the single biggest constituent of landfill trash.

¹³ According to *Municipal Solid Waste in the United States: 2007 Facts and Figures* by the Office of Solid Waste, EPA, November, 2008. Table 15 tracks a steady increase from 1960 through 2007.

¹⁴ Ibid. Table 16 notes no significant recycling of disposable diapers.

¹⁵ According to the National Association for Continence in their article "Bladder and Bowel Health" available online at: <http://www.nafc.org/bladder-bowel-health/>

¹⁶ How we came by these bounds is discussed in more detail in footnote 11, but note (rarely) they can be exceeded.

¹⁷ From the previously mentioned "Bladder Control in 1-4 Year Old Children..."

always produce an underestimate, as it makes no attempt to count adult diaper users and it is assuming that all feces in disposable diapers is being properly flushed.

Energy Answers Corporation estimated that an individual child using disposable diapers was responsible for approximately a ton of solid waste over the course of a year¹⁸. Performing estimates based upon the amount of urine children produce over time¹⁹ taken in conjunction with the average weight of a disposable diaper²⁰ (with associated packaging²¹) and the number of diaper changes pediatricians recommend per day²², it is fairly easy to get another independent estimate of the amount of MSW a single child in disposable diapers generates per year, and it comes out to be (on the low side) about a quarter of a ton per year. Thus if census data indicates your community has a diaper-wearing population of around 4,000 you could expect a savings of 1,000 to 4,000 tons of MSW annually if you could convince them to all use reusable diapers.

Exactly how much a community can save is based upon their local costs for trucking and handling MSW. The Town of Saugus serves as a good example; it directly hosts an incinerator so its costs per ton for trucking and handling MSW are lower than most, and its overall population of around 27,500²³ certainly does not place it as one of the largest communities in the Commonwealth²⁴. Regardless, a full conversion from disposable to reusable diapers would conservatively save the town approximately \$25,000 per year²⁵.

Other Governments' Treatment of Disposable Diapers

Some places are already taking advantage of the fact that a municipality can save money by encouraging its citizens to use reusable diapers. Canada currently has a disposable diaper tax²⁶. Westmount, Quebec goes further by subsidizing reusable diaper "starter kits" for needy parents²⁷. Vienna and Munich now both subsidize reusable diapers in order to save money on municipal solid waste; they estimate that they keep approximately two tons of waste out of

¹⁸ In the previously mentioned *Diapers: Environmental Impacts and Lifecycle Analysis*.

¹⁹ 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. Nevés et al, *J of Urology*, March, 2009.

²⁰ We obtained this by weighing a representative sample (different sizes and vendors) of disposable diapers.

²¹ Ibid. Expect roughly a pound of diaper packaging for every 100 diapers.

²² Regardless of what type of diapers children wear, parents should change them three to eight times per day; from T. Nevés et al already quoted above.

²³ Based upon U.S. Census data for 2008.

²⁴ Ibid. There are 62 communities in Massachusetts with larger populations.

²⁵ Calculating as described in the previous section with information from the U.S. Census and the Town of Saugus 2009 budget.

²⁶ From *Seattle Solid Waste Recycling, Waste Reduction, and Facilities Opportunities*, by URS Corporation, Herrera Environmental Consultants, Inc., & Norton-Arnold Company for Seattle City Council & Seattle Public Utilities; April, 2007.

²⁷ According to "What a Bummer! The Social Shaping of the Diaper in North America" by Leslie Regan Shade, *HOST: An Electronic Bulletin for the History and Philosophy of Science and Technology*, V. 2, January, 1994.

landfills for each child who uses reusable diapers²⁸. Seattle has been considering the idea of implementing a disposable diaper tax in order to subsidize reusable diapers²⁹.

The Christchurch, Kaikoura and the North Canterbury regions of New Zealand are currently experimenting with a commercial (in part funded by a disposable diaper company) disposable diaper composting (note that the plastic portions of disposable diapers can of course not get composted) facility that charges per bag of soiled diapers (the charge includes curbside pick-up). Currently the local district council is offering families that use this service a \$1 per week subsidy in order to encourage its use³⁰. It is still too early to tell whether or not this facility will be economically successful.

How To Effect Change

There is no fast way to get a population to stop using disposable diapers. The only sure way is through education. The average person is unaware of how much disposable diapers cost a community; in many cases dropping the disposable diaper subsidy (by convincing people to use reusable diapers and/or taxing disposable diaper sales) can result in enough savings to hire another school teacher, fund additional youth programs, or purchase new library materials. If people not only realize that keeping the disposable diaper subsidy means losing something else, but can see specifically what is being lost, they will be better able to make an educated decision.

Likewise people should be made aware of some of the other key benefits of using reusable diapers. First, as careful analysis of the various studies mentioned above proves, it is better for the environment³¹. Second, it is significantly less expensive³². Parents can expect significant savings; institutions like hospitals can possibly save even more³³. Third, while few health issues have been conclusively linked to disposable diaper use, at least one has³⁴, so it is healthier for babies to wear reusable diapers.

Lastly many people believe that using reusable diapers is still a slow, complicated affair involving pins; this is of course not true with modern reusable diapers. Using modern reusable diapers is not that much less convenient than

²⁸ From "Why Are Diaper Services Disappearing?" by Linda Baker, *E/The Environmental Magazine* (downloaded from <http://www.emagazine.com/view/?997> on Oct. 12, 2009).

²⁹ Detailed in the above mentioned *Seattle Solid Waste Recycling, Waste Reduction, and Facilities Opportunities* with additional information supplied in the above mentioned article "Why are Diaper Services Disappearing?".

³⁰ Information about the EnviroComp experiment can be found on their Web site at: <http://www.envirocomp.co.nz/>

³¹ Even the earliest such study (once it has its errors corrected) indicates that reusable diapers are better for the environment; see the previously mentioned *An Analysis of the Diaper Portion of SW-152c*. For still more information see *Diapers and the Environment* by Nhung T. Pham & Eric W. Brown; NEARTA, Saugus, MA, October 2009.

³² 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. In the nearly two decades since then, prices have gone up. For more details see *Diaper Cost Comparison* by Nhung T. Pham & Eric W. Brown; NEARTA, Saugus, MA, October 2009.

³³ Emerson Hospital in Boston saved \$1,000 per year in 1994 by switching to a diaper service according to "Waste Prevention, Recycling, and Composting Options: Lessons from 30 Communities" by Brenda Platt, Naomi Friedman, Carolyn Grodinsky, Pia MacDonald, & Margaret Suozzo, EPA, February, 1994.

³⁴ See "Scrotal Temperature is Increased in Disposable Plastic Lined Nappies" by C-J Partsch, M. Aukamp, & W. G. Sippell, *Disease in Childhood*, October, 2000, pages 364-368.

using disposable diapers³⁵. Currently most hospitals train new mothers how to use disposable diapers; if they were to change their programs to train the use of reusable diapers instead people would quickly realize that there is not that much difference in difficulty or convenience.

In short the approach that must be taken with diapers is similar to the approach currently being taken with recycling programs. Augmenting the “reduce, reuse, recycle” programs to include diapers would be a simple start. Hospitals tend already to teach new parents how to use disposable diapers; convincing them to also teach how to use reusable diapers (not to mention use reusables themselves) would be another step in the right direction. Deliberate subsidization programs to encourage people to use reusable diapers can also create a win-win situation where municipal governments benefit from reduced MSW and residents benefit from less expensive reusable diapers³⁶. Finally, penalties of some sort (either via pay-as-you-throw or disposable diaper taxes) can be implemented to cover the true costs of disposable diapers to municipalities.

³⁵ Even in 1990 Amy Dacyczyn estimated it at only half an hour extra per week on page 707 of the previously mentioned *The Complete Tightwad Gazette*, Random House, Inc., New York, NY, 1998. Reusable diaper technology has improved since then, so the difference is probably even smaller now.

³⁶ Assuming all solids are flushed, a single reusable diaper used just 75 times for a one year old will spare roughly 62 pounds of waste. At 100 uses, it prevents 83 pounds of waste. At 200 uses, 166 fewer pounds of waste will have to be processed. If the diaper is used on older children (or all solids are not properly flushed), even more waste will be forestalled. A single reusable diaper can be purchased for just \$10.00. Using Saugus’ trash disposal expenses for an example, a \$5.00 subsidy toward each reusable diaper will pay for itself even in the minimal 75 use case. Expected savings will vary wildly with location and specific local conditions.