

Changes in Nicotine Yield: 1998-2004

The Importance of Nicotine Disclosure

The Massachusetts Tobacco Control Program has analyzed data from 1998-2004 and has found that the amount of nicotine inhaled by the average smoker has increased 10% over the seven year period.

Although per capita consumption of cigarettes has declined, the amount of nicotine consumed per cigarette has increased. Concurrently, the amount of nicotine present in second-hand smoke has also increased.

Massachusetts is one of three states to receive information about nicotine levels in tobacco products. Massachusetts General Law chapter 94 section 307B and Department of Public Health Regulations 105 CMR 660.000 mandate that cigarette companies report each year to the Department the nicotine yield ratings for all cigarette brands with a U.S. market share of greater than 1.5%.

Since the signing of the Master Settlement Agreement in 1998, there has been no public disclosure of nicotine yield ratings. The Massachusetts 2004 report is the first to examine changes in nicotine delivery since 1998.

The 10% increase in nicotine delivered noted in the report is a significant finding because nicotine is highly addictive drug that affects nearly every organ in the body.

Nicotine Yield

Nicotine yield is a measure of the amount of nicotine in the smoke which a smoker inhales. It does not measure the amount of nicotine in a cigarette.

Summary

The amount of nicotine the smoker receives has increased over time. Data reveal significant increases in nicotine yield from 1998 to 2004 for all three tobacco companies (Lorillard, Philip Morris, and RJ Reynolds) and for all types of cigarettes -- full flavor, light, mild/medium, ultra-light; and menthol and non-menthol.

Methods

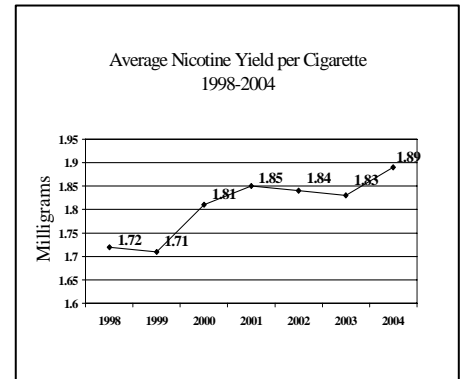
Data reported to the Massachusetts Department of Public Health from 1998 through 2004 from the three major tobacco companies was analyzed. In total there were 116 cigarette sub-brands for which data was available for both 1998 and 2004. Averages for these 116 brands were computed for all intervening years as well.

Results: Increasing Nicotine Yield

Results indicate a very strong positive correlation between the average nicotine yield and the year in which the testing was conducted ($r^2 = .805$; $p < .01$).

When compared to 1998 data, 92 of the 116 sub-brands had increased nicotine yields by 2004. Twelve (12) sub-brands decreased and twelve (12) remained unchanged.

The average number of milligrams of nicotine delivered increased by 9.9% during this period (from 1.72 milligrams in 1998 to 1.89 milligrams in 2004) ($t_{115} = 12.03$, $p < .0001$).



Similar increases were found for each type of cigarette tested (full flavor, light, mild/medium, and ultra-light), for both menthol and non-menthol cigarettes, for filtered cigarettes and for all companies (PM, RJR, Lorillard).

The total nicotine content of the sub-brands tested increased 16.6%, from 12.9 milligrams in 1998 to 14.3 milligrams in 2004 ($t_{72} = 12.79$, $p < .0001$). Similarly, the milligrams of nicotine per gram of tobacco increased 11.3% from 17.4 in 1998 to 19.4 in 2004 ($t_{114} = 9.75$, $p < .0001$).

Greater Than Ten Percent (10%) Increase in Nicotine Yield

Fifty-two (52) of the 116 sub-brands had increases in nicotine yield above 10% for the seven (7) year period. Analysis revealed that RJR's Doral brand had the largest percent increase (36%) in nicotine yield from 1998-2004.

Next was RJR's King Size Kool Lights with an increase in nicotine yield of 30%.

Percent Increase in Nicotine Yield (1998-2004)

Brand/Sub-Brand	% increase
Doral 85 Filter Light Hard Pack	36%
Doral 85 Filter Light Soft Pack	33%
Doral 85 Filter Full Flavor Soft Pack	33%
Kool 85 Filter Light Menthol Soft Pack	30%

Highest Nicotine Yield

In 1998, Newport 100s (full flavor, menthol, soft pack of 25 cigarettes) and Camel Regulars non-filter (full flavor, non-menthol, soft pack) tied for highest nicotine delivery (2.9 mg). All brands that year were less than 3.0 mg. In 2004, Newport filtered cigarettes had the highest nicotine yield at 3.2 mg. Five (5) cigarettes were 3.0 mg or above in 2004. Three (3) filtered sub-brands of Newport have surpassed Camel non-filter and Doral non-filter in highest nicotine yield in 2004. Some filtered cigarettes are delivering more nicotine to the smoker than non-filtered cigarettes.

Sub-Brands with Highest Nicotine Yield - 2004

Manufacturer/Brand/Sub-Brand	Nicotine Yield (mg)
Lorillard: Newport 100 Filter Full Flavor Hard Pack/Soft Pack Menthol	3.2
Lorillard: Newport 100 Filter Full Flavor Soft Pack 25 Menthol	3.1
RJ Reynolds: Camel 70 Non Filter Full Flavor Soft Pack	3.0
RJ Reynolds: Doral 85 Non Filter Full Flavor Soft Pack	3.0

Lowest Nicotine Yield

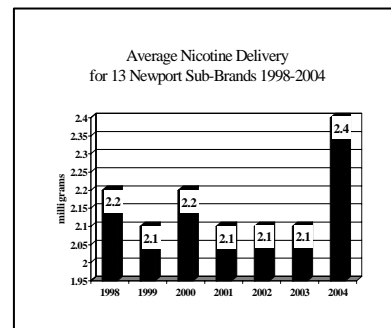
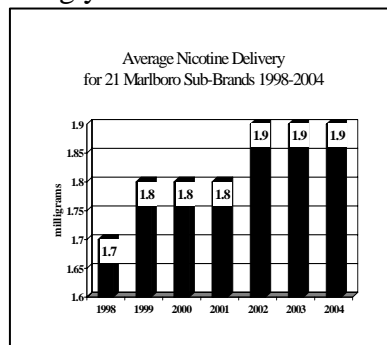
Doral Ultra-Light King soft pack with a nicotine yield of 0.9 mg in 1998 (the lowest nicotine delivery in 1998) increased 22% resulting in a nicotine yield of 1.1 mg in 2004. It remains with Winston Ultra-Light King soft pack as having the lowest nicotine yield in 2004.

Target audiences of the cigarette brands with the highest nicotine yield (Newport, Camel, and Doral) and the greatest percent increase (Doral and Kool) are some of the most vulnerable populations (minorities and youth).

Nicotine Yield in Brands Smoked by Youths

*"Marlboro is the choice of nearly two-thirds of youth smokers by the time they reach the end of high school. The second most widely used brand by teens is Newport, and the third is Camel. None of the other brands accounts for even 2 percent of the market among teens."*¹

The charts below reveal the increases in nicotine delivery for the two most popular brands among youth.



Implications of Increased Nicotine Levels

- Increased levels of nicotine may make it more difficult for the average smoker to quit.
- Similarly, physicians may not be able to determine the proper dosage for Nicotine Replacement Therapy as nicotine levels increase.
- Increased levels of nicotine consumed by pregnant women can lead to developmental delays in childhood as well as low birth weight infants².
- Insulin absorption may be slowed by nicotine leading to increased risk for Type 2 diabetes and increased hospitalizations^{3,4}.
- Medications designed to treat asthma, high blood pressure, and depression can lose their effectiveness in combination with nicotine^{5,6}.
- Exposure to nicotine from second hand smoke has profound effects on children, including cognitive deficits⁷.

This report was produced by the Massachusetts Tobacco Control Program, Massachusetts Department of Public Health.

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² Nora Volkow, M.D., presentation at the 13th Annual World Conference on Tobacco, July 2006; Castles, et. al., Effects of smoking during pregnancy. Five meta-analyses. American Journal of Preventive Medicine, Volume 16, Number 3, 1999.

³ Eliasson, B., Progress in Cardiovascular Diseases, Volume 45, Number 5, March - April 2003.

⁴ Zevin, S., Clinical Pharmacokinetics, Volume 36, Number, 6, June 1999.

⁵ <http://www.mayoclinic.com/health/drug-information/DR202407>

⁶ Volkow, N.D., et. al., Proceedings of the National Academy of Sciences, U S A, Volume 94, 1997.

⁷ Yolton, K., et. al., Environmental Health Perspectives, Jan 2005.

¹ Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (1999). Cigarette brand preferences among adolescents. (Monitoring the Future Occasional Paper No. 45.) Ann Arbor, MI: Institute for Social Research.