

# Managed Care Trends in Statin Usage

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## ABSTRACT

### Purpose

HMG-CoA reductase inhibitors (“statins”) have become the drug class of choice for the treatment of hyperlipidemia. Six product brands encompassing 20 dosage strengths have been available during the past two years.

The objective of this review is to describe dosing trends for the six statin brands and to determine if and how these trends vary among managed care plans as a function of product market share.

### Methodology

Utilization of HMG-CoA reductase inhibitors was examined using the NDC Health Information Services (Phoenix, Ariz.) database for the two-year period ending December 2000. This database contains unit dispensing data at the dosage-strength level for 1,079 managed care plans. Trends in market share, mean daily dose, and dosage distribution of the six current statin brands were examined. The relationship of market share to mean dose was also examined for each brand.

### Principal findings

Market share decreased for all statin brands during the two-year period, except for the two newest entries, atorvastatin (up 9.7 share points) and cerivastatin (up 4.6 share points). The mean dose of all statins increased during the two-year period. A statistically significant negative correlation between market share and mean dose was found for atorvastatin and a positive correlation was found for fluvastatin ( $P < 0.01$ ). Furthermore, atorvastatin share was significantly correlated to lower mean doses of all other statin brands. That is, higher use of atorvastatin was associated with lower doses of all statin products.

### Conclusion

In developing a cost-management strategy, managed care organizations should take historical and anticipated market-share changes and dose-mix changes into account along with the product’s clinical efficacy and total cost of care.

**Keywords:** Drug utilization review; HMG-CoA reductase inhibitors; statins; managed care pharmacy; hyperlipidemia.

## INTRODUCTION

HMG-CoA (3-hydroxy-3-methylglutaryl-coenzyme A) reductase inhibitors (“statins”) have become the drug class of choice for the treatment of hyperlipidemia. Six product brands encompassing 20 dosage strengths have been available during the past two years. (Cerivastatin was withdrawn from the market in August after reports of more than 30 fatalities linked to its use. — *Ed.*)

This article examines trends in the usage of statins in managed care or-

ganizations throughout the period from January 1999 through December 2000 using claims data from the NDC outpatient pharmacy database.

The objective of this review is to describe trends in dosing of the six statin brands and to determine if and how these trends vary among managed care plans as a function of the market share of the individual brand products. The relationship between mean doses for each statin brand and total statin acquisition costs is discussed. This information should be useful to pharmacy directors in managing and predicting statin utilization and costs within a managed care environment.

## METHODS

The NDC database used in this study contains statin utilization data (number of capsules or tablets) by month for the period from January 1999 through December 2000. Data are available for each HMO plan and employer PPO. Each HMO plan is associated with a parent organization, e.g., UnitedHealth Group or Cigna Healthcare. The database also contains utilization data for fee-for-service patients.

The primary source of the data in the NDC database is retail pharmacy claims. Although some dispensing data were collected from in-house pharmacies, organizations with a high proportion of in-house pharmacy dispensing were underrepresented. All data variables considered in this review (market share, mean dose, mean cost per dose) were ratios. Therefore, the absolute number of doses in each plan was not critical.

The utilization trends examined were 1) brand market share; 2) mean daily dose per brand; 3) distribution of dosage strengths within each

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The research for this study was funded by Pfizer Inc.

This paper has undergone peer review by appropriate members of MANAGED CARE’s Editorial Advisory Board.

brand; and 4) mean cost per day, weighted over all brands and dosage strengths, evaluated at wholesaler acquisition cost. To establish benchmarks for these trends, the investigators used the average values of all managed care plans in the database, representing 1,070 individual HMO and PPO plans.

The investigators also determined the degree of correlation between brand share and mean daily dose for each of the six brands during the final three months of the study period (October through December 2000) in a subsample of the 131 HMO plans with a minimum of 100,000 statin doses per month. These plans represented about 81 percent of the total statin utilization by the 1,070 managed care organizations in the database. In addition, the researchers looked at the relationship between brand share and mean daily dose among the largest local plans for two national HMO organizations.

For purposes of this study, a dosage regimen of one tablet or capsule per day was assumed for all brands and dosage strengths. This is consistent with product labeling, except for a twice-a-day regimen recommended for patients on 80 mg of fluvastatin (the highest recommended dosage). While some statin usage may vary from one tablet or capsule per day (e.g., tablet-splitting at higher doses), the investigators make the assumption that this usage is small and will be consistent across managed care plans. Therefore, cost per unit will be equal to patient cost per day.

**RESULTS**

**Total statin utilization in NDC database.** Total statin doses for the 1,070 plans in the NDC database for the specified two-year period amounted to 1.32 billion. Statin doses for the top 131 plans used in the correlation analysis, having at least 100,000 doses per month, totaled 145 million in the fourth quarter of 2000, compared to 179 million for all plans

(81 percent). Monthly statin doses for the 1,070 plans increased from 40.4 million doses in January 1999 to 66.3 million doses in December 2000, an increase of 64 percent for the two-year period.

**Market share.** Market share for the six statin brands at the beginning, midpoint, and end of the two-year period is shown in Table 1.

Atorvastatin and cerivastatin consistently gained share at the expense of the other four brands over the two-year period.

**Mean daily dose.** The mean daily dose was computed for each brand by taking the weighted average across all dosage forms for each brand. As shown in Table 2, the mean daily dose increased for all brands during the two-year period.

The largest increases in dosage during the past year, on a percentage basis, were seen for cerivastatin (partly due to the introductions of the 0.4-mg and 0.8-mg dosage forms) and simvastatin.

**Distribution of dosages.** The distribution of dosages for each brand is shown in Table 3. All brands except lovastatin demonstrated a migration toward higher dosage strengths.

**Mean cost per dose.** The mean cost per statin dose was computed using the wholesale acquisition cost published in the *Drug Topics Redbook Update* for February 2001. Prices for each brand and dosage strength are listed in Table 3. Using a constant price for each dosage strength throughout the two-year period, any changes in the mean cost per dose are attributable to changes in brand share and dosage-mix only. The mean cost per dose is shown in Table 4 for the weighted average of the 1,070 plans in the database and for fee-for-service customers. Discounts offered to HMOs were not taken into account.

The lower price in the fee-for-service sector is due to a slightly higher share for cerivastatin (8.2 percent in fee-for-service vs. 5.7 percent in managed care plans) and fluvastatin (6.6 percent vs. 5.8 percent) and a higher dosage mix for 10-mg atorvastatin (62.3 percent vs. 57.4 percent). This indicates that the fee-for-service market is slightly more cost-sensitive, as expected.

Table 5 shows the contribution of each brand to the overall increase in cost per dose of about 6 cents (from

**TABLE 1 Product market share (%): 1,070 managed care plans**

Product	Jan. '99	Dec. '99	Dec. '00	Share-point change from Dec. '99-Dec. '00	Share-point change from Jan. '99-Dec. '00
Atorvastatin	38.8	45.2	48.5%	3.3	9.7
Cerivastatin	1.1	3.1	5.7%	2.6	4.6
Fluvastatin	10.5	8.3	5.8%	-2.5	-4.7
Lovastatin	3.5	2.3	1.4%	-0.9	-2.1
Pravastatin	19.0	16.2	14.0%	-2.2	-5.0
Simvastatin	27.0	24.9	24.6%	-0.3	-2.4

**TABLE 2 Mean dose (mg): 1,070 managed care plans**

Product	Jan. '99	Dec. '99	Dec. '00	% Change Dec. '99-Dec. '00	% Change Jan. '99-Dec. '00
Atorvastatin	15.44	16.14	16.95	5.0	9.8
Cerivastatin	0.30	0.35	0.41	19.0	38.5
Fluvastatin	28.03	29.80	31.12	4.4	11.0
Lovastatin	24.52	24.54	24.65	0.4	0.5
Pravastatin	24.42	25.44	26.71	5.0	9.4
Simvastatin	20.11	22.75	25.30	11.2	25.8

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**TABLE 3 Distribution of dosage strengths and WAC price for each product: 1,070 managed care plans**

Product and dosage	Jan. '99	Dec. '99	Dec. '00	Pct.-point chg., Dec. '99–Dec. '00	Pct.-point chg., Jan. '99–Dec. '00	WAC price Feb. '01
Atorvastatin (10 mg)	62.0%	59.7%	57.4%	-2.3	-4.5	\$1.70
Atorvastatin (20 mg)	29.9%	29.8%	30.1%	0.3	0.2	\$2.62
Atorvastatin (40 mg)	8.2%	10.5%	12.0%	1.5	3.9	\$2.92
Atorvastatin (80 mg)	0.0%	0.0%	0.5%	0.5	0.5	\$2.92
Cerivastatin (0.2 mg)	2.1%	2.2%	1.8%	-0.4	-0.3	\$1.29
Cerivastatin (0.3 mg)	97.9%	49.2%	18.7%	-30.5	-79.2	\$1.29
Cerivastatin (0.4 mg)	0.0%	48.7%	70.8%	22.2	70.8	\$1.29
Cerivastatin (0.8 mg)	0.0%	0.0%	8.7%	8.7	8.7	\$1.29
Fluvastatin (20 mg)	59.9%	51.0%	44.4%	-6.6	-15.5	\$1.17
Fluvastatin (40 mg)	40.2%	49.0%	55.6%	6.6	15.5	\$1.17
Lovastatin (10 mg)	4.7%	5.5%	6.5%	1.0	1.8	\$1.10
Lovastatin (20 mg)	70.3%	69.0%	67.0%	-2.0	-3.3	\$1.93
Lovastatin (40 mg)	25.0%	25.5%	26.5%	1.0	1.5	\$3.48
Pravastatin (10 mg)	9.1%	8.1%	7.0%	-1.0	-2.1	\$2.09
Pravastatin (20 mg)	64.3%	60.7%	55.9%	-4.8	-8.4	\$2.04
Pravastatin (40 mg)	26.7%	31.2%	37.1%	5.9	10.4	\$3.31
Simvastatin (5 mg)	4.6%	3.5%	2.5%	-1.0	-2.1	\$1.43
Simvastatin (10 mg)	31.8%	26.5%	21.0%	-5.5	-10.8	\$1.91
Simvastatin (20 mg)	45.4%	46.5%	47.7%	1.3	2.3	\$3.33
Simvastatin (40 mg)	17.3%	20.5%	23.7%	3.2	6.4	\$3.33
Simvastatin (80 mg)	0.9%	3.0%	5.1%	2.0	4.2	\$3.33

\$2.23 to \$2.29) in all managed care plans from January 1999 to December 2000, evaluated using February 2001 wholesale acquisition cost (WAC) prices. The contribution of each brand is broken out into a *dosage* effect, based on the dosage mix of the brand, and a *share* effect, based on the brand's share of market. The investigators compute the *dosage* effect by holding the brand's market share constant and computing the change in overall statin cost per dose resulting only from changes in the brand's dosage mix. Conversely, the investigators compute the *share* effect by holding the brand's dosage mix constant and computing the change in overall statin cost per dose resulting only from changes in the brand's market share.

Based on the results shown in Table 5, fluvastatin made the greatest contribution to the change in overall statin cost per dose, a 5.2-cents-per-dose *increase*, due to its drop in share and relatively low WAC price. The other brands contributed to the overall change in cost per dose in differ-

**TABLE 4 Average weighted cost per dose: All MCOs vs. fee-for-service**

	Jan. '99	Dec. '99	Dec. '00	Change from Jan. '99 to Dec. '00	% Change from Jan. '99 to Dec. '00
1,070 plans	\$2.23	\$2.25	\$2.29	\$0.06	2.7
Fee-for-service	\$2.10	\$2.11	\$2.15	\$0.05	2.4

**TABLE 5 Product contribution (in dollars) to change in mean cost per dose, Jan. '99 to Dec. '00 (24 months)**

Product	Contribution	Dosage effect	Share effect	Market share- point change
Atorvastatin	0.010	0.024	(0.014)	9.7
Cerivastatin	(0.041)	0.000	(0.041)	4.6
Fluvastatin	0.052	(0.000)	0.052	-4.7
Lovastatin	(0.001)	0.000	(0.001)	-2.1
Pravastatin	0.011	0.019	(0.008)	-5.1
Simvastatin	0.033	0.047	(0.014)	-2.4
Total	0.065	0.091	(0.026)	0.0

ent ways. Cerivastatin contributed a 4.1-cent-per-dose decrease, due to its 4.6-percent-share increase and relatively low WAC price. Atorvastatin contributed a 1.4-cent-per-dose decrease due to its relatively low WAC price; this was offset, however, by a 2.4-cent-per-dose rise due to the increase in its mean dose, resulting in a

net positive contribution of 1 cent. Pravastatin and simvastatin had net positive contributions to cost per dose, due to an increase in mean dose. In reviewing the results of Table 5, it is essential to consider whether the contributions are due to a drop or an increase in market share. For example, cerivastatin and pravastatin both

have negative share-effect contributions. The drop in price for cerivastatin, however, came about by using *more* of a lower cost product, and the drop in price for pravastatin came about by using *less* of a more expensive product.

The effect of “flat pricing” can be seen in Table 2. Although cerivastatin and fluvastatin had significant increases in mean dose, each had a dosage effect of zero due to their “flat” pricing (same price for different dosage strengths) at the WAC level. Simvastatin has flat pricing for the 20-mg, 40-mg, and 80-mg dosages. The dosage effect for simvastatin is due to migration from the 5-mg and 10-mg dosages (which are priced lower than the 20 mg, 40 mg, and 80 mg) to the three higher strengths.

There was significant variation in cost per dose, which was assumed to be equal to patient cost per day (see methodology) and the change in cost per dose for all statins over the two-year period among the HMO organizations in the database. Table 6 displays the results for 10 large national and regional HMOs.

**Correlation of brand share to mean dose.** The investigators examined the relationship between brand share and mean dose by taking the average of each one during the period of October through December 2000 for each of the top 131 HMO plans. The analysis included all plans that had a minimum of 100,000 doses per month during this period. A linear regression was performed on the 131 data points. A significant negative correlation was found between brand share and mean dose for atorvastatin ( $P<0.01$ ) and a significant positive correlation for fluvastatin ( $P<0.01$ ). Simvastatin showed a marginally significant negative correlation ( $P=0.05$ ). Cerivastatin and pravastatin showed no significant correlation between share and mean dose. The analysis was not carried out for lovastatin, due to its small variation in market share (Table 7).

In Table 7, a negative slope indicates that mean dose tends to decrease as market share increases. The intercept represents the predicted mean dose at “zero share.” The predicted mean dose is found by multiplying the slope by the share and adding the intercept. For example, the following formula yields the predicted mean dose of atorvastatin at 50 percent share.

$$20.7 + (-7.03) \times (0.5) = 17.2 \text{ mg}$$

The linear-regression graphs for atorvastatin and fluvastatin, which showed statistical significance, are shown in Figures 1 and 2.

The investigators also looked at the correlation between brand share and average WAC cost per dose (equal to patient cost per day) for the 131 plans. Table 8 discloses the results of this analysis.

In Table 8, a negative slope indicates that average WAC cost per dose, weighted across all statins, tends to decrease as the product’s share increases. There was a significant

( $P<0.01$ ) negative correlation between brand share and average WAC cost per dose for atorvastatin, cerivastatin, and pravastatin. Simvastatin showed a significant ( $P<0.01$ ) positive correlation between market share and average WAC cost per dose. The linear regression graphs for atorvastatin and simvastatin, the two brands with the largest market shares, are shown in Figures 3 and 4.

The investigators also looked at the correlation between the brand share of atorvastatin and the mean dose of each other statin. This analysis was then performed for simvastatin share. Increases in atorvastatin share correlated significantly ( $P<0.01$ ) with lower mean doses of all other statins (Table 9). Higher simvastatin share was correlated to higher mean doses of the other statins, but the correlation was only significant ( $P<0.01$ ) in the cases of atorvastatin and cerivastatin (Table 10). Figures 5 and 6 depict linear-regression graphs for atorvastatin market share vs. pravastatin mean dose and simvastatin mean dose, the two brands with the largest

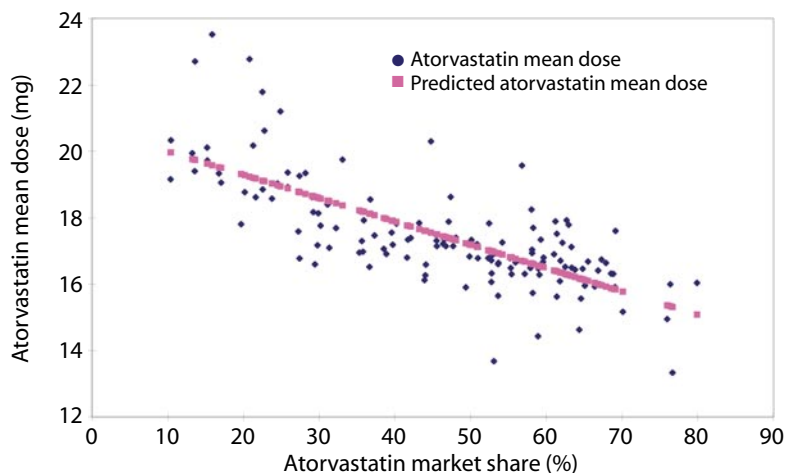
**TABLE 6 Top large national and regional HMOs: Variations in cost per dose and change in cost per dose**

HMO	Mean WAC cost per dose Jan. '99	Mean WAC cost per dose Dec. '00	Change in WAC cost per dose	% Change in WAC cost per dose
A	2.323	2.475	0.15	6.5
B	1.996	2.032	0.04	1.8
C	2.245	2.282	0.04	1.6
D	2.461	2.572	0.11	4.5
E	2.243	2.373	0.13	5.8
F	2.202	2.267	0.06	3.0
G	2.065	2.115	0.05	2.4
H	2.269	2.273	0.00	0.2
I	2.453	2.461	0.01	0.3
J	2.283	2.218	(0.06)	-2.8

**TABLE 7 Linear regression of mean dose vs. market share in top 131 plans**

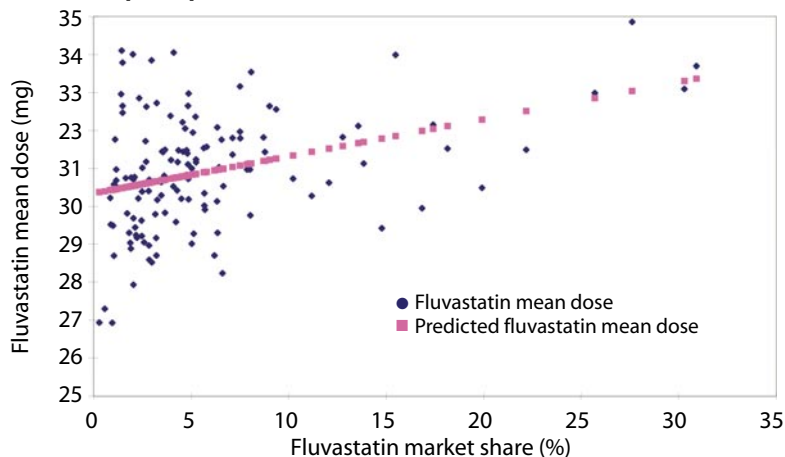
Product	Intercept	Slope	R-square	F statistic	Probability
Atorvastatin	20.70	(7.03)	0.54	152.99	1.17 E-23
Cerivastatin	0.41	(0.01)	0.01	0.91	0.34
Fluvastatin	30.34	9.77	0.14	20.24	1.50 E-05
Pravastatin	26.78	0.37	0.00	0.07	0.79
Simvastatin	26.29	(2.06)	0.03	3.92	0.05

**FIGURE 1 Regression line fit for atorvastatin: Market share vs. mean dose. Top 131 plans, Q4 2000**



Atorvastatin mean dose showed a statistically significant ( $P<0.01$ ) downward trend with market share.

**FIGURE 2 Regression line fit for fluvastatin: Market share vs. mean dose. Top 131 plans, Q4 2000**



Fluvastatin mean dose showed a statistically significant ( $P<0.01$ ) upward trend with market share.

market shares after atorvastatin.

Some of the correlations found for the 131 large HMO plans also held when examining local plans of two large national HMOs. In these cases, the investigators restricted the analysis to plans having at least 10,000 doses per month during the fourth quarter of 2000. Looking at the 77 largest plans (in terms of statin usage) of one national HMO (HMO A) that met the criteria, the correlation found

between mean dose and market share held for atorvastatin ( $P<0.01$ ) but not for the other statins (Table 11). A similar result was seen for the largest 63 local plans of a second national HMO (HMO B) that met the criteria (Table 12). The atorvastatin regression graphs for HMOs A and B appear in Figures 7 and 8. Simvastatin showed a significant ( $P<0.01$ ) positive correlation between mean dose and market share in HMO A.

## DISCUSSION

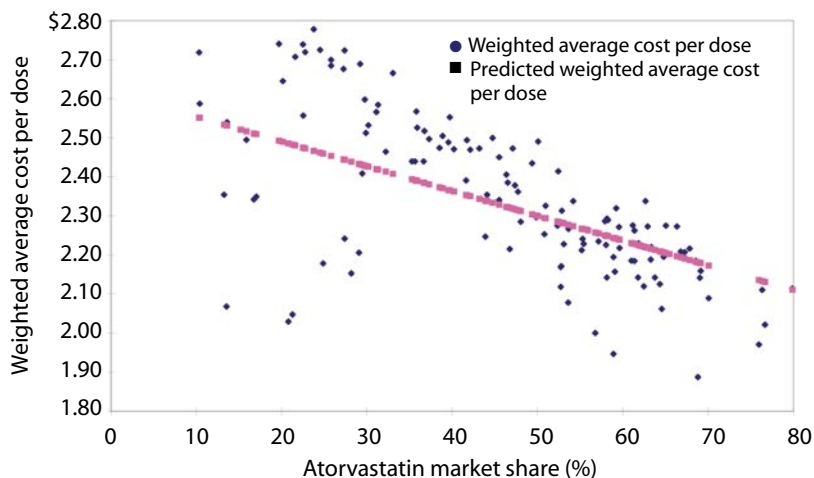
The HMG-CoA class of drugs is second only to the antidepressant class in dollar size within the U.S. pharmaceutical market and is growing rapidly. The estimated number of patient days of HMG-CoA therapy increased 64 percent in the two years ending December 2000. Managed care plans have taken steps to rein in costs in this category through formulary controls and purchasing agreements with manufacturers. On a cost-per-patient-day basis, assuming fixed drug-acquisition costs, costs will vary due to changes in brand market share and dosage mix. This study examined changes in brand market share and dosage mix to determine their effect on cost per statin dose. Furthermore, the relationship between market share and mean dose for each brand was examined.

**Mean dose and dosage distribution.** All category brands increased in mean dose within the sample of 1,070 managed care plans. Cerivastatin increased 38.5 percent during the two-year period to 0.41 mg, largely due to the introduction of the 0.4-mg dosage in mid-1999 and the 0.8-mg dosage in 2000. Simvastatin increased 25.8 percent to 25.3 mg, fluvastatin increased 11 percent to 31.1 mg, atorvastatin increased 9.8 percent to 17.0 mg, and pravastatin increased 9.4 percent to 26.7 mg.

The distribution of dosages for each brand shown in Table 3 is an indicator of how each brand is used in the treatment of elevated cholesterol. Although fluvastatin dosing is moving from the 20-mg to the 40-mg capsule, regimens are still nearly equally split between the two dosage strengths. Pravastatin usage among the three dosage forms shows a trend from the 20-mg to the 40-mg dosage. Simvastatin shows a net shift from the 10-mg dosage to the 40-mg and 80-mg dosages.

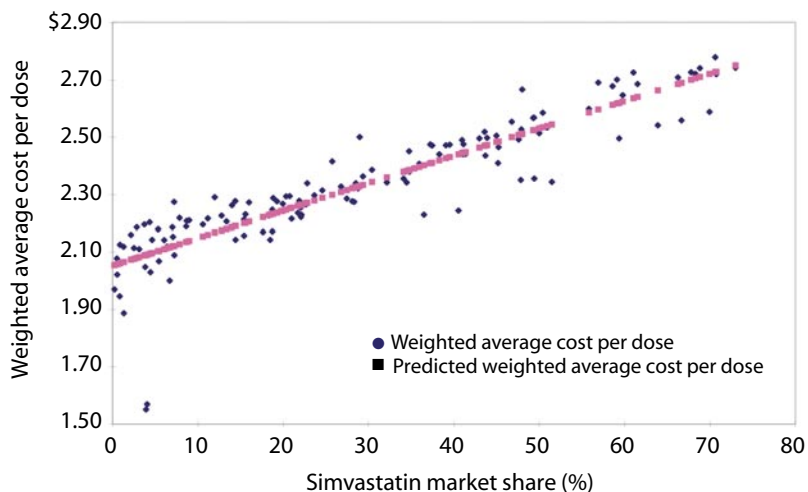
Atorvastatin retained a significant proportion of its use in the 10-mg dosage form, about 57 percent. There

**FIGURE 3 Regression line fit for atorvastatin: Market share vs. weighted average cost per dose. Top 131 plans, Q4 2000**



Weighted average cost per dose showed a statistically significant ( $P < 0.01$ ) downward trend with atorvastatin market share.

**FIGURE 4 Regression line fit for simvastatin: Market share vs. weighted average cost per dose. Top 131 plans, Q4 2000**



Simvastatin mean dose showed a statistically significant ( $P < 0.01$ ) upward trend with market share.

**TABLE 8 Linear regression of average WAC cost per dose vs. market share in top 131 plans**

Product	Intercept	Slope	R-square	F statistic	Probability
Atorvastatin	2.62	(0.63)	0.25	43.07	1.17E-09
Cerivastatin	2.39	(1.10)	0.28	48.97	1.27E-10
Fluvastatin	2.36	(0.58)	0.02	3.09	0.081
Pravastatin	2.47	(1.10)	0.18	28.22	4.61E-07
Simvastatin	2.05	0.95	0.81	534.44	1.04E-47

was about a 2-percent net shift from the 10-mg to the 40-mg dosage form in the year ending December 2000, from which it can be inferred that patients migrated from the 10-mg to the 20-mg dosage and from the 20-mg to the 40-mg dosage, leaving the proportion of patients using the 20-mg dosage nearly unchanged.

The investigators assumed in their analysis of mean dose that each tablet or capsule represented a single daily dose. Dosing regimens greater than once daily or involving splitting tablets would alter the mean doses presented here.

**Mean cost per dose.** Using WAC prices from February 2001, the weighted average cost per statin dose increased 6 cents to \$2.29 from \$2.23 for the 1,070 managed care plans in the database during the two-year period ending December 2000.

The contribution of each brand to the change in average cost per dose was calculated as a function of both brand market share and brand dosage mix (see Table 5). The primary contributor was found to be fluvastatin, which contributed a 5.2-cents-per-dose increase due to its drop in market share. Cerivastatin contributed a 4.2-cents-per-dose decrease due to its increasing market share. Atorvastatin and pravastatin each contributed about a 1-cent increase, and simvastatin contributed a 3.3-cents increase due mostly to dosage-mix increases.

The investigators have not attempted to adjust for changes in the WAC prices during the two-year period, because this review focuses on changes in market share and dosage mix for each brand. Prices for each brand and dosage strength will vary among managed care plans based on contract prices established with manufacturers and rebates obtained via PBMs.

While the overall change in cost per dose was about 6 cents or 2.7 percent, the change in cost per dose for individual HMOs varied significantly. For example, the investigators looked

at the cost per dose in the top 10 parent HMO organizations in the database, as defined by the number of statin doses. The percentage change in cost per dose during the two-year period varied from a high of 6.5 percent to a low of -2.8 percent. The December 2000 cost per dose (evaluated at February 2001 WAC prices) varied from a low of \$2.03 to a high of \$2.57. The December 2000 cost per dose in the fee-for-service segment was \$2.15, reflecting higher usage of cerivastatin, fluvastatin, and 10-mg atorvastatin.

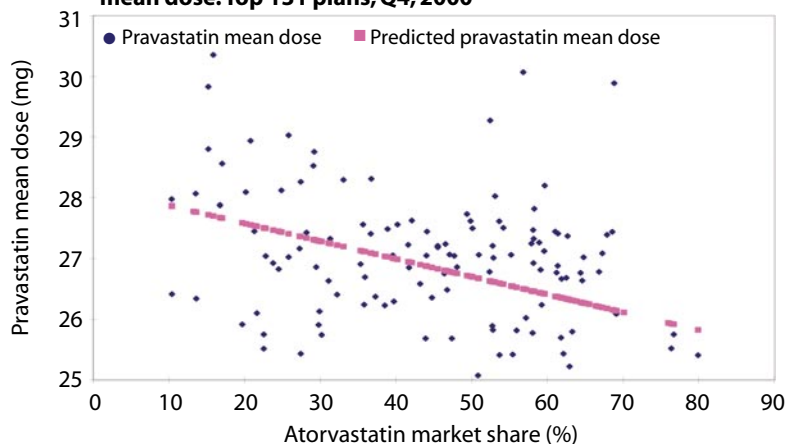
**Correlation of brand market share and mean dose.** The investigators used the market share and mean dose for each statin brand from the top 131 HMOs to assess the relationship between these variables for each brand.

The correlation was most significant ( $P < 0.01$ ) and consistent for atorvastatin, which showed a clear negative correlation between brand share and mean dose (higher share associated with lower mean doses). This correlation carried through when the largest plans within two national HMOs were examined. A significant ( $P < 0.01$ ) positive correlation was found in the case of fluvastatin for the 131 plans; this correlation did not hold for the largest plans in the two national HMOs, however.

Higher market shares of atorvastatin were also significantly ( $P < 0.01$ ) correlated to lower mean doses of all other statin brands. A weak positive correlation was found between the shares of simvastatin and the mean doses of the other statin brands, but the relationship was only significant ( $P < 0.01$ ) for simvastatin vs. atorvastatin and simvastatin vs. cerivastatin.

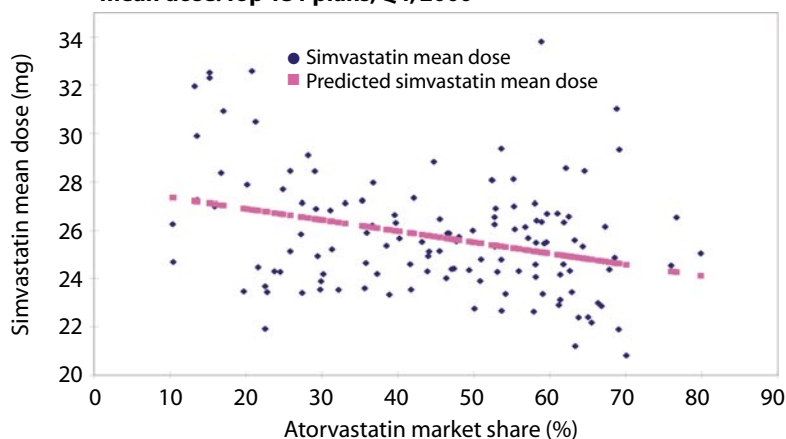
There are several possible explanations for these relationships. In the case of atorvastatin, those plans that have not placed atorvastatin on their drug formulary, reserving it for treatment failures on other products, may use higher doses for these refractory patients, thus raising the mean dose.

**FIGURE 5 Regression line fit for atorvastatin market share vs. pravastatin mean dose. Top 131 plans, Q4, 2000**



Pravastatin mean dose showed a statistically significant ( $P < 0.01$ ) downward trend with atorvastatin market share.

**FIGURE 6 Regression line fit for atorvastatin market share vs. simvastatin mean dose. Top 131 plans, Q4, 2000**



Simvastatin mean dose showed a statistically significant ( $P < 0.01$ ) downward trend with atorvastatin market share.

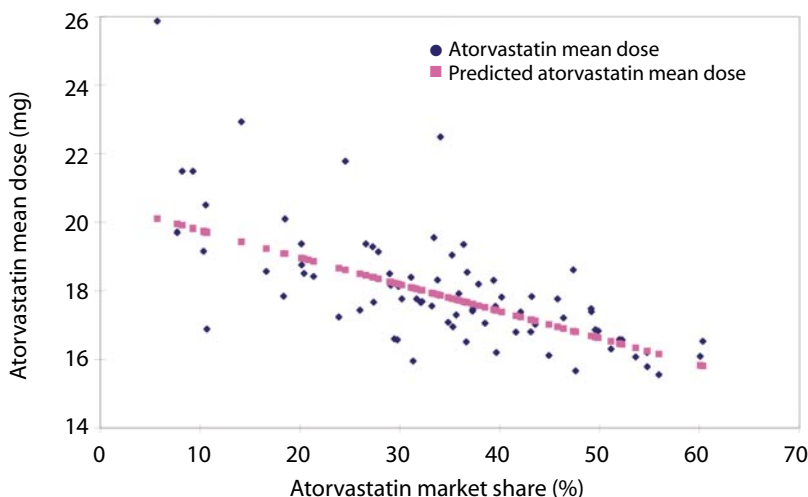
**TABLE 9 Linear regression of brand mean dose vs. atorvastatin market share in top 131 plans**

Product	Intercept	Slope	R-square	F statistic	Probability
Cerivastatin	0.42	(0.03)	0.07	9.37	2.69E-03
Fluvastatin	32.24	(2.92)	0.11	15.46	1.37E-04
Pravastatin	28.17	(2.93)	0.15	22.93	4.54E-06
Simvastatin	27.82	(4.63)	0.10	15.02	1.68E-04

**TABLE 10 Linear regression of brand mean dose vs. simvastatin market share in top 131 plans**

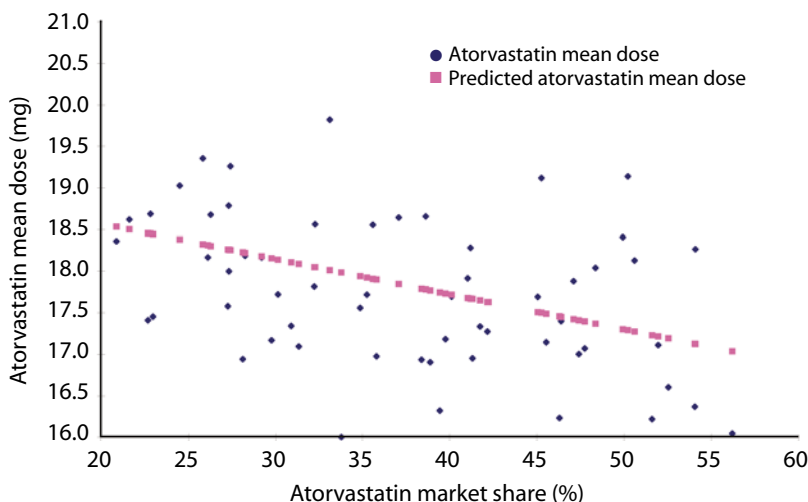
Product	Intercept	Slope	R-square	F statistic	Probability
Atorvastatin	16.47	3.51	0.19	30.71	1.62E-07
Cerivastatin	0.40	0.02	0.05	7.12	8.61E-03
Fluvastatin	30.58	1.13	1.13	3.02	0.08
Pravastatin	26.64	0.65	0.01	1.39	0.24

**FIGURE 7 Regression line fit for atorvastatin market share vs. mean dose: Top 77 plans of a large national HMO (HMO A)**



Atorvastatin mean dose showed a statistically significant ( $P<0.01$ ) downward trend with market share.

**FIGURE 8 Regression line fit for atorvastatin market share vs. mean dose: Top 63 plans of a large national HMO (HMO B)**



Atorvastatin mean dose showed a statistically significant ( $P<0.01$ ) downward trend with market share.

As atorvastatin use spreads to a larger proportion of a health plan's total membership, the average severity would tend to fall and the mean dose would decline. Higher use of atorvastatin may also foster a "10-mg mentality," i.e., physicians may become accustomed to starting patients on a 10-mg dose, the recommended

starting dose, and only titrating upward when satisfactory lipid control is not achieved. With lower use of atorvastatin, physicians may become accustomed to starting with a 20-mg dose, the recommended starting dose for all other statins except cerivastatin, and titrating upward from that point.

**Correlation of brand share and average cost per dose.** Based on WAC pricing, the investigators found a significant ( $P<0.01$ ) negative correlation between the market shares of atorvastatin, cerivastatin, and pravastatin and the average cost per dose weighted across all statins. That is, higher shares of these three products tended to be associated with lower statin costs. There was a significant ( $P<0.01$ ) positive correlation between simvastatin market share and average cost per dose. These relationships are based on two primary factors: the WAC price of each product and the relationships between brand share and mean dose.

These results do not take into account *net* product prices that result from contract discounts with manufacturers and rebates from both manufacturers and PBMs, nor do they account for different member copayment levels. Net prices for each product and member copayments will vary among managed care plans. No attempt has been made here to estimate net brand pricing.

**CONCLUSION**

This review examined statin utilization trends in the managed care environment during the two year period ending December 2000. The primary trends were 1) an increase in market share of the two newest brands, atorvastatin and cerivastatin, and corresponding share loss for the four older brands; 2) an increase in the mean dose of all brands; and 3) a significant ( $P<0.01$ ) negative correlation between atorvastatin market share and mean dose of all statin brands, i.e., HMOs with higher use of atorvastatin tended to have lower mean doses of all statin brands.

The average cost per dose of statin therapy, based on February 2001 WAC prices, was examined. Based on product dosing recommendations, the investigators assumed that cost per dose equated to patient cost per day. It was found that changes in the

**TABLE 11 Linear regression of mean dose vs. market share in the top 77 plans of a large national HMO (HMO A)**

Product	Intercept	Slope	R-square	F statistic	Probability
Atorvastatin	20.54	(7.85)	0.21	19.50	3.33E-05
Cerivastatin	0.39	0.52	0.03	2.27	0.14
Fluvastatin	30.43	6.87	0.01	0.43	0.52
Pravastatin	26.64	1.87	0.00	0.03	0.87
Simvastatin	22.74	6.72	0.11	9.49	2.89E-03

**TABLE 12 Linear regression of mean dose vs. market share in the top 63 plans of a large national HMO (HMO B)**

Product	Intercept	Slope	R-square	F statistic	Probability
Atorvastatin	19.42	(4.24)	0.18	13.32	5.47E-04
Cerivastatin	0.37	0.65	0.09	6.24	0.02
Fluvastatin	31.76	(12.12)	0.01	0.74	0.39
Pravastatin	25.05	21.34	0.07	4.74	0.03
Simvastatin	26.09	(1.36)	0.01	0.50	0.48

average cost per dose during the two years ending December 2000 were due to both changes in brand market share and mean dose. There was a significant ( $P < 0.01$ ) negative correlation between brand share and average WAC cost per dose for atorvastatin, cerivastatin, and pravastatin. Simvastatin showed a significant ( $P < 0.01$ ) positive correlation between market share and average WAC cost per dose. In developing a cost-management strategy, managed care organizations should take historical and anticipated market-share changes and dose-mix changes into account along with the product's net price after discounts, clinical profile, and total cost of care.