Dear Editor,
The recent paper "High-Mileage Study of On-Board Diagnostic Emissions" by Gardetto et al.[1] contains an unfortunate error in the text, which might cause the reader to misinterpret the data in Figure 1 and Table 5. The text states:

"Repairs were made on 54 vehicles and trucks based on the results of either on-board diagnostic equipment (OBD; 46 of the 54) or IM240 testing (eight of the 54). It should be noted that one IM240 failure could never be repaired to pass, and this vehicle was dropped from the study. The data were then analyzed to determine the sum of the emission benefits for the repairs identified by either OBD and/or an IM240 cycle."

The original data file for the repairs actually contains 57 entries, but nine of these show no record of failing either OBD or IM240. This leaves a total of only 48 vehicles that failed either or both inspection and maintenance tests. From these 48 vehicles, the published data can be exactly reproduced. For instance, in Gardetto et al., Table 5, the cumulative federal Test Procedure carbon monoxide (CO) emission benefit is given as 206 gm/mile from 46 vehicles. As shown in the revised table, given as Table 1 below, there was an accumulated repair benefit of 52 gm/mi CO from the 40 "failed OBD-only" vehicles and a further 154 from the six IM240 failures that also failed OBD. Interested readers are invited to draw their own conclusions concerning OBD and IM240 from this table.

Table 1. Cumulative repair cost, cumulative hydrocarbon, CO and NO_x benefits, and cumulative fuel economy results.

I/M Failure Mode	Summed Cost	ΔHC gm/mi	ΔCO gm/mi	ΔNO_x gm/mi	ΔFuel Economy
IM240 only ($n = 2$)	$ 736	1.9	18	5.5	−1.0
IM240 and OBDII ($n = 6$)	$ 1798	8.7	154	6.6	5.7
OBDII only ($n = 40$)	$19,068	3.3	52	9.4	−2.2

Notes: Only the six vehicles with both IM240 and OBD failures achieved upon repair a cumulative fuel economy improvement of almost 1 mpg/vehicle. Vehicles that failed IM240 only and vehicles that failed OBD only suffered a small net loss in gas mileage upon repairs.

I appreciate the authors sharing the raw data files, which formed the basis for their manuscript.

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1. Gardetto, E.; Bagian, T.; Lindner, J. High-Mileage Study of On-Board Diagnostic Emissions; *J. Air & Waste Manage. Assoc.* **2005**, *55,* 1480-1486.

Dear Editor,
We have performed additional analyses and wish to make clarifications regarding findings reported in the paper "High-Mileage Study of On-Board Diagnostic Emissions" by Gardetto et al.[1] The data provided by the paper's authors provide useful insights regarding repairs of vehicles using on-board diagnostic equipment (OBD) and IM240 criteria. Although the data are from the first 153 vehicles of a larger 300-vehicle dataset, it is our opinion that useful conclusions can be reached from this sample. We believe this even though the data are not likely representative of real-world inspection/maintenance (I/M) program conditions; the vehicles in the study were volunteered by their owners and the repair technicians knew that the vehicles' performances were being monitored by the U.S. Environmental Protection Agency (EPA). Additionally, I/M tailpipe test results in this analysis represent the best possible scenario, and extrapolating these results to field tailpipe testing is difficult because of the concerns listed in the original paper.

We have re-examined the original 153 vehicle dataset, and eliminated one vehicle because of ambiguity in its true classification. Of the remaining 152 vehicles, 46 (30%) failed with the malfunction indicator light (MIL) illuminated, and nine (6%) failed the laboratory IM240 test (LAB240) at EPA's final cutpoints.[1] Because so many more vehicles failed with the MIL illuminated than the IM240, one would expect that OBD/MIL repairs would produce greater emissions reductions for a fleet than IM240 emissions criteria for repairs.

There are 48 vehicles of the 152 vehicle dataset for which there are pre- and post-repair Federal Test Procedure (FTP) data. Forty-six vehicles failed and were repaired according to OBD/MIL criteria. Two vehicles passed the OBD/MIL tests but failed the LAB240 (OBD errors of omission based on FTP results) and were repaired according to laboratory IM240 criteria. Three vehicles had OBD-failing evaporative and tailpipe codes; we kept them in our analysis based on a review of the repairs being directed mainly at tailpipe-emissions control components. We did not include five vehicles of the 46 in our analysis because their OBD failures were for evaporative codes only, and evaporative emissions were not measured in this study. Of the remaining 41 MIL failures, six of those also failed the LAB240 test; the remaining 35 were OBD/MIL failures only.

The emission reductions and cost-effectiveness data for the 43 vehicles (41 OBD failures plus 2 OBD errors of omission) are shown in Table 1. We calculate emission reductions as the net difference in FTP emissions for the sum of THC + 0.1 × CO + NO_x, in grams per mile accumulated repair benefit for the repaired vehicles, because these pollutants are the focus of motor vehicle I/M programs. Of the 41 OBD-failing vehicles, the 6 LAB240 failures (15%) produced 63% of the total emission reduction at only 9% of the total repair costs. The remaining 37% of the emission benefit came from the 35 OBD-only failing vehicles at 91% of the total repair costs. However, the eight vehicles that failed the LAB240 produced 69% of the emission reduction benefit for the 43-vehicle dataset.

It has been reported previously that the majority of vehicles failing I/M tests are low or "marginal" emitters, whose emissions are only slightly above the I/M failure cutpoint, and that the majority of the emissions benefit derives from repairing only a small fraction of the failing

Table 1. Number of vehicles per I/M failure type, repair costs, exhaust emission reduction, and cost-effectiveness per accumulated gram per mile for the repaired fleet.

I/M Failure Type	*N*	Total Repair Costs	Cumulative Reduction (g/mi)[a]	Repair Costs/ Vehicle	Repair Effectiveness ($/g/mi)[a]
OBD/MIL	41	$19,975	48.7	$487	$409
MIL + LAB240	6	$1799	30.7	$300	$59
LAB240 only; no MIL failure	2	$736	9.2	$368	$80
MIL only; no LAB240 failure	35	$18,176	18.0	$519	$1009

[a]Cumulative emission reduction and repair effectiveness costs calculated as the sum (THC + 0.1 CO + NO_x), in grams per mile, totaled for the repaired fleet.

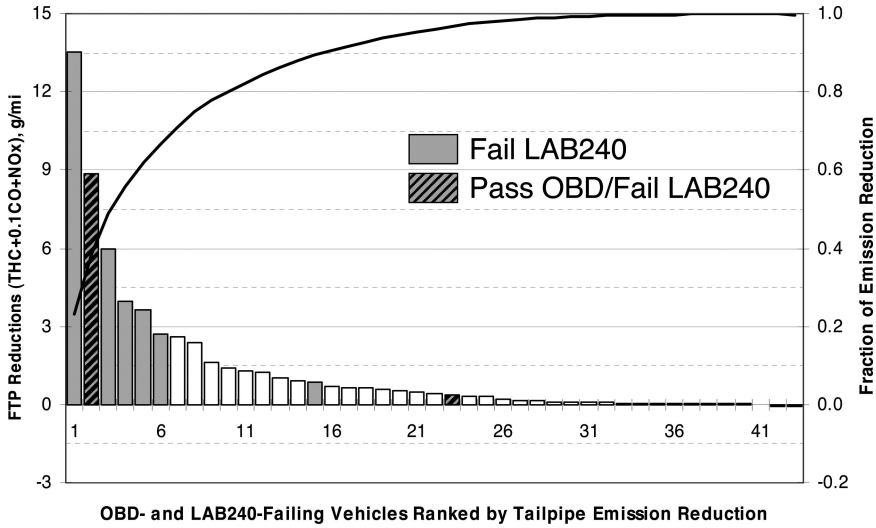

Figure 1. Cumulative net exhaust emission reductions, and fraction of emission reductions (solid line) for the 43 on-board diagnostic equipment (OBD)/MIL and LAB240-failing vehicles, in rank-order from largest to least emission reductions. The gray bars are vehicles that failed the LAB240; the cross-hatched bars are the two OBD error-of-omission vehicles.

fleet.[2] The tailpipe emission reductions obtained by repairing the 43 OBD/MIL/LAB240-failing vehicles are shown in Figure 1, where the vehicles' net FTP emission reductions (THC + 0.1 × CO + NO_x) are in rank-order from greatest to least. Forty-nine percent of the total reduction was obtained by repairing only three of the 43 vehicles (7%). Two vehicles' FTP emissions increased after repairs. The emission reductions missed by the two OBD errors-of-omission (vehicles 2 and 23 in Figure 1) are equal to the total emission reduction obtained from the 31 vehicles having the least emission reduction in the 43-vehicle dataset. The cost of repairing those 31 vehicles was approximately three-fourths of the total repair costs.

We await EPA's release of remaining data for the entire 300-vehicle dataset. In the meantime, our analysis of the 152-vehicle dataset shows that I/M pass/fail decisions based solely on OBD criteria greatly increase the number of failing vehicles with little significant benefit from repairs. Moreover, in this 152 vehicle dataset OBD-only failures resulted in higher average repair costs per vehicle and dramatically higher total repair costs for the fleet. Finally, OBD errors-of-omission resulted in significant loss of emission benefits in this study.

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