

**Can Unlicensed Motorcycle Owners Be Persuaded to Obtain a License? Evaluation of a Safety Program in Maryland**

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## **Abstract**

*Background:* Unlicensed motorcycle operators appear to be disproportionately involved in police-reported motorcycle crashes in Maryland, accounting for about 27 percent of motorcycle operators in police-reported crashes, although unlicensed owners comprise 17 percent of primary motorcycle owners. A randomized controlled trial was conducted to determine whether an educational intervention could increase licensure rates among Maryland motorcycle owners.

*Methods:* Based on focus groups and outreach to organizations interested in motorcycle safety in Maryland, a cover letter and brochure were developed to provide information about the benefits of motorcycle licensure, methods of obtaining licenses, including rider education courses, and adverse legal consequences of being caught operating a motorcycle while unlicensed. Maryland Motor Vehicle Administration (MVA) records of registered motorcycles were linked with licensure files to determine which motorcycle owners lacked valid motorcycle licenses or learner's permits. The population eligible for an intervention consisted of 8,500 unlicensed motorcycle owners who had no licensed co-owners listed in MVA vehicle registration records. Half of them were randomized to receive a cover letter and brochure from MVA, which was mailed to them in early June, 2005. Licensure rates among the intervention group and comparison group of unlicensed motorcycle owners were followed for five months post-intervention.

*Results:* Licensure rates remained low in both the intervention and comparison groups. As of November 15, 2005, a total of 268 unlicensed owners in the intervention group had obtained Class M motorcycle licenses and 157 had obtained Class R motorcycle learner's permits. The comparison group obtained 201 Class M licenses and 121 Class R permits during the same period. The overall success rate in the intervention group, defined as obtaining Class M or R, was 10.1 percent compared with 7.6 percent in the comparison group, a statistically significant increase (licensure ratio (LR)=1.33; 95 percent confidence interval (CI) = 1.15-1.52). Women were overrepresented within the unlicensed group relative to the entire population of motorcycle owners. A low percentage of unlicensed female owners obtained M licenses or R permits. The intervention appeared to be more successful among unlicensed male owners, who had a LR for obtaining M licenses of 1.46 (95% CI=1.21-1.75). LRs were significantly higher among unlicensed owners ages 41-48 and 49+ receiving the intervention compared with younger age groups. Regional comparisons were limited by small numbers; however, those counties falling into the Capital region close to Washington, DC had higher response rates to the intervention (LR=1.63; 95% CI=1.12-2.38) than other Maryland regions.

*Conclusions:* The intervention did appear to increase licensure rates, yet the success rate was far less than optimal. One potential barrier to licensure was the high demand for motorcycle training courses during 2005, which led to a scarcity of spaces in the courses; however, the unlicensed motorcycle owners had the option of obtaining a license without taking a rider education course. Further research should explore whether licensure rates could be increased by modifying the intervention, such as mailing brochures earlier in the year, incorporating a stronger message from MVA, and repeating the mailings to owners who remain unlicensed. In addition, future research should explore the relationship between licensure, ownership, and crash risk.

## **Introduction**

The number of deaths and non-fatal injuries has been increasing among motorcycle riders in the United States since 1997 (National Highway Traffic Safety Administration, 2005; Insurance Institute for Highway Safety, 2005). The 89 percent increase in motorcycle-related deaths likely is attributable to several trends: increasing numbers of motorcycle registrations, accompanied by increased travel on motorcycles, and the higher proportion of motorcycle riders who are older than 40 and thus more susceptible to injury.

Effective interventions are needed to reduce the burden of injury arising from motorcycle crashes. One potential risk factor for involvement in a motorcycle crash is lack of licensure. Unlicensed motorcycle operators appear to be disproportionately involved in police-reported motorcycle crashes in Maryland, accounting for about 27 percent of motorcycle operators in police-reported crashes, although they comprise only 17 percent of Maryland motorcycle owners. The absence of a valid license may indicate potential deficits in the skills needed to operate a motorcycle safely; however, the absence of a license also may be a marker for risky driving behavior that would not necessarily improve after obtaining a motorcycle license.

The purpose of this study was to determine whether a persuasive educational intervention could increase licensure rates among unlicensed motorcycle owners in Maryland. The intervention was designed so as to increase the likelihood of the target population being motivated to obtain licenses.

## **Methods**

The intervention consisted of a mailing from the Maryland Motor Vehicle Administration

(MVA) that included a letter from MVA, a brochure explaining how to get licensed, and a form that unlicensed motorcycle owners were asked to return to MVA concerning their intentions. The letter said that MVA records had identified the owner as unlicensed and described the potential legal consequences of being stopped by police when operating a motorcycle while unlicensed. The brochure and cover letter were developed with advice from focus groups convened with members of two motorcycle rider clubs in Maryland, members of a safety task force consisting of motorcycle riders and local traffic safety professionals, and motorcycle safety specialists from MVA. The brochure had attractive photographs and was designed with a positive message about the benefits of licensure, while pointing out negative consequences if people were caught operating a motorcycle without a valid license. At the suggestion of focus groups, a picture of a tow truck hauling a motorcycle was included to illustrate an unwanted consequence of operating a motorcycle without a valid license. This intervention was considered as having the potential to be more effective than most other educational interventions because it notified people that MVA was aware of their lack of a valid license; the mailing came from a state regulatory agency (MVA); and a response to the MVA was requested. Approval to conduct the study was received from Maryland MVA and from the Institutional Review Board of the University of Maryland School of Medicine.

To determine the efficacy of a persuasive educational mailing, the study was designed as a randomized controlled intervention trial. This type of study is the best method of evaluating whether a program has been successful because it eliminates the bias that can arise when the people who volunteer for an intervention differ from those who choose not to participate in a program. In addition, the use of the same follow-up period for intervention and comparison

groups eliminates the possibility of temporal trends accounting for any observed changes in licensure rates. The data sources were Maryland licensure and vehicle registration files, which first were used to identify the target population for the intervention and then were used to follow the population over time to determine the effects of the intervention.

The initial study population was drawn from licensure and vehicle registration files created by the Maryland Motor Vehicle Administration (MVA) on April 26, 2005. After identifying the license numbers of owners and co-owners of registered motorcycles, these numbers were linked to the licensure files to determine whether the owners and co-owners had Class M motorcycle licenses or unexpired Class R permits, which are learner's permits for motorcycles. To obtain a Class M license in Maryland, riders either can take and pass a riding course taught by accredited instructors or obtain a Class R permit by passing a knowledge test, hold the Class R permit for at least two weeks but no longer than six months, and then pass a skills test administered at one of the MVA offices. To pass the riding course, a series of skill and knowledge tests administered by the instructor must be passed. The curriculum of the rider course is similar to that developed by the Motorcycle Safety Foundation.

About 89,000 motorcycles were registered in Maryland as of April 26, 2005. Primary owners of the motorcycles numbered 78,786; about 8,700 owned more than one motorcycle. Co-owners numbered 9,356. Of the total number of primary owners, 65,284 (83 percent) held a Class M motorcycle license, whereas 3,502 (37 percent) of co-owners were licensed.

To be eligible for the study population of unlicensed owners, a motorcycle owner had to lack both a Class M license and an unexpired Class R permit as of May 31, 2005 and either have no

co-owner or an unlicensed co-owner (lacking either a Class M or an unexpired Class R endorsement). Unlicensed owners with licensed co-owners were excluded from the study population because we assumed that the licensed co-owner was the primary operator of the motorcycle and we wished to target those unlicensed owners most likely to be riding motorcycles without having a legal license. A total of 8,500 unlicensed owners were deemed eligible for the study and half (4,250) were randomized to receive the intervention educational mailing.

The mailing dates for the educational/persuasive materials for the intervention group were June 9-10, 2005. We were unsure how long it would take before any measurable effect could be detected and initially considered using a follow-up date of two weeks from the mailing date. Unexpectedly, a clear spike in motorcycle licenses and permits was observed just a few days later, on June 13, 2005, so that June 13, 2005 was chosen as the date for initiation of follow-up for both intervention and comparison groups. Any licenses or permits obtained during May 31-June 12, 2005 were excluded from the analyses.

Only 106 response forms were received by MVA after the mailing, so the recipients correctly perceived the response as voluntary. Some recipients may have failed to see the postage-paid response form because it was attached to the end of the brochure. Owing to the small numbers of responses, this paper will not describe answers on the response forms other than that some of the responders said that they did not operate the motorcycle registered in their name and named another household member as the primary operator.

Quartiles of age were calculated among the population of unlicensed motorcycle owners eligible

for randomization. Counties in Maryland and Baltimore City were assigned to five regions for the purposes of analysis: Capital (close to Washington, DC), Central Maryland (the city of Baltimore and surrounding counties), the Eastern Shore (east of the Chesapeake Bay), Southern Maryland, and Western Maryland.

Statistical analyses were generated using SAS/STAT software, Version 9.1 (SAS Institute, Inc., 2000-2004). Statistical comparisons were done using chi-square tests of proportions. In addition, the formulae for the Mantel-Haenszel risk ratio were adapted to calculate licensure ratios and 95 percent confidence intervals in the intervention and comparison groups (Agresti, 2002; Greenland and Robins, 1985; Mantel and Haenszel, 1959). If a licensure ratio is close to 1.0, that suggests no effect from the intervention, whereas if a licensure ratio and its lower 95 percent confidence interval both exceed 1.0, such a finding suggests a high likelihood that the intervention resulted in higher licensure rates.

## **Results**

Significant differences by age and gender were present when comparing the study population of unlicensed motorcycle owners eligible for randomization with licensed owners (Table 1).

Females comprised about a quarter of unlicensed primary motorcycle owners but only 9 percent of licensed owners. Younger age groups were overrepresented among unlicensed owners, accounting for about half of unlicensed owners and 31 percent of licensed owners. Licensure rates increased with age, ranging from 79 percent in the youngest age quartile (age 32 or younger) to 92 percent in the oldest age quartile (age 49 or older). No particular regions in Maryland stood out as having a higher proportion of unlicensed owners. Prince George's

County in the Capital region had a higher percentage of unlicensed motorcycle owners than other counties, however. The age and gender distributions of randomized and comparison groups of unlicensed owners were similar, indicating that the randomization procedure was successful (Table 2).

As of November 15, 2005, a total of 425 unlicensed owners had obtained either Class M licenses or R learner's permits among owners randomized to the intervention group, compared with 322 among owners randomized to the comparison group (Table 3). The overall success rate in the intervention group, defined as obtaining Class M or R, was 10.1 percent compared with 7.6 percent in the comparison group. The licensure ratio (LR) for obtaining Class M or R in the intervention group relative to the comparison group was 1.33 (95 percent confidence interval (CI)=1.15-1.52). Similar LRs were observed when Class M licenses and Class R permits were considered separately.

Neither significant increases nor decreases in licensure were observed among unlicensed female motorcycle owners in the intervention group. Among men, the intervention appeared to be more successful, with a LR of 1.46 for obtaining Class M licenses (95% CI=1.21-1.75) (Table 3). Significant increases among male owners randomized to receive the mailing also were observed for Class R permits and for combined Class M/Class R. In the intervention group, about 3 percent of female owners obtained a Class M or R during follow-up compared with 13 percent of male owners.

The intervention appeared to be most successful among motorcycle owners in the two oldest age



quartiles (ages 41-48 and 49+) (Table 3). The LRs for obtaining Class M licenses were 2.07 (95% CI=1.35-3.18) among owners age 49 and older and 1.76 (95% CI=1.23-2.50) among owners ages 41-48, whereas a non-significant increase in licensure was observed among owners ages 33-40 (LR=1.22). The youngest age quartile (age 32 or younger) did not appear to be affected by the intervention. In examining the relationship of age to response to the intervention, the absolute numbers of Class M licenses differed little by age within the intervention group. Within the comparison group, the absolute numbers of licenses obtained decreased with age.

Potential regional differences within Maryland in response to the intervention were explored (Table 4). Small numbers led to low statistical power to detect effects for the Eastern Shore, Southern Maryland, and Western Maryland; however, each of those regions had non-significant increases in licensure in the intervention group. If those three regions had been combined, which would be justifiable based on their low population density, the increases would have been significant. The greatest increase was observed in the Capital region, which included counties near Washington, DC (LR for obtaining Class M = 1.63; 95% CI=1.12-2.38). A smaller increase was observed for Central Maryland, the area that included Baltimore (LR for obtaining M=1.21; 95% CI=0.92-1.59).

## **Discussion**

The findings suggest that the educational intervention led to a modest but consistent increase in licensure rates. The licensure rate remained far less than optimal, which is consistent with past research indicating that educational interventions, by themselves, typically have very limited effects in changing behavior (Christoffel and Gallagher, 2005). One potential barrier to licensure was the high demand for motorcycle training courses during 2005, which led to a scarcity of

spaces in the courses. During February-March, 2005, the study team contacted every site offering basic motorcycle riding courses and discovered that these courses filled early in the year, so that a motorcycle owner attempting to enroll in a basic riding course in June or July would have been shut out. However, the unlicensed motorcycle owners had the option of obtaining a license without taking a rider education course. Also, many of them may have had sufficient experience to permit their taking the advanced rider classes, which did not fill as quickly, to obtain licensure. If we had been able to follow the population for longer than five months, we may have observed either weakening or stronger effects of the intervention over time. Weakening effects could occur from the lack of reinforcement measures for the intervention; however, it is also possible that the intervention may have long-term effects lasting into the next calendar year. Potentially, some unlicensed owners in the intervention group may decide to enroll in basic rider classes during 2006 as a result of the mailing received in 2005.

In considering the effects of the intervention, the most important outcome was obtaining a Class M license. Obtaining a Class R permit is one step on the path to receiving a valid license, but some motorcycle owners may obtain Class R permits as a way of riding a motorcycle legally without having to pass the skill tests. Our data suggest that this may be occurring: 1,049 unlicensed motorcycle owners in the study had held expired Class R permits prior to April 26, 2005.

The findings by gender are noteworthy: (1) women were overrepresented among unlicensed owners who did not have a licensed co-owner; (2) unlicensed women owners were less likely to obtain their Class M licenses or R permits than unlicensed male owners, whether they were in

the intervention or control groups; and (3) being assigned to the intervention resulted in inconsistent and non-significant effects among unlicensed female owners. One potential explanation for these findings is that, to reduce insurance rates, many women are being listed on vehicle registrations as the sole motorcycle owner although they do not operate the motorcycles. Among unlicensed owners who did not operate their motorcycles, the letter from MVA pointing out the adverse legal consequences from operating a motorcycle while unlicensed would not have applied to their situations.

The age differences in the success of the intervention, with higher LRs with increasing age, did not result in a higher absolute number of licenses among older motorcycle owners in the intervention group. Rather, the higher LRs appear to be due to the small number of older motorcycle owners in the comparison groups who obtained licenses. Perhaps some older owners are not primary operators, but are registered as sole owners to reduce insurance rates or do not feel the need to get licensed because they rarely operate their motorcycles.

The Washington, DC region appeared more responsive to the intervention than the Baltimore region. Reasons for the observed regional differences are unclear.

The major limitation of this study is that at the time of the mailing of educational brochures (June, 2005), basic riding courses were filled, so that the response may have been less than would have been the case if the mailing had been done in February. This also shortened the period of follow-up and lessened the number of months of follow-up that occurred during peak motorcycling season. Nonetheless, there still was room in the courses for experienced riders in

June, 2005, and all unlicensed owners had the option of getting a learner's permit and then taking the skills test without taking a course. None of the unlicensed owners were younger than age 18 and thus subject to a requirement to take a course before obtaining a motorcycle license. The strengths of this study include the advice from motorcycle riders that was used to develop the intervention materials and the randomized controlled study design, which is the optimum method of evaluating safety programs.

It is unclear whether unlicensed motorcycle operators who obtain a valid motorcycle license will reduce their risk of crash involvement and injury. The current study was unable to address that question because of the small numbers of unlicensed operators who obtained their license during the follow-up period. Intuitively, licensure should result in safer motorcycle operators because the purpose of licensing is to ensure that all drivers possess basic knowledge of safe vehicle operation and road safety rules, in addition to possessing the skills necessary for safe maneuvering on roads. Another way in which the licensure process could increase safety is by discouraging would-be riders who are unprepared for the challenges of handling a motorcycle. Yet licensure could lead to higher rates of death and injury simply by increasing operator confidence and exposure to motorcycle travel, unless the skills acquired through the process of getting licensed counterbalanced the increased risk from additional exposure. Past research does not indicate whether increasing licensure rates among motorcycle operators will reduce crash risk. McGwin et al. (2004) report lower mortality rates in states with more stringent requirements for motorcycle licensure, including skill tests. Reeder et al. (1995) observed that licensed motorcycle operators and owners reported significantly more riding exposure than unlicensed owners in New Zealand. In a separate study, Reeder et al. (1999) evaluated the

impact of New Zealand's graduated driver licensing system on motorcycle-related hospital admissions and concluded that the injury reductions that were observed after implementation of the system were attributable mostly to less travel on motorcycles. A study in California reported that lack of valid motorcycle licensure was a strong risk factor for involvement in injurious crashes, but also pointed out that increasing licensure may not affect the risk of crash involvement (Kraus et al., 1991).

Further research should explore whether licensure rates could be increased by modifying the intervention, such as mailing brochures earlier in the year, incorporating a stronger message from MVA, and repeating the mailings to owners who remain unlicensed. In addition, the relationship between licensure, ownership, and crash risk should be examined.

### **Acknowledgments**

Many people and organizations have made this study possible. We would like to thank the funding agency, the National Highway Traffic Safety Administration (NHTSA). The views expressed in this paper are those of the authors and do not necessarily reflect those of either NHTSA or the Maryland Motor Vehicle Administration. Staff at Dynamic Science, Inc. have played an essential role in initiating the study, conducting the focus groups, and assisting with other necessary tasks, including Frances Bents, Harold Herrera, Ann Rozsi, Louise Woodruff, Joseph Lloyd, and Mike Warner. We are very grateful to the Maryland Motor Vehicle Administration (MVA) for their willingness to participate in this study, allow letters to be sent under the auspices of MVA, share datasets, answer questions and give advice, and comment upon study methods. In particular, we would like to thank Andrew Krajewski and Philip Sause

of the MVA. Karen Sutter and Buzz Napper of Sutter Design, Inc. designed numerous versions of a very appealing brochure. Shiu Ho of the National Study Center for Trauma and Emergency Medical Systems of the University of Maryland School of Medicine also provided assistance at several critical junctures in the analysis.

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**Table 1. Comparison of Maryland licensed<sup>1</sup> and unlicensed<sup>2</sup> motorcycle owners by Age, Gender, and Region, Maryland Licensure and Vehicle registration files, April, 2005**

<b>Characteristic</b>	<b>Unlicensed</b>		<b>Licensed</b>		<b>p-value<sup>3</sup></b>
	<b>Number</b>	<b>(%)</b>	<b>Number</b>	<b>(%)</b>	
<b>Age (quartiles)<sup>4</sup></b>					
<= 32	2,340	(27)	8,594	(13)	p < 0.0001
33-40	1,919	(23)	11,857	(18)	
41-48	2,283	(27)	21,690	(33)	
49+	1,958	(23)	23,134	(35)	
		(100)		(100)	
<b>Gender</b>					
Male	6,341	(75)	59,551	(91)	p < 0.0001
Female	2,159	(25)	5,733	(9)	
		(100)		(100)	
<b>Region<sup>5</sup></b>					
Capital	2,463	(29)	17,523	(27)	p < 0.0001
Central	3,487	(41)	29,529	(45)	
Eastern Shore	1,106	(13)	6,857	(11)	
Southern	867	(10)	6,257	(10)	
Western	521	(8)	4,892	(6)	
		(100)		(100)	

<sup>1</sup>Licensed defined as a primary motorcycle owner with a Class M motorcycle license.

<sup>2</sup>Unlicensed defined as primary motorcycle owner lacking either a Class M motorcycle license or an unexpired Class R motorcycle learner's permit and not having a licensed co-owner.

<sup>3</sup>Chi-squared tests

<sup>4</sup>Quartiles defined by age distribution among unlicensed drivers.

<sup>5</sup>Capital includes Frederick, Montgomery, and Prince George's Counties; Central includes Baltimore City and counties of Anne Arundel, Baltimore, Carroll, Harford, Howard; Eastern Shore includes Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, and Worcester Counties; Southern includes Calvert, Charles, and Saint Mary's Counties; Western includes Allegany, Garrett, and Washington Counties.

**Table 2. Characteristics of Unlicensed<sup>1</sup> Maryland Owners Randomized to Intervention or Comparison Groups, Maryland Licensure and Vehicle Registration files, April, 2005**

<b>Characteristic</b>	<b>Intervention</b>		<b>Comparison</b>	
	<b>Number</b>	<b>(%)</b>	<b>Number</b>	<b>(%)</b>
<b>Age (quartiles)</b>				
<= 32	1,147	(27)	1,160	(27)
33-40	950	(23)	948	(22)
41-48	1,089	(26)	1,166	(28)
49+	1,010	(24)	939	(22)
<b>Gender</b>				
Male	3,122	(74)	3,142	(75)
Female	1,074	(26)	1,071	(25)

<sup>1</sup>Unlicensed defined as primary owner of a registered motorcycle lacking either a Class M motorcycle license or an unexpired Class R motorcycle learner's permit; additional condition was absence of a licensed co-owner on the vehicle registration.



**Table 3. Licensure Ratios (LR) and 95 Percent Confidence Intervals (CI) for Obtaining Motorcycle Class M Licenses or Class R Learner's Permits among Intervention Group Relative to Comparison Group by Gender and Age Quartile, June 13, 2005 – November 15, 2005**

Group	Obtained Class M			Obtained Class R			Either M or R			Neither M/R
	Number	LR	95% CI	Number	LR	95% CI	Number	LR	95% CI	Number
<b>Total</b>										
Intervention	268	1.35	1.13-1.61	157	1.33	1.05-1.67	425	1.33	1.15-1.52	3,771
Comparison	201			121			322			3,891
<b>Gender</b>										
<b>Men</b>										
Intervention	252	1.46	1.21-1.75	144	1.33	1.04-1.69	396	1.38	1.20-1.60	2,726
Comparison	176			112			288			2,854
<b>Women</b>										
Intervention	16	0.64	0.34-1.19	13	1.43	1.61-3.33	29	0.85	0.52-1.39	1,045
Comparison	25			9			34			1,071
<b>Age Quartiles</b>										
<b>Ages ≤ 32</b>										
Intervention	66	0.91	0.66-1.25	46	1.10	0.73-1.66	112	0.98	0.76-1.25	1,035
Comparison	74			42			116			1,044
<b>Ages 33-40</b>										
Intervention	62	1.22	0.86-1.75	39	1.31	0.82-2.09	101	1.24	0.94-1.64	849
Comparison	51			30			81			867
<b>Ages 41-48</b>										
Intervention	76	1.76	1.23-2.50	40	1.64	1.01-2.65	116	1.68	1.27-2.22	973
Comparison	47			27			74			1,092
<b>Ages 49+</b>										
Intervention	64	2.07	1.35-3.18	32	1.40	0.82-2.39	96	1.75	1.26-2.43	914
Comparison	29			22			51			888

**Table 4. Regional Licensure Ratios (LR) and 95 Percent Confidence Intervals (CI) for Obtaining Motorcycle Class M Licenses or Class R Learner's Permits among Intervention Group Relative to Comparison Group, June 13, 2005 – November 15, 2005**

Region	Obtained Class M			Either M or R			Neither M/R
	Number	LR	95% CI	Number	LR	95% CI	Number
<b>Capital<sup>1</sup></b>							
Intervention	67	1.63	1.12-2.38	108	1.46	1.10-1.94	1,084
Comparison	42			75			1,135
<b>Central<sup>2</sup></b>							
Intervention	110	1.21	0.92-1.59	182	1.26	1.02-1.55	1,581
Comparison	89			140			1,565
<b>Eastern Shore<sup>3</sup></b>							
Intervention	31	1.33	0.79-2.24	54	1.44	0.97-2.14	474
Comparison	24			38			497
<b>Southern<sup>4</sup></b>							
Intervention	34	1.52	0.91-2.53	46	1.31	0.87-1.99	365
Comparison	23			36			386
<b>Western<sup>5</sup></b>							
Intervention	24	1.53	0.84-2.78	30	1.36	0.82-2.26	210
Comparison	17			24			237

<sup>1</sup>Includes Frederick, Montgomery, and Prince George's Counties

<sup>2</sup>Includes Baltimore City and counties of Anne Arundel, Baltimore, Carroll, Harford, Howard

<sup>3</sup>Includes Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, and Worcester Counties

<sup>4</sup>Includes Calvert, Charles, and Saint Mary's Counties

<sup>5</sup>Includes Allegany, Garrett, and Washington Counties