Farm Tractors and Mandatory Roll-Over Protection Retrofits: Potential Costs of the Policy in New York

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ABSTRACT

Tractor roll-overs are the leading cause of fatal farm accidents, accounting for more than one-fourth of all agriculturally related deaths. Most of these deaths could be prevented if the tractors were equipped with roll-over protective structures (ROPS). This study estimates the number of tractors in New York without ROPS, projects their retirement, and then estimates the number of lives which would be saved if ROPS were retrofitted on old tractors. The basic costs associated with mandating ROPS are calculated from these estimates. The minimum economic cost of mandating ROPS is $511,136 per life saved for the retrofits, and an additional $253,254 per life saved for every $1 million spent annually on enforcement. It is concluded that a policy mandating ROPS on all tractors would be expensive, but should be considered with particular attention to the need for and cost effectiveness of enforcement. (*Am J Public Health*. 1991;81:921–923)

Introduction

Agriculture consistently has one of the highest fatal accident rates of any occupation,[1] and tractor roll-overs play a prominent role in such accidents. Tractors are associated with about 50 percent of fatal agricultural accidents,[2] with roll-overs typically accounting for over half of these.[3–6] Evidence from Sweden suggests that most of these roll-over fatalities could have been avoided if the tractors involved had been equipped with roll-over protective structures (ROPS) to prevent operators from being crushed by an overturn.[7]

Most farm tractors in the United States lack ROPS, with only 19 percent of tractors in Pennsylvania[6] and 15 percent in one New York county* so equipped. ROPS became available in the 1960s, but did not become standard equipment on many tractor models until the late 1970s and early 1980s. In 1985, manufacturers voluntarily agreed to make them standard equipment on all new tractors.

Various proposals have been made to make ROPS mandatory in the US.[4,8] This study analyzes the National Coalition for Agricultural Safety and Health (NCASH) proposal to offer farmers retrofit incentives for five years and require ROPS on all tractors after 10 years. The potential economic cost per life saved from such a policy in New York is estimated using cost-effectiveness analysis, a common approach to appraising public health policies.[9–15] The cost shifting effects of incentives are not addressed in this analysis because of the study's economic (as opposed to financial) focus.

Methods

There are few available data on the age distribution of tractors currently on US farms or their ROPS status. The magnitude of the effect of ROPS in reducing the number and severity of non-fatal injuries is uncertain, especially when the operator is not wearing a seat belt, although anecdotal evidence suggests almost all deaths are prevented.

For this study the potential number of tractors which would be retrofitted in New York State was estimated by interpolating from US Census of Agriculture, Farm and Industrial Equipment Institute, and Pennsylvania tractor data, using the 4 percent retirement rate implied by data in the Census of Agriculture. There are no available data about the percentage of tractors of different ages in New York without ROPS, so the results of a survey in Pennsylvania by Huizinga and Murphy[6] had to be used. The geography, agricultural production, and economic situation of farmers in Pennsylvania and New York are roughly similar, making their data a relatively good approximation for tractors in New York. A total of 59,873 tractors would need to be retrofitted according to these calculations. It was assumed that all tractors covered by the 10-year requirement would be retrofitted during the first five years of the program, when the incentives are in effect (see Figure 1).

An average of nine people a year die from tractor roll-overs in New York State.** The number of deaths which would be averted by the retrofit policy was estimated by combining this with the current percentage of tractors without ROPS and the estimated pace of retrofits, under

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*Unpublished study of Otsego County, New York. Cooperstown, New York: New York Center for Agricultural Medicine and Health.

**Unpublished data on New York agriculturally related accidents. Cooperstown, NY: New York Center for Agricultural Medicine and Health.

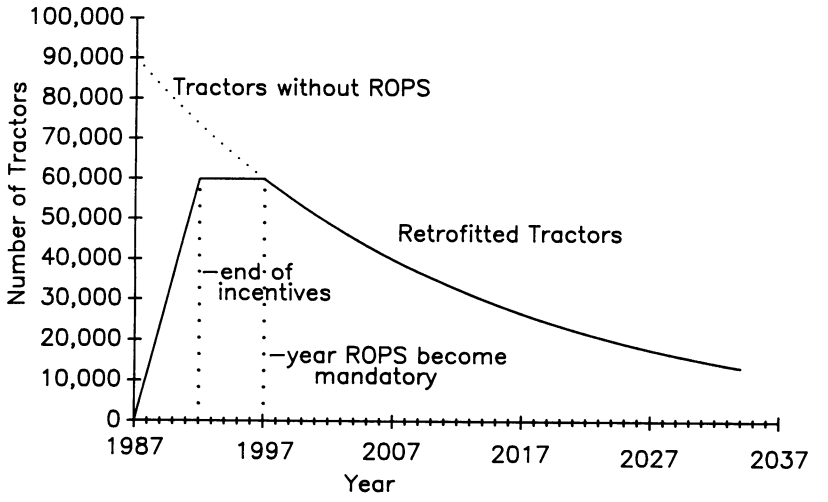

FIGURE 1—Estimated Number of Tractors Originally Manufactured Without ROPS Operating in New York if ROPS Became Mandatory on all New Tractors

TABLE 1—Cost Per Life Saved

Life-Saving Effectiveness of ROPS	Cost Per Life Saved* For ROPS	Cost Per Life Saved* For Every $1 Million Spent Annually on Enforcement
75 Percent	$684,729	$337,672
100 Percent	$511,136	$253,254

*Discount rate = 5 percent

two alternative assumptions about the life-saving effectiveness of ROPS; 100 percent and 75 percent.

The costs of such a policy would include enforcement, as well as purchase and installation of the ROPS. Without enforcement there is no guarantee that all tractors will be retrofitted or that retrofitted ROPS will not later be removed. In Pennsylvania, 38 percent of the tractors manufactured since 1986 do not have ROPS, even though beginning that year tractors without ROPS were sold only under special circumstances. This occurred in part because farmers removed the ROPS after purchasing the tractor.[6] The reasons for removals have not been comprehensively studied, although the inability to operate a ROPS equipped tractor in buildings with low ceilings is a common explanation. The costs of enforcement can be significant, but because the NCASH proposal lacks an enforcement plan such costs will not be directly integrated into the analysis.

The specific cost of retrofitting tractors was determined by calling five ROPS manufacturers and wholesalers, including John Deere, Inc, and Ford/New Holland. The contacts indicated that increased sales would not affect most prices. The average uninstalled retail price reported for most ROPS was $632, which means the average final per unit cost will be approximately $700 with installation. The present value of all the retrofits was calculated assuming that the retrofits occur evenly throughout the five-year incentive period. Both costs and the lives saved were discounted with a 5 percent discount rate.

Results

A policy mandating ROPS in 10 years requiring any tractor in New York to have ROPS to be operated and providing economic incentives for retrofits during the first five years of the program could have a total ROPS cost of approximately $36.3 million. The present value of lives saved would be 53 or 71, depending upon the life-saving effectiveness of ROPS. The costs per life saved under the different scenarios are in Table 1. If perfect compliance does not occur and fewer lives are saved, the enforcement cost per life saved would be higher.

Discussion

These estimates of cost do not include consideration of the effectiveness and cost of enforcement. In addition, the model of tractor retirements biases the number of lives saved upwards. Another upward bias in estimation of the lives saved is that we could not include the natural reduction in farmers' exposure to risk over the years as tractors are slowly shifted from field work to more stationary roles and their hours of use decrease. Finally, non-pecuniary aspects of requiring ROPS retrofits are not included in these estimates.

Based on the projected cost without enforcement, ROPS would be similar to other life-saving interventions, but the need for enforcement could drastically increase cost. One reviewer found costs less than $1 million for auto safety standards and greater than or equal to $3 million for most efforts to regulate toxic substances.[16] Graham and Vaupel reviewed 35 studies of life-saving programs, and found the cost per life saved ranged from no cost for compulsory seat belt use, $60,000 for mandatory smoke detectors, $255,000 for the 1966 Motor Vehicle Safety Act, $408,000 for mandatory air bags, and $1,200,000 for the 55 mph speed limit, to over $3,500,000 for policies regarding toxic substances.[17]

Mandating ROPS retrofits is worth considering because of its life-saving impact, but enforcement must be directly and carefully debated because the policy impact will depend so much upon it and because enforcement could easily be the largest expense. In any event, a retrofit policy will not be cheap. □

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The Use of Direct Mail to Increase Clinician Knowledge: An Intervention Study

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ABSTRACT

A probability sample of American general practitioner dentists, 40 years of age or older, in solo private practice, was the target of two direct mail interventions offered at two different times, to test whether knowledge regarding prophylaxis of patients at risk for infective endocarditis could be improved. Tests of knowledge were responses in a mail questionnaire to clinical vignettes, designed to elicit the content of antibiotic regimens used for patients at risk. The research design enabled detection of (1) the effect of the interventions; (2) the differences in their effect; (3) the attenuation of their effect; and (4) the effect of time. Where baseline knowledge was low, it was improved and did not rapidly disappear. Both mail interventions were equally effective, in most instances, and there was no attenuation of the interventions' effect and no effect of time on the control groups' knowledge over a 4½ month period. The results suggest that it is possible to improve clinicians' knowledge of expert recommendations through direct mail intervention. (*Am J Public Health.* 1991;81:923–925)

Introduction

Direct mail has been used relatively infrequently, except by the pharmaceutical industry, to "market" ideas to clinicians. The results of several studies[1–7] testing the efficacy of mailed information in improving clinicians' knowledge are equivocal. Moreover, the effects of these efforts are often difficult or impossible to discern because of the absence of a sound experimental design.

Since the mid-1950s, the American Heart Association (AHA) has been trying to inform physicians and dentists about the details of a variety of antibiotic regimens that have been determined to be efficacious in the prevention of infective endocarditis, depending on the risk factor and the procedure to be performed. As the state of the art has changed, these AHA recommendations have been revised.[8–13] Dentists have been a target group for this AHA program because any procedure that produces mucosal bleeding may produce a transient bacteremia which, in turn, may seed a heart valve previously scarred by, for example, rheumatic heart disease. The ultimate sequela of this series of events may be infective endocarditis.

Our project had four aims: (1) to determine whether simple inexpensive mail interventions could be designed to improve the knowledge of dental general practitioners (GPs) about the management of patients at risk for infective endocarditis; (2) to design two interventions, one with a theoretical component and one without it, to determine whether the additional material would have an additional effect; (3) to determine whether the effects of the interventions, if any, would be maintained over time; and (4) to determine whether clinicians' knowledge would change over time, independent of the planned interventions.

Methods

After a probability sample of 1148 dentists, classified as GPs, 40 years or older, in private practice within the continental United States, was drawn from

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