

Policy proposal:

**TO MAINTAIN A VALID DRIVER'S
LICENSE, ALL INDIVIDUALS AGE 65 AND
OVER SHOULD COMPLETE BIENNIAL
COGNITIVE ASSESSMENTS.**

“Con” Argument

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Prevalence of impaired driving

- Older adults have relatively low rates of driving accidents, including in the mild stages of dementia.
- Rule is costly to implement and not proportionate with relatively mild risk of accidents in 65+ population.
- Risk of taking away driving privilege for those not at high risk of accidents

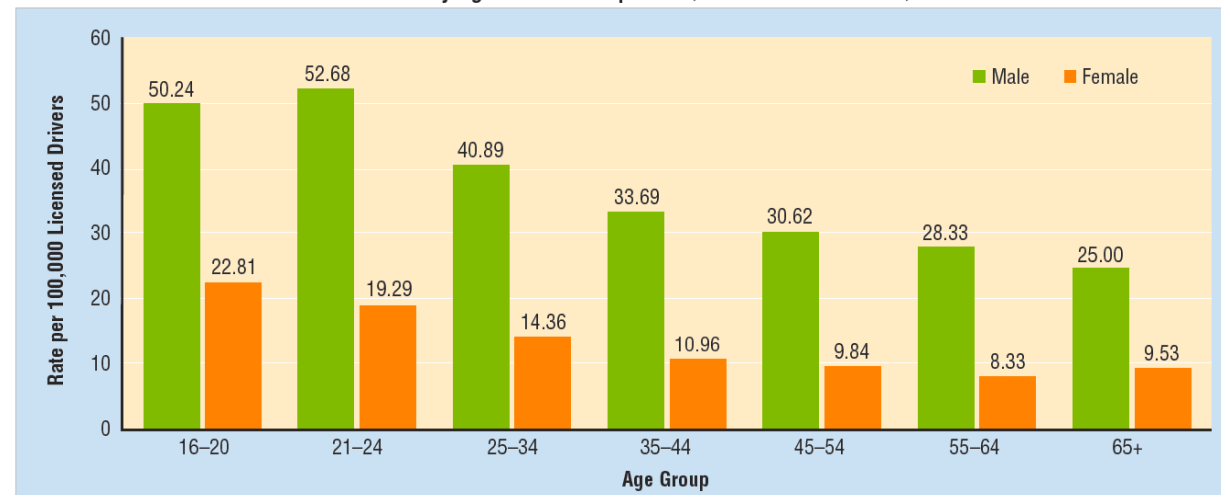
medical conditions reviewed by DMV & medical board due to risks related to driving

- Alzheimer's Disease
- Severe Arthritis
- Sleep Apnea
- Stroke
- Vision Disorders
- Diabetes
- Parkinson's Disease

www.nhtsa.gov/national-center-statistics-and-analysis-ncsa/crash-report-sampling-system-crss

Figure 2

Driver Involvement Rates in Fatal Crashes by Age and Gender per 100,000 Licensed Drivers, 2016



Source: FARS 2016 ARF.
Licensed Drivers: Federal Highway Administration.

Lowest rate of fatal accidents is among drivers age 65+ (lower than other groups on a per driver basis)

Highest rate of Fatal accidents is drivers 80-84 (**NHTSA 2018**)

National Highway Traffic Safety Administration Fact Sheet on Older Adults:

Look in the slide notes below for topics to consider talking about

~ 65+ = 19% of all drivers (2016)

~ 65+ = 30% of USA population

~ 65+ = 49.2 million and growing because of baby boomer population (**NHTSA 2018**)

Dementia Prevalence Ranges from 6.3% in Japanese Americans to 12.9% in Caribbean Hispanic (**Mehta et al 2017**)

Errors & misuse of Epidemiologic methods

Odds Ratios and Relevance Ratios are not valid methods to confirm Diagnostic tests

True positive Fraction and False positive fraction Association vs Classification to detect power of diagnostic power

Low mile bias and more accidents in general

Measurement of accidents per mile driven is inaccurate because older adults drive very few miles so their accident per mile driven fatality rate is artificially inflated due to low mile bias. **(Langford 2008)**

Drivers 80-85 are at most risk of killing themselves behind the wheel while teenage drivers more likely to kill other young people and pedestrians . **(Tefft 2014)**.

Though fatal crashes are more common among drivers age 65+, this is a reflection of the higher risks of accidents to frail elderly drivers, not greater seriousness of traffic accidents involving older adults.

(Regev S et al.)

Cognitive dysfunction too low to merit such strict surveillance

The degree of cognitive dysfunction among older adults (especially those under 70) is too low to merit such rigorous surveillance: **Mehta KM et al**, "Rates for all dementias increased for each subsequent 5-year age cohort from 0.8 for those aged 65–69 years to 74.3 years for those aged 95 and over, and were higher for women than men"

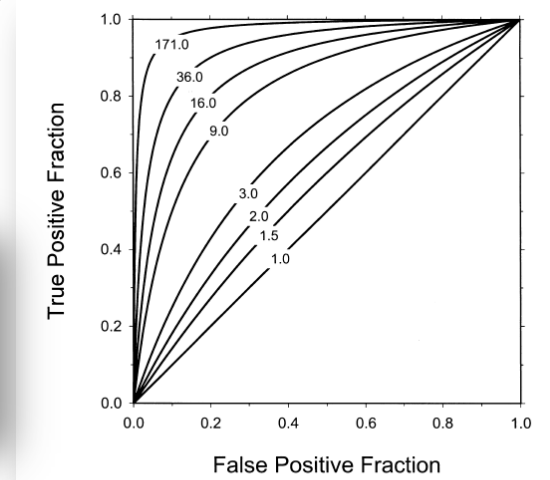
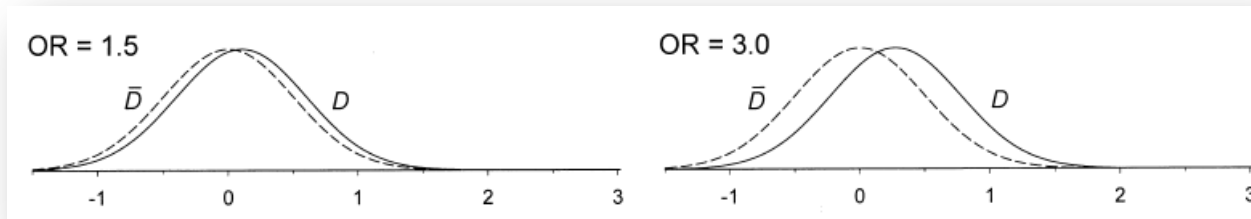
(Breen DA et al 2007): "The three year rule, which broadly states that with regular review the risk of crashes in patients with Alzheimer's disease is acceptably low for up to three years after the disease becomes clinically apparent, has been proposed as a means of guiding relicensing policy."

[illegible]

Limitations of cognitive tests

No measure is reliably predictive of driver safety/traffic collisions

- Meta-analysis (>80): pooled effect size of **1.94**



- Maze task in an enriched population (known MCI or early dementia; 70% failed driving task) – **odds ratio 3.1**
 - 1 in 10 stripped of driving privileges unfairly
 - Missed 1 in 5 who were unsafe
- Systematic review in dementia patients: **Single tests and batteries lack ability to discriminate sufficiently** between safe and unsafe drivers.

Vanlaar W et al. A meta-analysis of cognitive screening tools for drivers aged 80 and over. Traffic Injury Research Foundation, Ottawa, ON; 2013

Figures: Pepe MS et al. Limitations of the odds ratio in gauging the performance of a diagnostic, prognostic, or screening marker. Am J Epidemiol; 2003.

Snellgrove CA. Cognitive screening for the safe driving competence of older people with mild cognitive impairment or early dementia. Australian Transport Safety Bureau, 2005.

Bennett JM et al. Cognitive tests and determining fitness to drive in dementia: A systematic review. JAGS; 2016.

There is poor evidence for individual tests which claim efficacy

Of a 9-test cognitive battery, only a Knowledge of Road Signs test improved prediction (OR 1.11)

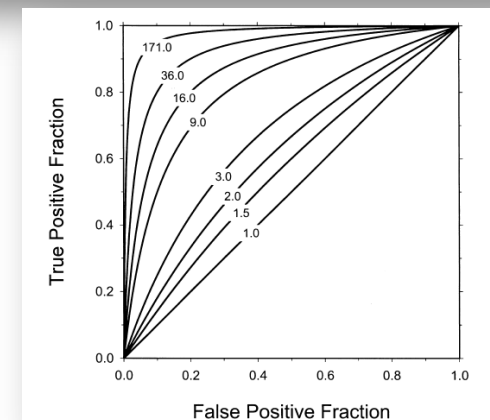
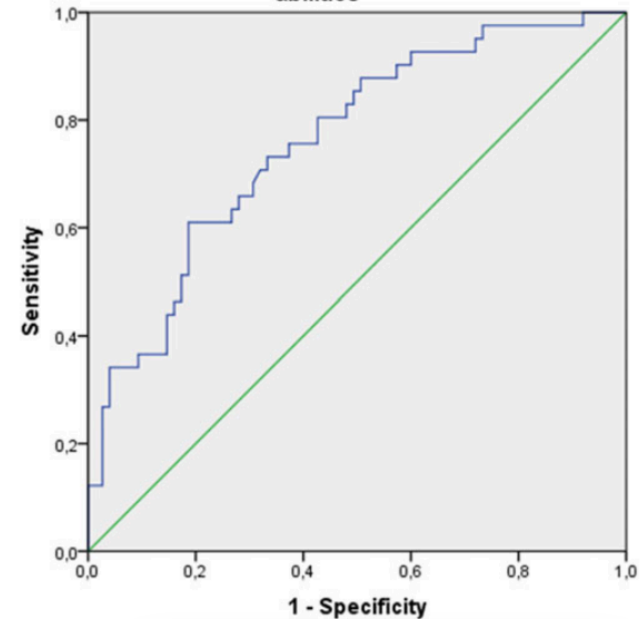
- >70 with self- or caregiver cognitive complaint, only 65% fit to drive
- Recommended battery (including functional reach test and visual acuity): 70% of participants correctly classified
- “Our results plead against a mandatory age-based screening of older drivers”

3-year prospective study of 2000 >70s using MMSE decline:

RR for MMSE<24 was 2.33

RR for MMSE decline was 1.64

ROC curves with predicted values from logistic regression model of functional abilities



Urlings JHJ et al. Aiding medical professionals in fitness-to-drive screenings for elderly drivers: development of an office-based screening tool. *International Psychogeriatrics*; 2018.

Huisingh C et al. General cognitive impairment as a risk factor for motor vehicle collision involvement: A prospective population-based study. *Geriatrics*; 2018.

Cognitive test scores impacted by...

Prospective study of 3-year accident rates in 2000 >70s with MMSE:

- RR for crash if MMSE<24 (“impaired”) was 2.33
- 46% of “impaired” participants were nonwhite (compared with 17% of “non-impaired”)
- After adjustment for race, education, and other confounders: OR 1.3-1.6 (and NS).

Literacy

- Systematic review and meta-analysis
- Tests are inadequately validated; no screening test can be recommended [in illiterate/low-educated older adults]¹

Race/ethnicity

- MMSE scoring affected by preferred language²
- IQCODE affected by race (does not identify CIND in Af-Am)³

Education

- MMSE performance affected by lower education levels^{2,4,5}
- Discrepancies persisted after years-of-education adjustment (poor quality of education years in minority populations)⁶

Income

- MMSE performance affected by lower income levels⁴
- MMSE affected by neighborhood of residence⁵

Huisingsh C et al. General cognitive impairment as a risk factor for motor vehicle collision involvement: A prospective population-based study. *Geriatrics*; 2018.

1. **Paddick SM et al.** Cognitive screening tools for identification of dementia in illiterate and low-educated older adults, a systematic review and meta-analysis. *Int Psychogeriatr*; 2017.
2. **Matallana D et al.** The relationship between education level and mini-mental state examination domains among older Mexican Americans. *J Geriatr Psychiatry Neurol*; 2011.
3. **Potter GG et al.** Cognitive performance and informant reports in the diagnosis of cognitive impairment and dementia in African Americans and whites. *Alzheimers Dement*; 2009.
4. **Ortiz IE et al.** Comparison of cultural bias in two cognitive screening instruments in elderly Hispanic patients in New Mexico. *Am J Geriatr Psychiatry*; 1997.
5. **Espino DV et al.** Ethnic differences in MMSE scores: where you live makes a difference. *J Am Geriatr Soc*; 2001.
6. **Manly JJ et al.** Cognitive test performance among nondemented elderly African Americans and whites. *Neurology*; 1998.

Summary of findings

- **Weak associations** with dangerous driving undermine utility of tests for risk stratification
 - Leading to enormous **collateral damage** from false negatives and false positives
- Proving a cognitive test won't unfairly discriminate against a vulnerable population will be an **impossible task**
 - Extensive biases demonstrated throughout the spectrum of cognitive tests
 - Screening would **disadvantage vulnerable older adults** solely on the basis of literacy, race/ethnicity, education, income, etc

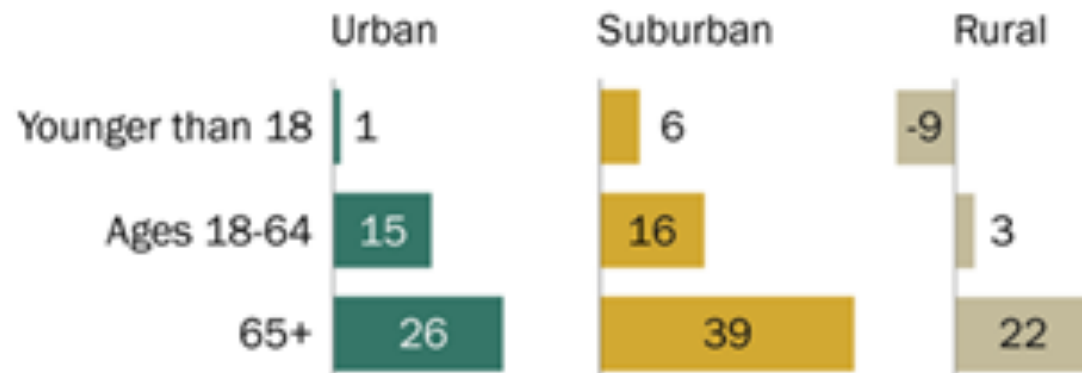
Impact on the elderly

Impact of Driving Cessation

- Driving cessation reduces social engagement levels
- Among Medicare beneficiaries surveyed in 2011 and again in 2013, those who had stopped driving vs. those who maintained their driving frequency showed:
 - 39% lower odds of visiting friends/family,
 - 24% lower odds of going out for enjoyment,
 - 40% lower odds of attending religious services, and
 - 46% lower odds of participating in organized activities
- The transition to driving cessation has been associated with significant decline in physical and social functioning, physical performance and physical role.

Suburban counties are graying more rapidly than other types

% change in age group since 2000 by county type



- >75% of older adults (65+) are expected to live in rural or suburban areas in the next decade

From the elderly perspective ...

- Independence – the capacity to do (or not do) something without depending on the kindness or support of others

"not driving ... you become a prisoner. I have to depend on other people"

"you can't always find someone to help you... even if you ask, you may not get what you want"

- Freedom – the ability to do something or go somewhere without constraint

"I don't feel in complete control"

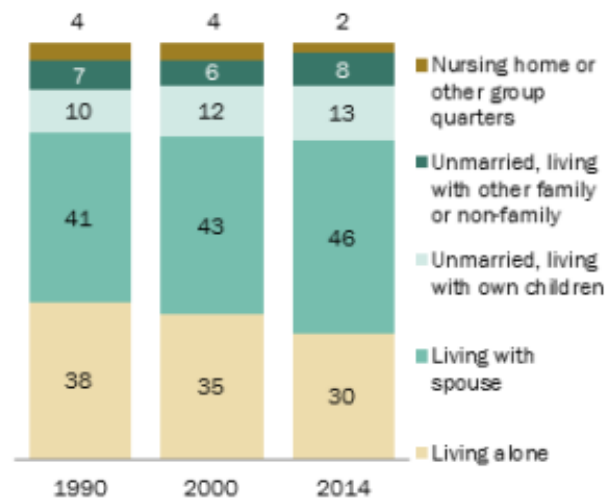
"world had been reduced to one square mile"

Transportation Alternatives

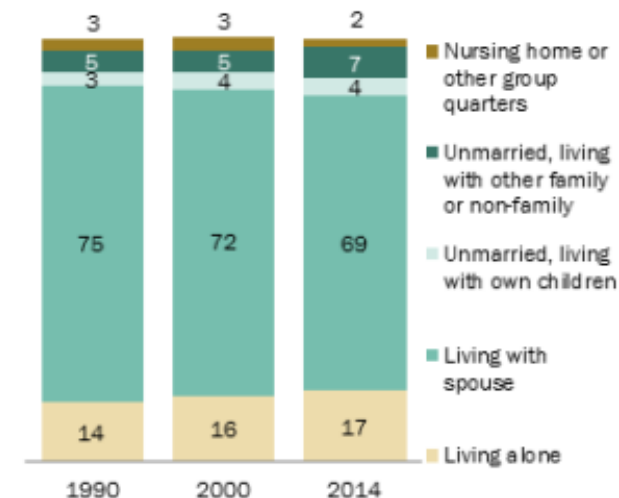
- Riding with family and friends

According to the American Psychological Association, 26% of older adults 65+ lived alone in 2014

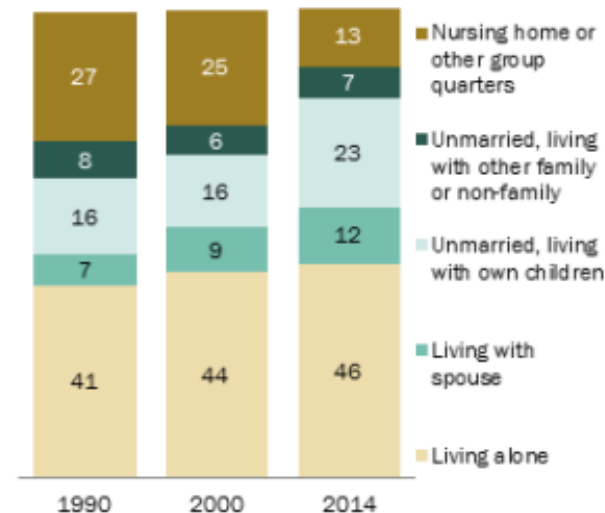
% among women ages 65 to 84



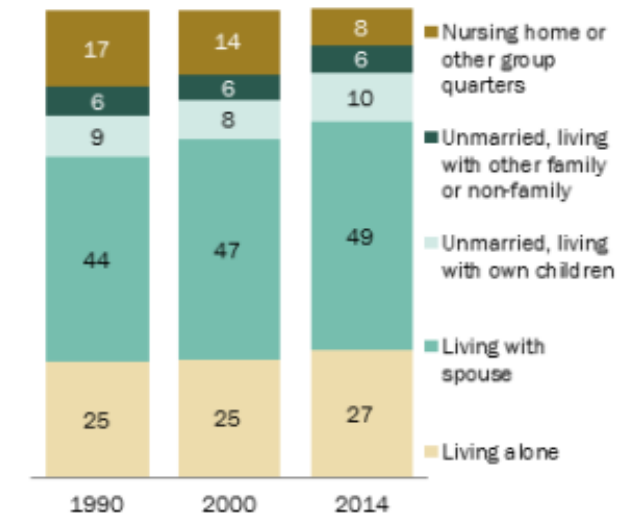
% among men ages 65 to 84



% among women ages 85 and older



% among men ages 85 and older



Transportation Alternatives

- Private Transportation
 - senior-oriented shuttle services
 - Uber/Lyft

Require financial resources and a certain level of technological comfort/literacy



Transportation Alternatives

- Paratransit
 - 1990 Americans w/ Disabilities Act: “public transit operators must provide demand-responsive door-to-door services to people with disabilities who cannot use or get to conventional bus services”

Limited to people living within 1.5 miles of a bus line

Access & Hours of Operation

Eligibility Restrictions



(Center for Transportation Studies and Age Lab,
2001)

Real World Outcomes

How well does age-related screening of drivers (and associated restrictions) actually improve safety?

Only regulations associated with lower crash fatality rates:^{1,2}

1) Vision testing 2) requiring in-person renewal

Protective effect only seen among drivers **age ≥ 85**

Grabowski DC (2004):

- Retrospective, longitudinal study (1990-2000) of all fatal crashes in the continental United States involving either an older (65-85 yrs) or middle-aged (25-64 yrs) driver.
- Using regression analysis, studied effect of state mandates of in-person renewal, vision tests, road tests, and frequency of license renewal on driver fatalities, controlling for state-level factors.

Tefft BC (2014):

- Used data from 46 U.S. states (yrs 1986–2011), associating driver licensing policies and population-based fatal crash involvement rates of drivers aged 55 years and older, in 5-year age groups.
- Estimated effects using population-averaged binomial regression, adjusted for seasonality, time trends, other traffic safety laws, and economic factors.

1. Tefft, B. C. (2014). Driver license renewal policies and fatal crash involvement rates of older drivers, United States, 1986–2011. *Injury epidemiology*, 1(1), 25.
2. Grabowski, D. C., Campbell, C. M., & Morrissey, M. A. (2004). Elderly licensure laws and motor vehicle fatalities. *Jama*, 291(23), 2840-2846.

How well does age-related screening of drivers (and associated restrictions) actually improve safety?

Calif. pilot study¹ of 3-tier set of tests of vision, cognitive function (tier 1: memory recall task, tier 2: Perceptual Response Test, a reaction time test), knowledge of road rules & road test:

- Resulted in increased de-licensure and restrictions, no reduction in traffic crashes vs. two post-hoc control populations among drivers ***age ≥ 70***

1. Camp, B. J. (2013). The overall program effects of California's 3-Tier Assessment System pilot on crashes and mobility among senior drivers. *Journal of safety research*, 47, 1-8.

Is there evidence to the contrary?

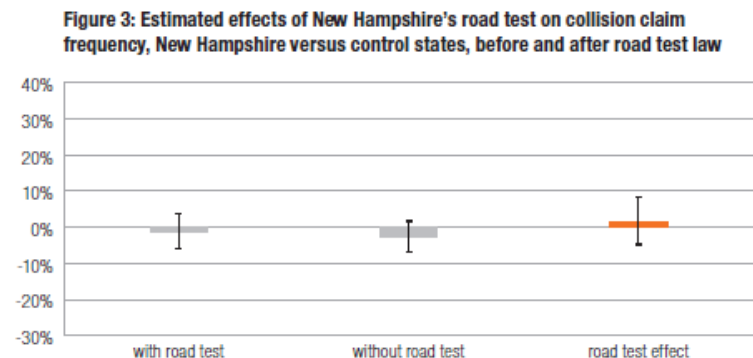
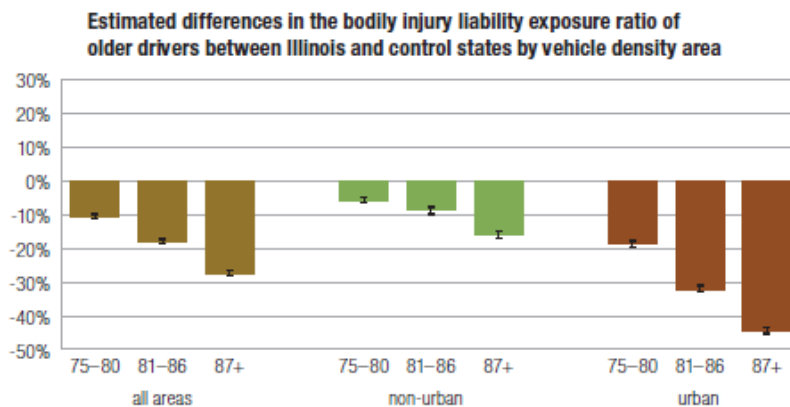
A little, but it's weak and only seen among drivers age ≥ 70

Sharp and Johnson (2005)¹

- Longitudinal analysis of data on crashes involving drivers in 15 states age ≥ 70
- Found: more stringent licensure requirements associated with fewer crashes among elderly drivers
- Methodological weaknesses: applied level of significance ($p < 0.5$ and $p < 0.1$) non-standard, and the study did not control for other possibly interfering factors on the state-level

Mandatory road tests in Illinois and New Hampshire (2016)^{2,3}

Insurance claim rates were lower for drivers age ≥ 75 in Illinois, compared with surrounding states without road test requirements. However, New Hampshire did not see the same benefit from the age ≥ 75 road test requirement in effect until 2011.



1. Sharp, E. B., & Johnson, P. E. (2005). Taking the keys from grandpa. Review of Policy Research, 22(2), 187-204.
2. Highway Loss Data Institute. 2016. Illinois mandatory on-road driving test for older drivers. *HLDI Bulletin*, 33(20).
3. Highway Loss Data Institute. 2016. New Hampshire mandatory on-road driving test for older drivers. *HLDI Bulletin*, 33(36).

No Help, and Possibly Harm ...

A Danish Natural Experiment:¹

- In Denmark license renewal, including a compulsory physical, is required at frequent intervals starting at age 70
- In 2006 the country began requiring the m-MMSE and clock-drawing test be done as part of this required physical

Number of drivers involved in fatal accidents*

	Pre-Cog Testing Rate	Rate Afterwards
Age 18-69	19.31	20.50
Age 70+	12.6	13.37

Number of unprotected road users killed*

	Pre-Cog Testing Rate	Rate Afterwards
Age 18-69	19.31	20.50
Age 70+	12.6	13.37

* Per 100,000 people

“Screening programmes for older drivers are an example of a political measure that seems to make sense, but that fails to produce the desired benefits. On the contrary, on a traffic systems level, this measure decreases overall safety and is connected to various direct and indirect costs.”

1. Siren, A., & Meng, A. (2012). Cognitive screening of older drivers does not produce safety benefits. *Accident Analysis & Prevention*, 45, 634-638.

Other International Studies, Similarly Found...

Comparison of outcomes of (loose) **Swedish** and (stringent) **Finnish** policies on screening showed harm from additional screening for older drivers **age 70+**:¹

Analysis found:

- Lower licensing rate for persons age 70 years or older: 44.2% in Sweden, 14.6% in Finland
- Fatality rates of older drivers and passengers: OR slightly greater than 1, indicating slightly greater risk in Finland
- Fatality rates of unprotected road users:
30-49, OR = ~1, older groups OR >2
≥ 65 OR = 2.46 for males
2.27 for females)

Similar study in **Australia** looking at different policies: Victoria (where there is no age-related restrictions or requirements) vs. other states:²

Analysis found:

- Higher proportion of pp **age 80+** had driver's license, 36.7% vs. 33% to 23.5%
- Per license, rates of fatal/serious injury crashes among people **age 80+** lower in Victoria, after correction for general traffic safety in each state

1. Hakamies-Blomqvist, L., Johansson, K., & Lundberg, C. (1996). Medical screening of older drivers as a traffic safety measure—a comparative Finnish-Swedish evaluation study. *Journal of the American Geriatrics Society*, 44(6), 650-653.

2. Langford, J., Fitzharris, M., Newstead, S., & Koppel, S. (2004). Some consequences of different older driver licensing procedures in Australia. *Accident Analysis & Prevention*, 36(6), 993-1001.

Summary

- Age-related policies regarding licensure do not appear to reduce crashes nor their consequences (injury and fatality) and may have paradoxical effects.
- The preponderance (if not all the research) in this domain has looked at people older than age 65-70, who are more likely to have cognitive disturbances and health-related driving deficits.