



Combining Axon Registry and IRIS Registry Data to Compare VA Between People with Neuromyelitis Optica and Multiple Sclerosis

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Financial Disclosure

I have the following financial interests or relationships to disclose:

2020 Therapeutics: Consultant/Advisor

Department of Defense: Grant Support

National Eye Institute: Grant Support

Research to Prevent Blindness: Grant Support

Verana Health: Consultant/Advisor



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Disclosures

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H. Moss is a medical advisor to Verana Health

L. Wiener, C. Rizy, S. Baxi & A. Torres are employees of Verana Health



Vision is an important outcome in MS & NMO

Learnings from past prospective and academic based retrospective studies:

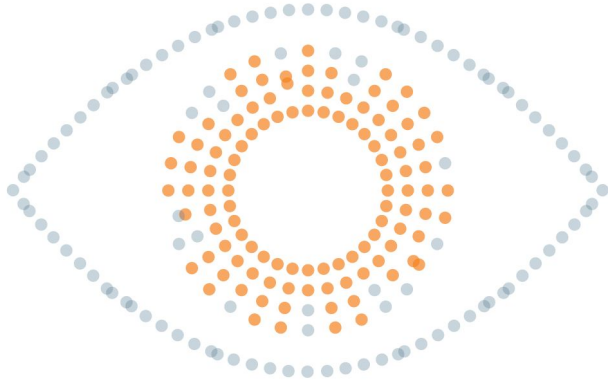
- Vision is the only functional system correlated with ALL Quality of Life subscales in MS patients (Rudick et al, Arch Neurol, 1992; Salter, Multiple Sclerosis 2013:19:953))
- In MS measures of visual system function and structure capture
 - Chronic neuro-degeneration (Talman, Ann Neurol, 2009; Gordon-Lipkin et al, 2007)
 - Acute neurological injury (eg. optic neuritis) (Costello, JNNP 2015)
 - MS diagnosis (Kenny et al, neurology 2022)
 - Treatment response (Button et al, neurology, 2017)
- Visual outcomes are worse in NMO than MS (neurology 2009, 73: 302-8; Ophthalmology, 2019: 126:44)

The selection bias of prospective and academic center retrospective studies may not accurately capture real world outcomes (Taipale, JAMA Psych 2022: 79)

Are their real world differences in visual outcomes between MS and NMO?



Vision is an important outcome in MS & NMO



- Vision is the only functional system correlated with **all** quality of life subscales in people with MS
- In MS measures of visual system function and structure are relevant to disease pathophysiology and clinical care
- Visual outcomes are worse in NMO than MS

Neurology 2009, 73: 302-8; Ophthalmology, 2019: 126:44; Rudick et al, Arch Neurol, 1992; Salter, Multiple Sclerosis 2013:19:953; Talman, Ann Neurol, 2009; Gordon-Lipkin et al, 2007; Kenny et al, neurology 2022; Costello, JNNP 2015; Button et al, neurology, 2017



Important Questions Remain

The selection bias of prospective and academic center retrospective studies may not accurately capture real-world outcomes.

| Are their real-world differences in visual outcomes between MS and NMO?



Real-world care of an MS patient



Neurology office

Diagnosis of MS/NMO

- Monitoring
- Neurological exam
- Vision

Treatment MS/NMO



Ophthalmology office

Diagnosis of MS/NMO

- Monitoring
- Neurological exam
- Vision

Treatment of MS/NMO



Objectives

To compare real-world visual acuity (VA) outcomes between people with MS and NMO by combining data from neurology and ophthalmology practice derived registries:



American Academy of Neurology Axon Registry®:
neurology specific patient registry de-identified
EHR data, 3 million unique patients

(Sigsbee Neurology 2016:87)



AMERICAN ACADEMY
OF OPHTHALMOLOGY®

American Academy of Ophthalmology IRIS®
Registry (Intelligent Research in Sight) :
ophthalmology specific patient registry
de-identified EHR data, 70 million unique patients

(Parke. Ophthalmology 2017: 114)

Verana Health has partnered with the AAN and AAO to assemble clinical data bases based on these registries.



Objectives

To compare real-world visual acuity (VA) outcomes between people with MS and NMO by combining data from registries:



Axon Registry®

- Neurology patient registry
- de-identified EHR data
- 3 million unique patients



IRIS® Registry

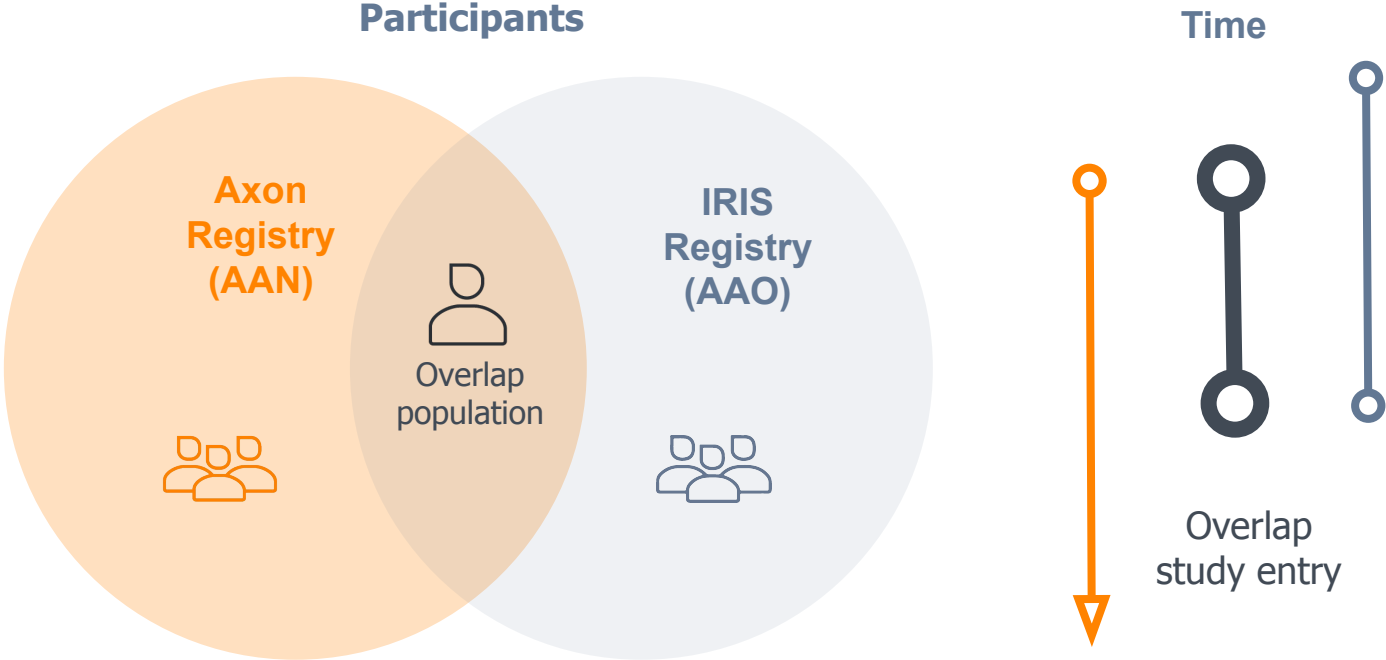
(Intelligent Research in Sight)

- Ophthalmology patient registry
- de-identified EHR data
- 70 million unique patients

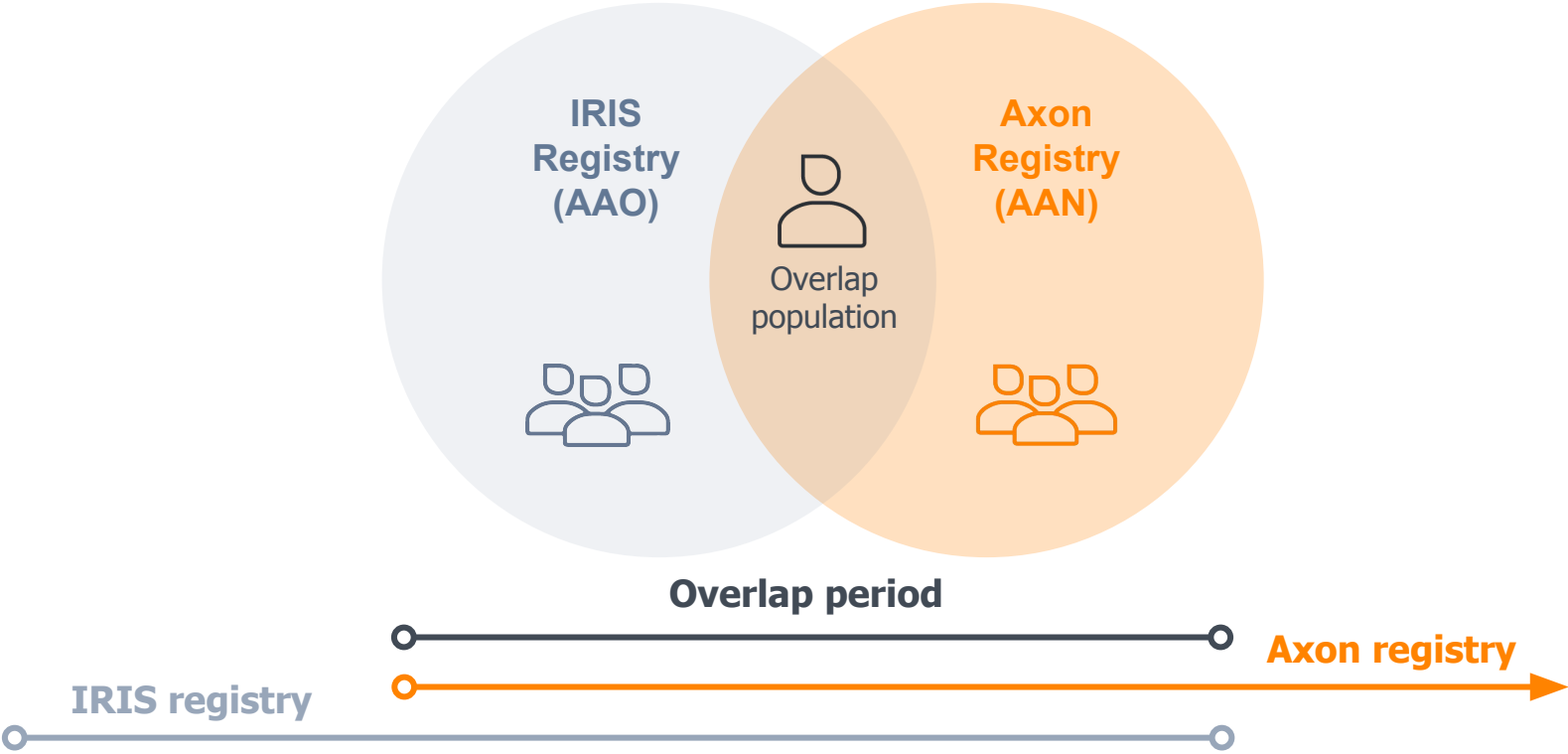
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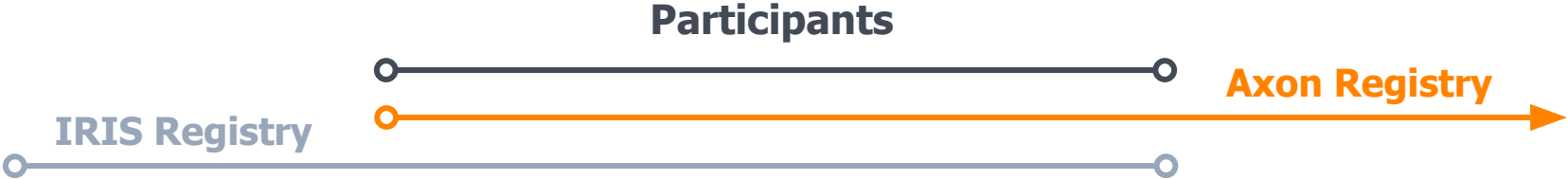
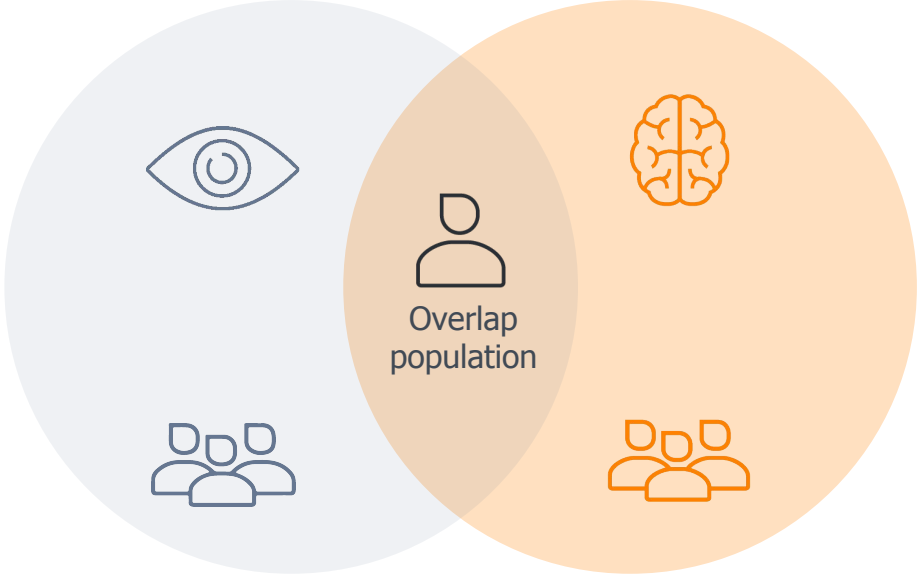
Defining Overlap between Axon and IRIS registries



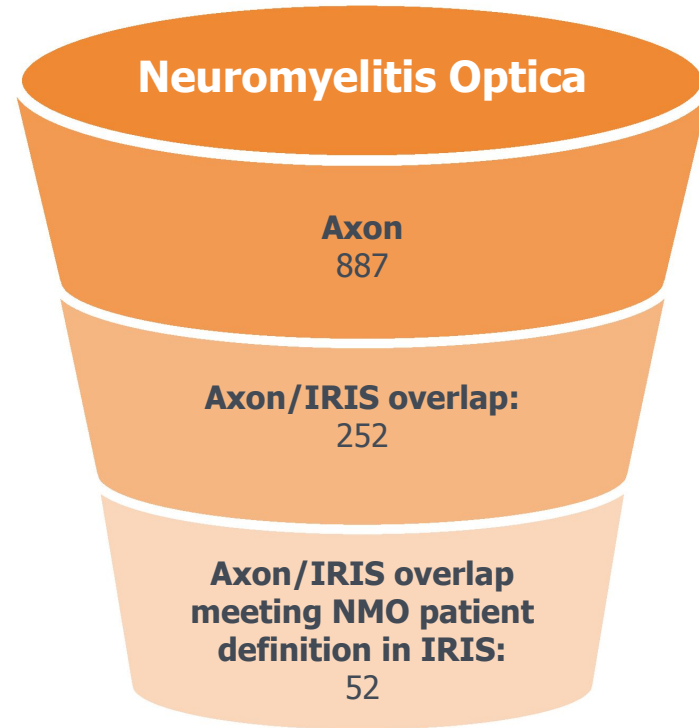
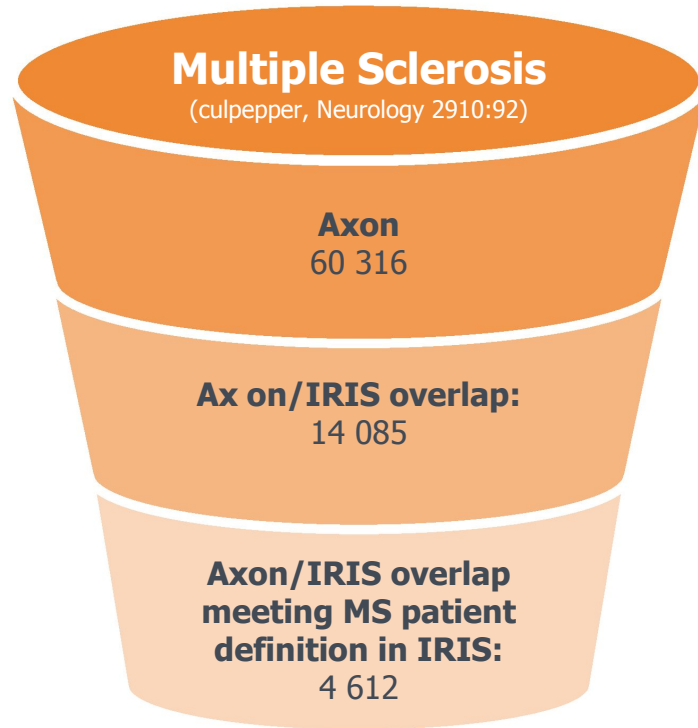
Defining Overlap between Axon and IRIS Registries



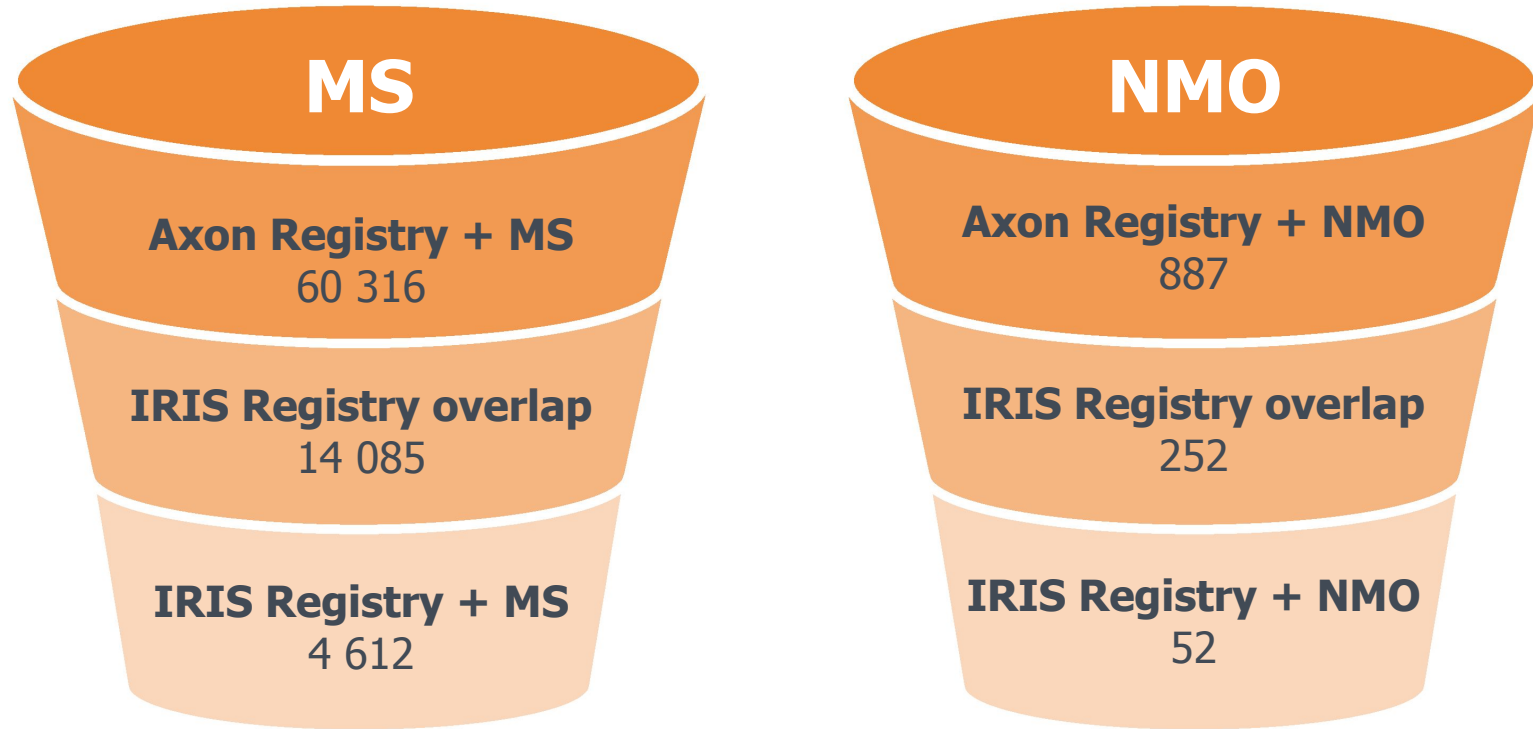
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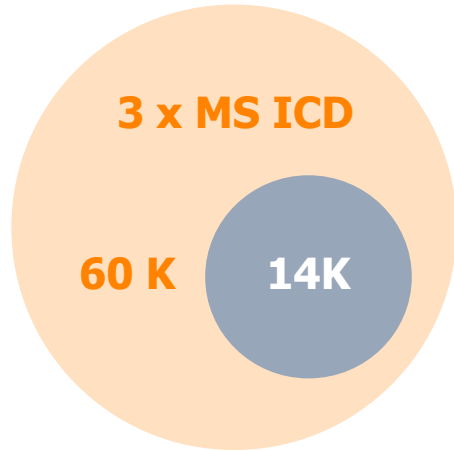
MS and NMO Patients in Axon and IRIS



MS and NMO Patients in the Axon Registry and IRIS Registry



There are demographic differences in Axon/IRIS overlap population



Distribution of MS patient demographics

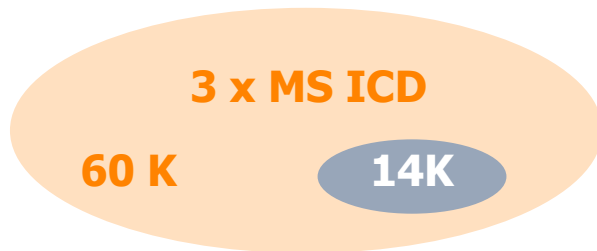
Variable	Axon only (46K)	Axon/Iris overlap (14K)	Comparison
Age (years)	48 +/- 13	54 +/- 13	P < 0.0005
Race (white)	67.7 %	74.8%	P < 0.0005
Ethnicity (hispanic)	4.9%	3.9%	P < 0.0005
Sex	74.4%	80.3%	P < 0.0005
Location	↑ South ↓ NE	↓ South ↑ NE	P < 0.0005

NMO patients also older in overlap vs. Axon only, though not different in race, ethnicity, sex or location



Demographics

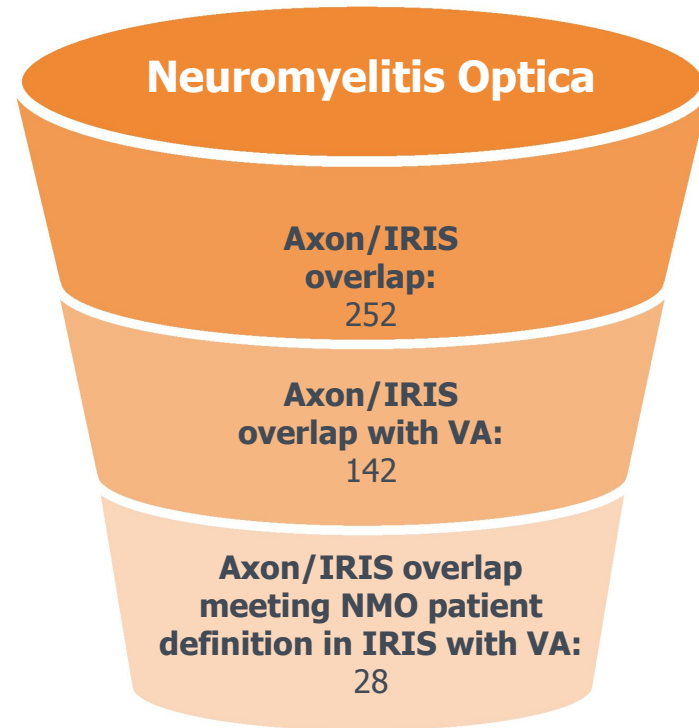
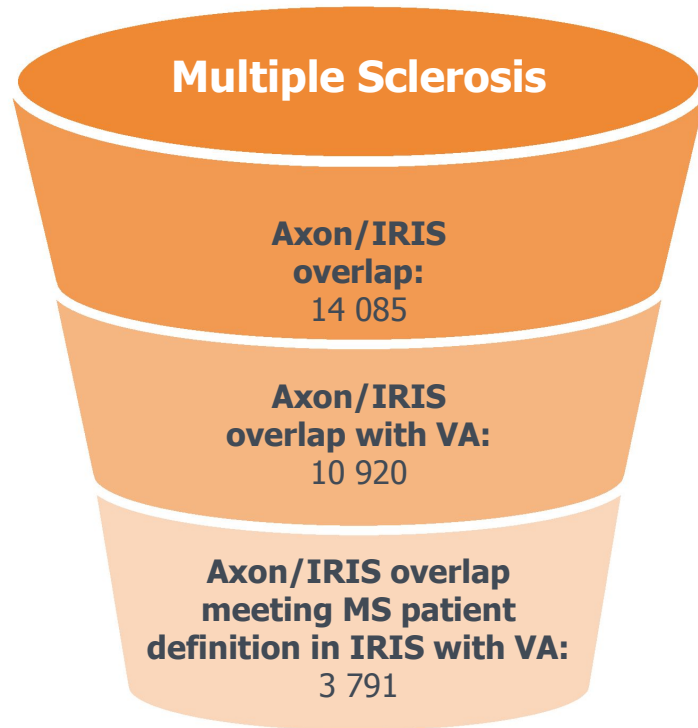
P<0.05 for all



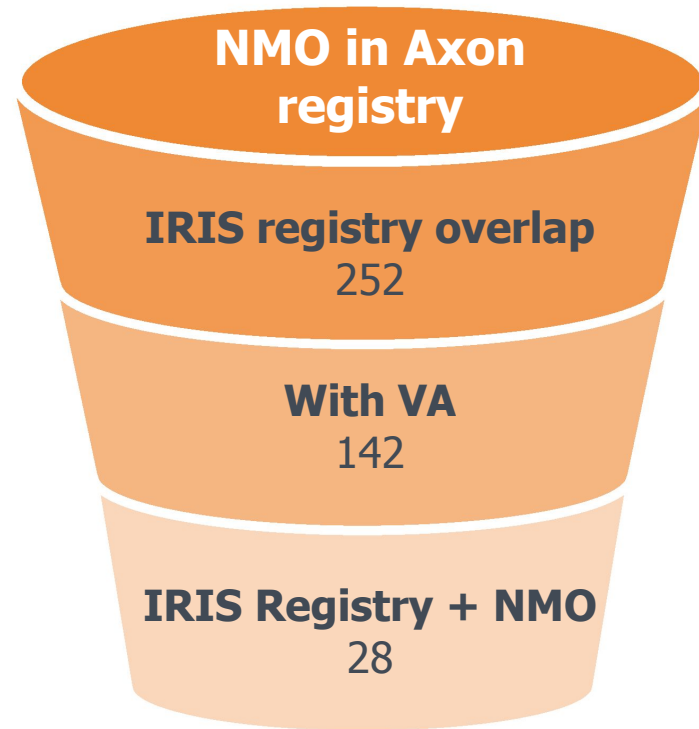
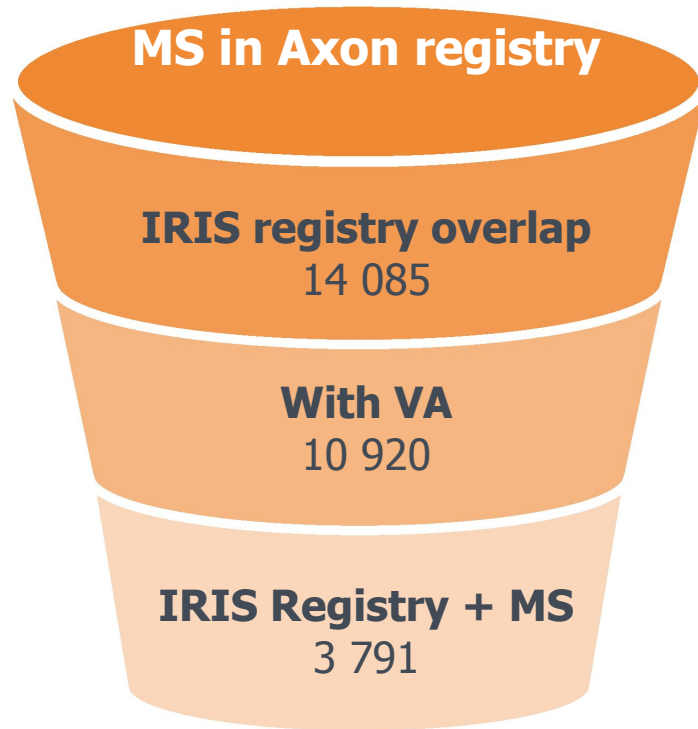
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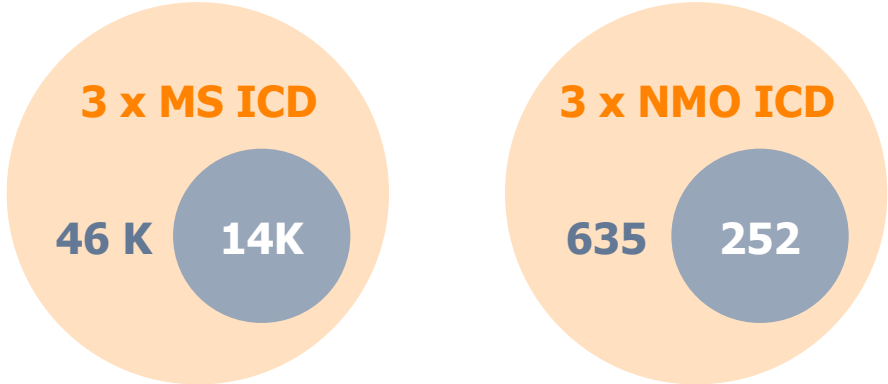
Visual acuity in MS and NMO patients (data availability)



Data Availability for Visual Acuity (VA)



Combining registry data captures visual outcomes (Axon participants with multiple sclerosis or NMO)



logMAR Visual Acuity (averaged between eyes), unadjusted comparison

	MS	NMO
VA available	10 920 (77%)	142 (61%)
VA (mean, 95% CI)	0.097 (0.0, 0.239)	0.176 (0.049, 0.398)

Adjusted comparison (age, gender): MS -0.17 (-0.12, -0.21) logMAR vs. NMO <0.0005
P < 0.0005 Mann Whitney



Combining registry data captures visual outcomes

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*Adjusted comparison (age, gender): MS -0.17 (-0.12, -0.21) logMAR vs. NMO <0.0005. P < 0.0005
Mann Whitney*



Conclusions

Combined registry analysis identifies more MS and NMO patients with VA than using an ophthalmology based registry alone

IRIS Registry captures expected visual outcome differences between MS and NMO patients

Combined registry analysis has potential to broaden the scope of real world outcomes studies



Conclusions

- Neurology-based registry identifies more MS and NMO patients than using an ophthalmology based registry alone
 - Sample size comparable to published single disease studies and exceeds comparison studies
 - Approach mitigates selection bias in prospective studies
- IRIS Registry captures expected visual outcome differences between MS and NMO patients
- Sets the stage to use combined registries to expand variables that can be captured to broaden the scope of real-world outcomes studies



Limitations



Neither registry
is a population
sample



Diagnosis based
on ICD codes



VA is often not
collected in a
standardized
fashion



Demographic data
is EHR derived with
missingness and
misclassification



Did not account
for ophthalmic
comorbidities

