

# Multiple Sclerosis in the Latino/Hispanic American

Lilyana Amezcua, MD  
Assistant Professor of Neurology  
Medical Director, MS Comprehensive Care and Research Center  
University of Southern California,  
Keck Medical School

## Disclosures

- Dr Amezcua has received honoraria for advisory boards from Acorda, Biogen, Questcor, and Novartis.
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# Hispanic Americans

## Objectives:

- Incidence/prevalence in US
- Clinical characteristics
- Asian features
- Migration's influence
- Vitamin D



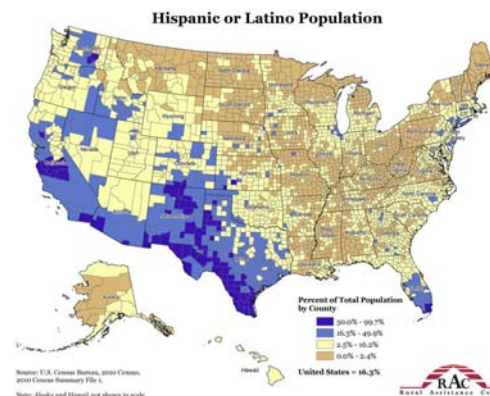
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# Hispanic Americans

- Based on the 2010 U.S. Census Survey
  - 16.3% of population
- Largest Hispanic groups:
  - Mexicans with 67%,
  - followed by Puerto Ricans almost 10%,
  - Cuban 3.5%
  - El Salvador, Dominican and Guatemala ( $\leq 3\%$ )

Projections: 29% by 2050



[www.census.gov/PressRelease/www/releases/archives/facts\\_for\\_features\\_special\\_editions/013984.html](http://www.census.gov/PressRelease/www/releases/archives/facts_for_features_special_editions/013984.html)

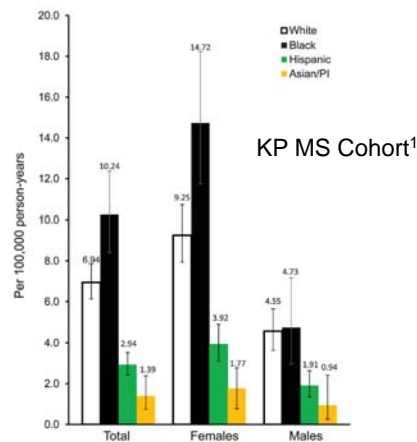
## Hispanics and MS

- Hispanic Whites (HW) are considered to be less susceptible to MS,
- recent reports suggests an increase in MS incidence and prevalence throughout Latin America<sup>1-3</sup>
- While environmental and genetic interactions are involved in MS
- **Race and ethnicity are likely to play a role in susceptibility and clinical outcome**

1. Rivera VM. Multiple sclerosis in Latin America: reality and challenge. *Neuroepidemiology* 2009; 32: 294–295. 2. Corona T, and Roman GC. Multiple sclerosis in Latin America. *Neuroepidemiology* 2006; 26: 1–3. 3. Gonzalez O and Sotelo J. Is the frequency of multiple sclerosis increasing in Mexico? *J Neurol Neurosurg Psychiatry* 1995; 59: 528–530.

## Racial and ethnic differences in the incidence of MS in US

Figure Incidence of multiple sclerosis (MS) by race/ethnicity and sex



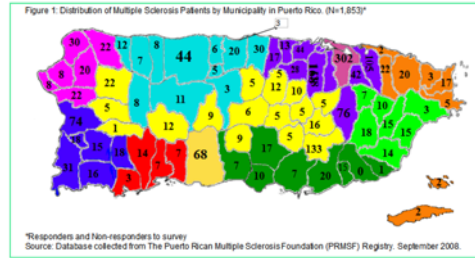
Golf Era MS Cohort:  
Blacks were highest at 12.1 (11.2–13.1), Whites at 9.3 (8.9–9.8) and others 6.9 (6.0–7.9).

\*For 83 Hispanics defined for 2000–07, the rate was 8.2 (interval 6.5–10.1).<sup>2</sup>

1. Langer-gould, A. et al. Incidence of multiple sclerosis in multiple racial and ethnic groups. *Neurology* 2013 May 7;80(19):1734–9.
2. Wallin, MT. et al The Gulf War era multiple sclerosis cohort: age and incidence rates by race, sex and service. *Brain*. 2012 Jun;135(Pt 6):1778–85.

## THE PUERTO RICO STUDY FOR THE PREVALENCE OF MULTIPLE SCLEROSIS-

- Puerto Rico is a Caribbean island with a population of 3,994,259 (2007)
- Health Survey 2003/2005, Puerto Rico (PR) has a crude MS prevalence rate of 52/100,000 inhabitants.<sup>1</sup>



1. PRMSF Epidemiological Study (2009); personal communication and Courtesy of Angel Chineia, MD

## Puerto Ricans with MS

Table 1: Differences by Gender in Certain Variables among Multiple Sclerosis Patients.

	Average Age of Men (by Years)	Average Age of Women (by Years)
Age of Onset	32	33
Age of Diagnosis	34	36
Interval between Onset and Diagnosis	10	8
Duration of MS	12	12

(N=698)

Source: Database collected from The Puerto Rican Multiple Sclerosis Foundation (PRMSF) Registry, Puerto Rico, 2008.

In line with what we would expect overall

1. Chineia, A, et al. The Puerto Rico study for the prevalence of multiple sclerosis. Bol Asoc Med P R. 2012 Sep-Dec;104(4):4-9. and PRMSF Epidemiological Study (2009); personal communication and Courtesy of Angel Chineia, MD

## Age of Onset in Hispanics appears to be younger than non-Hispanic white

Analyzed enrollment data from the Registry of the North American Research Committee on Multiple Sclerosis (NARCOMS) Project to compare 26,967 Caucasians, 715 Latinos, and 1,313 African Americans with MS

	Hispanics	AA	White
MS symptom	28.6 years	29.8 years	30.1 years
MS diagnosis	34.5 years	35.8 years	37.4 years

Buchanan, R. J., M. A. Zuniga, et al. (2010). Comparisons of Latinos, African Americans, and Caucasians with multiple sclerosis. *Ethn Dis* 20(4): 451-457.

6/8/2014

## Age of Onset of MS in Hispanics in Southern California

### USC's Hispanic Registry

	HW (n = 119)	NHW (n = 76)
Age at first symptom (mean ± se.) <sup>‡</sup>	28.5 ± 1.01	32.6 ± 1.15*
Age at first diagnosis (mean ± se.) <sup>‡</sup>	29.7 ± 0.98	32.9 ± 1.48 <sup>‡</sup>
Diagnostic lag (mean ± se.) <sup>‡</sup>	1.2 ± 0.26	0.3 ± 0.12*
Disease Duration (mean ± se.)	8.8 ± 0.75	11.4 ± 1.07*
Gender		
Female	69 (58.0%)	57 (75.0%)
Male	50 (42.0%)	19 (25.0%)
F:M	1.4:1	3.0:1*

### KP Multiethnic Cohort

	White (n = 258)	Hispanic (n = 116)	Black (n = 106)	Asian/PI (n = 13)	Total* (n = 496)	p Value
Age at diagnosis, y, mean (range)	44.5 (12.9-78.3)	35.1 (8.6-67.8)	41.7 (10.0-72.4)	40.3 (21.7-62.7)	41.6 (8.6-78.3)	<0.0001
Age at symptom onset, y, mean (range)	40.7 (11.2-70.6)	33.2 (8.5-65.3)	38.3 (9.4-71.8)	39.4 (20.9-61.4)	38.4 (8.5-71.8)	<0.0001

Reports from whites should not be generalized to Hispanic Americans

Amezcuca, L. et al. Multiple sclerosis in Hispanics: a study of clinical disease expression. *Multiple sclerosis*, 2011;17(8):1010-6.  
Langer-gould, A. Incidence of multiple sclerosis in multiple racial and ethnic groups. *Neurology* 2013 May 7;80(19):1734-9.

6/8/2014

## Age of Onset in Hispanics younger than non-Hispanic white

### University of Miami MS Registry

	HW (mean $\pm$ se.)	NHW (mean $\pm$ se.)
Age at onset (years)	33.42 $\pm$ 0.62	34.78 $\pm$ 0.61
Age at diagnosis (years)	37.83 $\pm$ 0.67	40.37 $\pm$ 0.62
Diagnostic lag (years)	4.31 $\pm$ 0.41	5.58 $\pm$ 0.48

■ HW (n=286) appear to be diagnosed earlier than NHW cases (n=276) after adjustment for age at exam (p=0.04).

Delgado, Silvy, et al. (2013). Comparison of Clinical Disease Expression of Multiple Sclerosis between Hispanics and non-Hispanics patients, poster at AAN 2013  
Courtesy of Dr. Delgado

6/8/2014

## Clinical Presentation:

**Mexico:** high frequency of optic neuritis as initial symptom (33% compared to historical 14-19% European)<sup>1</sup>

### Southern California<sup>2</sup>

Table 2. Distribution and odds ratio (OR) of symptoms at onset and disability pattern by race/ethnicity

Symptoms	Frequency (%)		Risk for HW compared with:-NHW	
	HW	NHW	OR	p-value
Optic Neuritis*	31.5	19.7	1.99	0.10
Sensory†	13.9	27.9	0.41	0.03
Motor†	13.0	14.7	0.86	0.74
Transverse Myelitis*	25.0	13.1	2.22	0.07
Other	16.7	18.0	0.94	0.82

\*70% Mexican

1. Cordova, J, et al. Western and Asian features of MS in Mexican Meztizos. Clin Neurol Neurosurg. 2007 Feb;109(2):146-51.
2. Amezcu, L. et al. Multiple sclerosis in Hispanics: a study of clinical disease expression. Multiple sclerosis. 2011;17(8):1010-6.

## South Florida\*- Hispanic Symptoms

Location of symptoms at onset	HW (%)	NHW (%)
Brainstem	16	14
Optic Neuritis	16	19
Long Tract Sensory	47	50
Long Tract Motor	21	19
Spinal Cord	32	27
Cognitive	3	2
Cerebellar	8	7

▪HW individuals and NHW initially present with similar symptoms.

▪Sensory deficits and spinal cord symptoms were the most common MS initial presentation in both groups.

\*49% Caribbean, followed 12% S. America

Delgado, Silveira, et al. (2013). Comparison of Clinical Disease Expression of Multiple Sclerosis between Hispanics and non-Hispanics patients, poster at AAN 2013  
-courtesy of Dr. Delgado

## MS in Latin America

- Preponderance of combined optic nerve and motor Deficits:

1. Colombia
2. Brazil
3. Cuba
4. Panama
5. Mexico

Studies: lack MRI and NMO antibody status

- 1: 12.4 MS/OSMS ratio

1. Luetic, G. MS in Latin America. Int MS J. 2008 15:6-11, 2. Correale, J. MS in Latin America. Int MS J. 2008 Editorial  
3. Gracia F. Prevalence and Incidence of Multiple Sclerosis in Panama (2000-2005). Neuroepidemiology 2009; 32:287-293.

# Admixture in Hispanics

## 1) Cultural Diversity:

## 2) Genetic Diversity:

- ancestrally linked Asian, African and Europeans<sup>1</sup>
- Mating pattern:

Most Hispanics descend from European men and Native American (Asian derived) or African women<sup>2</sup>

Perception: Asian Background thought to be protected in MS due to the low incidence/prevalence of MS in Asian countries like Japan and low number of cases in natives

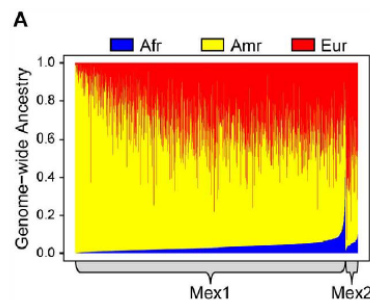
1. Gonzalez Burchard E, et al. (2005) Latino populations: a unique opportunity for the study of race, genetics, and social environment in epidemiological research. Am J Public Health 95: 2161-2168
2. Wang, S, et al Ruiz-Linares, A. Geographic patterns of genome admixture in Latin American Mestizos. PLoS Genet. 2008 Mar 21;4(3):e1000037

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# Ancestral components in Hispanics



- **East Coast** Hispanics have higher mean African admixture and
- **West Coast** Hispanics have higher mean Indigenous admixture
- Reflection of different continental origins

Contrast to AA:

- African roots of African Americans- **uniform mixing** of multiple West African populations



- AA subjects have on average, 16% European and <10% Indigenous American admixture.

1. Johnson et al Ancestral components of admixed genomes in a Mexican cohort. Plos genetics 2011
2. Halder, I. et al Measurement of admixture proportions and description of admixture structure in different U.S. populations. Hum Mutat. 2009 Sep;30(9):1299-309.



## 140 Hispanic cases with MS

2,193 ancestry informative markers that have been previously reported to capture between and within *continental heterogeneity*<sup>1</sup>

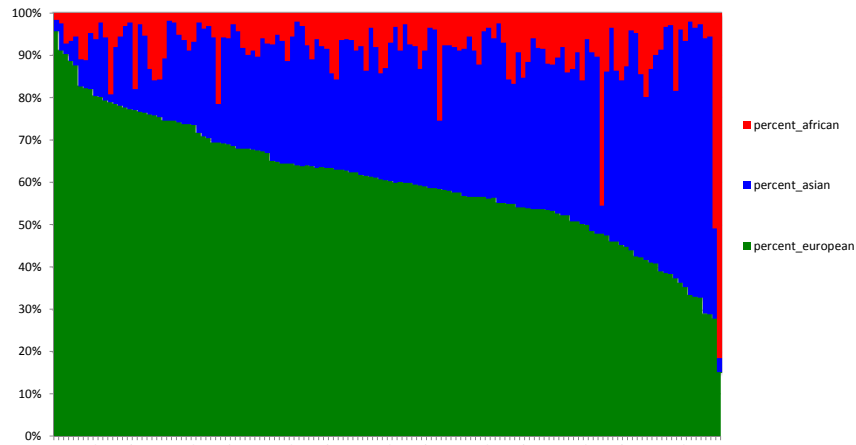


Figure 1: Global Ancestry estimated via STRUCTURE. Asian ancestry ranged between 4% to 83% (mean=41)

USC Hispanic MS data- private data not published

## Absence of Multiple Sclerosis and Demyelinating Diseases among Lacandonians, a Pure Amerindian Ethnic Group in Mexico

Jose Flores,<sup>1</sup> Silvia González,<sup>1</sup> Ximena Morales,<sup>1</sup> Petra Yescas,<sup>2</sup>  
Adriana Ochoa,<sup>2</sup> and Teresa Corona<sup>1</sup>

<sup>1</sup> Neurodegenerative Diseases Laboratory, The National Institute of Neurology and Neurosurgery, Insurgentes Sur 3877 Col. La Fama. Del. Tlalpan, CP 14269, Mexico City 14000, DF, Mexico

<sup>2</sup> Genetics Laboratory, The National Institute of Neurology and Neurosurgery, Insurgentes Sur 3877 Col. La Fama. Del. Tlalpan, CP 14269, Mexico City, DF, Mexico

Correspondence should be addressed to Teresa Corona, coronav@unam.mx

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Multiple Sclerosis (MS) is a highly polymorphic disease characterized by different neurologic signs and symptoms. In MS, racial and genetic factors may play an important role in the geographic distribution of this disease. Studies have reported the presence of several protective alleles against the development of autoimmune disorders. In the case of MS, however, they help define MS as a complex disease, and confirm the importance of environmental agents as an independent variable not associated with ethnicity.

A sample of 5,372 (10% of population)  
16% parasitized

## Spinal Cord in Hispanics with MS-Asian trait?

- Longitudinal SC lesions (LESCLs) reported in 14–31 % of Asians with relapsing MS
- LESCLs reported in 1-3% of whites
- we examined the distribution of spinal cord lesions and its relationship with disability in Hispanics



Amezcu, L. et al Spinal cord lesions and disability in Hispanics with multiple sclerosis. J Neurol. 2013 Nov;260(11):2770-6.

Fig 1: multifocal cord lesions, Fig 2: LESCLs from Amezcu et al.

## Spinal Cord in Hispanics

**Table 1** MS characteristics by spinal cord involvement

Variable	LESCLs 31 (18.9 %) Frequencies (%)	sSCLs 94 (57.3 %) Frequencies (%)	nSCLs 39 (23.8 %) Frequencies (%)	Total n = 164	p value
Age <sup>a</sup>	40.8 ± 10.94	40.1 ± 11.47	38.7 ± 9.41	39.9 ± 10.87	0.70
Gender					
Females	15 (48.39 %)	55 (58.51 %)	25 (64.10 %)	95 (57.93 %)	0.41
Male	16 (51.61 %)	39 (41.49 %)	14 (35.90 %)	69 (42.07 %)	
Disease duration (year) <sup>a</sup>	12.8 ± 8.88	7.5 ± 5.69	4.9 ± 4.54	7.9 ± 6.68	<0.0001
≥5 years, n (%)	25 (81 %)	61 (65 %)	15 (39 %)	101 (62 %)	
Age symptom onset (year) <sup>a</sup>	25.7 ± 10.88	31.4 ± 11.71	31.97 ± 8.68	30.5 ± 11.08	0.03
Age of diagnosis (year) <sup>a</sup>	28.0 ± 10.62	32.6 ± 11.73	33.8 ± 9.28	32.0 ± 11.10	0.07
Diagnostic lag time (year) <sup>a</sup>	2.29 ± 4.68	1.18 ± 2.43	1.9 ± 3.25	1.6 ± 3.17	0.19
EDSS Score <sup>b</sup>	5.75 (3.0–6.0)	3.00 (1.0–6.0)	1.75 (1.0–3.0)	3.0 (1.0–6.0)	<0.0001
EDSS ≥ 4	21 (67.74 %)	34 (36.11 %)	6 (15.38 %)	61 (41 %)	<0.0001
Clinical OSMS, n (%)	10 (32.26 %)	1 (1.06 %)	0	11 (7 %)	<0.0001
Met Barkhof, n (%)	28 (90.32 %)	76 (80.85 %)	26 (66.67 %)	130 (79 %)	0.05

Presence of LESCLs were associated with the greatest risk to disability (OR 7.3, 95 % CIs 1.9–26.5; p = 0.003) compared to no spinal cord lesions independent of disease duration, sex, and age of first symptom.

# Ancestry in Hispanics with MS

Figure 1: 45 cases with estimated global ancestry (via the program STRUCTURE).



European ancestry, mean= 48% , Amerindian ancestry ranged between 4% to 83% (mean=41%), African and Asian ancestry had an average estimated proportions of 5% and <1%, respectively. A single individual had a large estimated African ancestry of 73% (Ethnicity: Cuban)

We found that an **increasing proportion of non-European ancestry** was significantly associated with: an increased risk of LESCLs ( $p=0.03$ ) and LESCLs were associated with increased disability ( $p=0.05$ )

Amezcu, L, Liu, J, Lund, B, Langer-Gould, AM, Van Den Berg, D, Lerner, A, Weiner, LP and Conti, DV. Ancestry: Mark Impact in Hispanics with Multiple Sclerosis. Poster presented at AAN, April 2012.

Could admixture in Hispanics facilitate localization of genetic variants important to disability and help us understand the behaviour of the disease?

## Admixture: Cultural Diversity in Hispanics

- Different Origins despite common language
  - variation exists in diction, speech patterns, vocabulary, and vernacular usage, each unique to a region of origin
  - Social and cultural factors
- May impact:
  - MS progression and its treatments
- Potentially adds a significant barrier

## Age of onset in Hispanics with MS

Migration in MS has been primarily associated with susceptibility and age of onset.<sup>1-4</sup>

- individuals raised in a region of high MS prevalence, but whose ancestors originate from regions in which MS is rare, have an earlier age of MS onset

<sup>1</sup>Dean G, Kurtzke JF *British medical journal*. Sep 25 1971;3(5777):725-729. <sup>2</sup>McLeod JG, Hammond SR, Kurtzke JF. *Journal of neurology*. Apr 2012;259(4):684-693. <sup>3</sup>McLeod JG, Hammond SR, Kurtzke JF. *Journal of neurology*. Jun 2011;258(6):1140-1149. <sup>4</sup>Elian M, Nightingale S, Dean G. *Journal of neurology, neurosurgery, and psychiatry*. Oct 1990;53(10):906-911.

## Effect of Nativity on Age of onset

Table 4. Distribution of age of onset and among HW by place of residence until age 15

	Migration after age 15 (n = 27)	Born in US or migration before age 15 (n = 42)	p-value
Age of Diagnosis (mean ± SE)*	35.7 ± 2.16	25.5 ± 1.42	0.0001
Age of 1 <sup>st</sup> symptom (mean ± SE)	34.0 ± 2.31	24.1 ± 1.47	0.0003
F:M	0.9:1	2:1	0.13
Age of migration**	26.44		
Median lag time from migration to disease onset	14.5 yrs		

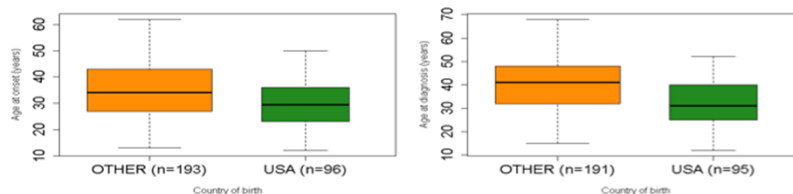
\*Mean and standard error (se), \*\*age of migration available for 25/27 (92%).

After adjusting for sex, age of diagnosis and disease duration in this cohort

- **migrants to the USA after age 15 had more than threefold** (OR 3.61, 95% Cis 1.1–12.2) increased risk of having ambulatory disability.

Amezcuca, L. et al. Multiple sclerosis in Hispanics: a study of clinical disease expression. *Multiple sclerosis*. 2011;17(8):1010-6.

## South Florida: Effect of Country of Birth on Age at Onset and Age at Diagnosis in HW



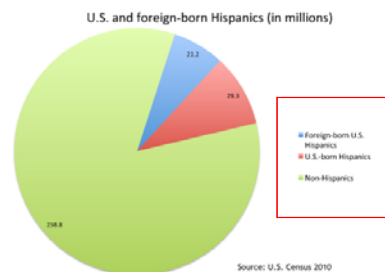
■HW patients born in the USA have a significantly earlier Age at Onset ( $29.21 \pm 0.90$ ) compared to HW patients born outside the USA ( $35.52 \pm 0.78$ ) after adjustment for site of ascertainment ( $p < 0.001$ )

■HW patients born in the USA have a significantly earlier Age at Diagnosis ( $31.96 \pm 0.95$ ) compared to HW patients born outside the USA ( $40.75 \pm 0.80$ ) after adjustment for site of ascertainment ( $p < 0.001$ )

Delgado, Silveira, et al. (2013). Comparison of Clinical Disease Expression of Multiple Sclerosis between Hispanics and non-Hispanics patients, poster at AAN 2013  
Courtesy from Dr. Delgado

## Hispanics and Migration/Immigration

- A complex population of *US-born and foreign-born* immigrants (Figure)
- Age of immigration and nativity are important social factors related to acculturation.<sup>5,6</sup>
- Less is known if migration influences disability.<sup>7,8</sup>



<sup>1</sup>Dean G, Kurtzke JF *British medical journal*. Sep 25 1971;3(5777):725-729. <sup>2</sup>McLeod JG, Hammond SR, Kurtzke JF. *Journal of neurology*. Apr 2012;259(4):684-693. <sup>3</sup>McLeod JG, Hammond SR, Kurtzke JF. *Journal of neurology*. Jun 2011;258(6):1140-1149. <sup>4</sup>Elián M, Nightingale S, Dean G. *Journal of neurology, neurosurgery, and psychiatry*. Oct 1990;53(10):906-911. <sup>5</sup>Torres JM, Wallace SP. *American journal of public health*. Sep 2013;103(9):1619-1627. <sup>6</sup>Lara M, et al. Acculturation and Latino health in the United States: *Annual review of public health*. 2005;26:367-397. <sup>7</sup>Berg-Hansen P, et al *European journal of neurology*. Jul 3 2013. <sup>8</sup>Debouvierie M et al *Neurology*. Jan 2 2007;68(1):29-32.

## Demographics of Hispanics with MS

**Table 1:** Baseline characteristics, nativity and age of migration of Hispanics with MS

Characteristics	US Born n=202	Early Migrant n=35	Late Migrant n=67	Overall n=304	p-value
Female, n %	132 (65)	19 (54)	38 (57)	189 (62)	0.27
Relapsing Remitting, n %	189 (94)	30 (86)	61 (91)	280 (92)	0.09
Age, yrs*	39.1 (11.1)	42.4 (13.0)	44.9 (11.2)	40.8 (11.6)	0.001
Age 1 <sup>st</sup> symptom, yrs*	28.5 (9.7)	31.9 (12.9)	34.2 (11.9)	30.1 (10.8)	<0.001
Age of migration, yrs***	0 (0,0)	6 (3, 12)	22.5 (19, 29)		<0.001
Age at diagnosis, yrs*	30.1 (10.4)	32.5 (13.8)	36.6 (11.1)	31.8 (11.2)	<0.001
Disease duration, yrs*	9.2 (7.5)	9.9 (8.3)	8.4 (7.6)	9.1 (7.6)	0.60
EDSS of ≥6, n %	37(18)	3 (9)	19 (28)	59 (19)	0.04
Ethnic Origin:					
Mexican	141 (71)	22 (63)	43 (62)	206 (67)	0.11

Abbreviations: \* means and standard deviations, yrs=years

\*\*\* Median, Interquartile range (Q1, Q3)

Most were of Mexican background which is consistent with Los Angeles County demographics<sup>1</sup>

L. Amezcua et al Are Recent Immigrants at Higher Risk of Disability with MS? Presented at AAN 2014; oral and manuscript submitted

[http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC\\_SF1\\_QTP3](http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_SF1_QTP3)

## The association between birth place, migration and disability in relapsing remitting MS (n= 280)

Factors	Unadjusted OR (95% C.I.)	p-value	Adjusted OR (95% C.I.)	p-value
Sex (Female)	0.8 (0.42-1.37)	0.36	0.8 (0.41-1.55)	0.50
Age 1 <sup>st</sup> Symptom (yrs)	1.0 (0.98-1.03)	0.85	1.0 (0.99-1.06)	0.15
Disease Duration (yrs)	1.1 (1.05-1.14)	<0.0001	1.1 (1.08-1.19)	<0.0001
Socioeconomic (County)	1.6 (0.85-3.20)	0.14	1.3 (0.62-2.63)	0.51
US born	(ref)		(ref)	
Early-immigrant	0.5 (0.15-1.83)	0.31	0.4 (0.09-1.48)	0.16
Late-immigrant	2.1 (1.11-4.13)	0.02	2.3 (1.07-4.82)	0.03

Only individuals with MS symptoms after age 17 (n=256):

**Late-immigrants** were still found to be at a two fold risk of severe disability (OR 2.0 Cis 0.87-4.43) ,p=0.11) compared to US born.

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## Immigration and Risk of Disability

- Higher disability was associated with a later age of immigration to the US.
- While these results could be explained by genetic, ethnic/racial and environmental differences, behavioral and social factors that parallel migration should also be considered.<sup>1-4</sup>
- Stress, tobacco use (9% in our sample), and mental health services are reported to be exacerbated in recent immigrants

<sup>1</sup>Lara M, et al. Acculturation and Latino health in the United States: *Annual review of public health*. 2005;26:367-397. <sup>2</sup>Delavan M, et al *BMC public health*. 2013;13:458. <sup>3</sup>Caplan S. Latinos, acculturation, and acculturative stress: *Policy, politics & nursing practice*. May 2007;8(2):93-106. <sup>4</sup>Iezzoni LI, et al *American journal of public health*. Jun 2000;90(6):955-961.

## Examples of Disparity in Care

Few questionnaire base studies on services:

- Latinos (44%) with MS had more depression compared to whites (39%)
- Latinos never received the various mental health services

Buchanan, R. J., M. A. Zuniga, et al. (2010). Comparisons of Latinos, African Americans, and Caucasians with multiple sclerosis. *Ethn Dis* 20(4): 451-457.

- MS management for low-income minorities in New York with 31% of women and 28% of men Hispanic – 1/3 never treated by MS specialists

Shabas, D. and M. Heffner (2005). Multiple sclerosis management for low-income minorities. *Mult Scler* 11(6): 635-640.

## Other potential explanations

- Social: diet changes are strongly tied to assimilation into American culture
- Access to care: most are underinsured/indigent
- Hygiene hypothesis: Immigrants in their country of origin might have been parasitized and now clean in the new country
- Genetic: Gradients of increasing Native American background and of correspondingly decreasing European ancestry have been reported as a function of birth origin from North to South.

## Hispanics and Vitamin D- Reflection of cultural practices and genetics?

### **Hispanics Practice:**

Use less sunscreen

Outdoor occupations

But yet less in diet – high lactose intolerance, less fish consumption

### **Genetic:**

- vitamin D receptor polymorphisms
- Skin- higher melanin production
- GWAS and Vitamin D concentrations in Hispanic Americans *without MS*
  - genetic variability and heritability was found between 25(OH)D and its active metabolite, 1,25-dihydroxyvitamin D<sup>1</sup>



## Environmental: Vitamin D levels in Hispanics with MS

**Table 2** Differences in serum 25(OH)D levels between Hispanics and whites with MS

Characteristics	Whites	Hispanics	p value
Entire cohort	n = 80	n = 80	
25(OH)D (ng/ml), mean (SD)	37.3 (19.8)	25.1 (9.4)	<0.001
25(OH)D <30 ng/ml, n (%)	33 (41)	56 (70)	<0.001
25(OH)D <20 ng/ml, n (%)	11 (14)	30 (40)	<0.001
No vitamin D supplement use	n = 68	n = 71	
25(OH)D (ng/ml), mean (SD)	32.1 (13.1)	24.6 (8.7)	<0.001
25(OH)D <30 ng/ml, n (%)	33 (49)	51 (72)	0.005
25(OH)D <20 ng/ml, n (%)	12 (18)	26 (37)	0.01

SD standard deviation, 25(OH)D 25-hydroxyvitamin D *t* test

Amezcu, L, Chung, R, Conti, DV and Langer-Gould, AM. Vitamin D levels in Hispanics with MS. J Neurol 2012 Dec

NHANES Report 2005

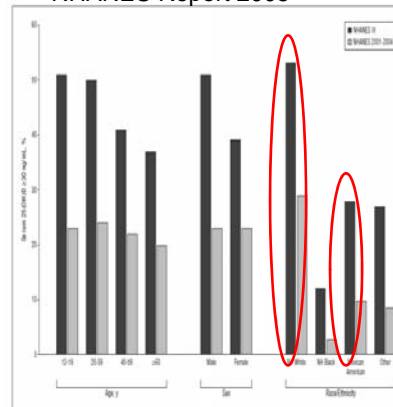
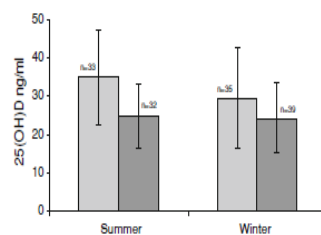


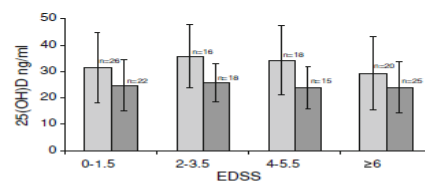
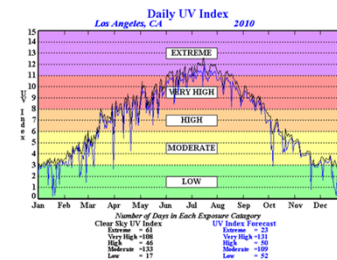
Figure 2. Prevalence of serum 25-hydroxyvitamin D (25(OH)D) level of 30 ng/ml, or more in the Third National Health and Nutrition Examination Survey (NHANES III) (1988-1994) and in NHANES 2001-2004, stratified by demographic characteristics. NH indicates non-Hispanic. To convert 25(OH)D levels to nanomoles per liter, multiply by 2.48.

## Season of blood draw and disability level did not influence serum 25(OH)D levels in Hispanics with MS



**Fig. 2** 25(OH)D levels are lower in Hispanics than in whites with MS regardless of season of when sample was drawn. Levels of 25-hydroxyvitamin D ng/ml (25(OH)D) were found to be low in Hispanics (dark grey) regardless of season (mean  $24.9 \pm 8.2$  ng/ml in summer and  $24.4 \pm 9.2$  ng/ml in winter, unadjusted  $p = 0.8$ ), while 25(OH) D levels for whites (light grey) were lower in the winter (mean  $35.0 \pm 12.4$  ng/ml in summer and  $29.5 \pm 13.3$  ng/ml in winter, unadjusted  $p = 0.08$ )

Amezcu, L, Chung, R, Conti, DV and Langer-Gould, AM. Vitamin D levels in Hispanics with MS. J Neurol 2012 Dec



**Fig. 1** 25(OH)D levels are lower in Hispanics compared to whites with MS and are not influenced by EDSS. Each column represents mean serum 25-hydroxyvitamin D ng/ml (25(OH)D) with its corresponding standard deviation. Levels of 25(OH)D were lower in Hispanics (dark grey bars) than whites (light grey bars) with MS (mean and standard deviation,  $24.6 \pm 8.7$  and  $32.1 \pm 13.1$  ng/ml, respectively,  $p < 0.001$ ) across all expanded disability status scale (EDSS) strata. While vitamin D levels were lower in whites with

## Summary: Hispanics with MS

1. Lower risk of MS compared to whites but higher risk than Asians
2. Younger age of disease onset compared to whites
3. Birth Place and age of immigration appears to have an effect on age of disease onset and disability
4. Genetic diversity may be responsible for certain clinical and radiological features observed in the disease
5. Social/Cultural diversity may be complicating access to care and utilization
6. Environmental: lower vitamin D than whites-significance in Hispanics with MS still unclear

## Last Note

- Ethnicity/Race does play a role in MS
- How do we resolve this?
  - Increase our understanding of subpopulations
    - Epidemiological studies
    - Clinical trials (increase diversity)
    - Collaboration
    - Patient Outcomes and integration of social cultural factors

# Thank You!

MS Neurology Team:

**Leslie P. Weiner, MD**  
Wendy Gilmore, PhD  
Brett Lund, PhD  
Margaret Burnett, MD  
Regina Berkovich, MD  
Eve Kelland, PhD  
Karina Ledezma, MPH

USC Neuroradiology:

Alex Lerner, MD  
Meng Law, MD

USC Preventive Medicine:

David Conti, PhD  
**Talat Islam, PhD**

Epigenome Center at USC:

David Van Den Berg, PhD- Epigenome Center

Kaiser Permanente:

**Annette Langer-Gould, MD, PhD**

NMSS

**Victor Rivera, MD**-Chair, Hispanic Advisory Board  
Mercy Willard, MPH

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