

## 10. Vowel Nasalization

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### 1. The values shown on the map

This map shows the distribution of contrastive vowel nasalization in the world's languages. The existence of contrastive nasal vowels is well known in some languages, e.g. French /pɛ̃/ *pain* 'bread' versus /pɛ/ *paix* 'peace'. About a quarter of the languages in our sample have a nasal-oral vowel contrast.

@	1. Contrastive nasal vowels present	64
@	2. Contrastive nasal vowels absent	179
	total	243

Nasalization phenomena are of course not restricted to oral vs. nasal phonemic vowel contrast. Of the 179 languages with no nasal vowel contrast, at least 31 are reported to have some kind of non-phonemic nasalization, such as contextual nasalization of vowels adjacent to nasal consonants, e.g. Thai /mɛː/ → [mɛ̃ː] 'mother'.

### 2. Number of oral vs. nasal vowels

The number of contrastive nasal vowels in a language is often less than that of oral vowels—approximately 60% of our sample shows this pattern. Lakhota (Siouan; North and South Dakota) has five contrastive oral vowels, but only three nasal vowels:

## (1) Lakhota (Boas and Deloria 1941)

i	u	ĩ	ũ
	o		
ɛ			
a		ã	

There is evidence to suggest that a reduction in the number of nasal vowels has a phonetic basis: the acoustic effect of nasalization is known to affect the perceptual distinctiveness of vowels (e.g. Beddor 1993). However, it is difficult to predict the shape of reduced vowel inventories. Lakhota (1) has only maximally peripheral nasal vowels. In other languages, such as Yoruba (Niger–Congo; Nigeria), the distinction between close and open mid vowels is reduced in favour of nasal open mid vowels; but in Seneca (Iroquoian; New York State) the nasal vowel system is limited to mid vowels /ẽ õ/ only:

## (2) Yoruba (Ogunbowale 1970)

i	u	ĩ	ũ
e	o		
ɛ	ɔ	ẽ	õ
a		ã	

## Seneca (Chafe 1996)

i	u		
e	o		
		ẽ	õ
æ	a		

Maba (Maban, Nilo–Saharan; Chad) is the most extreme example of reduced contrastivity: it has 12 oral vowels but only one nasal vowel /ũ/. In some languages nasal vowels are not only few in number, but are also extremely rare: there are only two recorded lexical items with nasal vowels in Karok (Hokan; California).

The very strong claim, made by Ferguson (1966), that "the number of nasal vowels is never greater than the number of non-nasal vowel phonemes" needs some slight revision. Koyra

Chiini (Songhay; Mali), which has a four-way contrast involving nasality and length, has more short nasal vowels than short oral vowels:

(3) Koyra Chiini (Heath 1999b)

i	u	iː	uː	ĩ	ũ	ĩː	
e	o	eː	oː	ẽ	õ		õː
a		aː		æ̃	ã		ãː

The reason for this unexpected imbalance is the borrowing of the front low vowel æ̃ in French loanwords, e.g. /maŋgazæ̃/ < French *magasin* ‘warehouse’.

### 3. Vowel length and weight

Sixteen languages in the sample have a four-way contrast involving both long and short oral and nasal vowels. In many cases, the four-way system is fully symmetrical, as in Apurinã (Arawakan; Brazil):

(5) Apurinã (Facundes 2000)

i	ɨ	iː	ɨː	ĩ	ĩ̃	ĩː	ĩ̃ː
e	o	eː	oː	ẽ	õ	ẽː	õː
a		aː		ã		ãː	

The interaction of length and nasality means that nasal vowel systems can in fact be quite large. Matters are further complicated where Advanced Tongue Root is a third factor. Koromfe (Gur; Burkina Faso) has, as a result, 21 oral vowels and 19 nasal vowels, including ATR variants in both sets.

Hajek (1997) reports that vowel nasalization occurs preferentially on long vowels and bimoraic sequences. Such a claim finds additional support in Lango (Nilotic; Uganda), where nasal vowels only appear in a bimoraic sequence, e.g. /cɔŋ/ ‘knee’ vs. /cõ.ẽ/ ‘knees’, /ʔorã.ã/ ‘sterile’.

#### 4. Nasal spreading

Vowel nasality has differing prosodic properties across languages. In many languages vowel nasalization is strictly local, i.e. it does not spread to an adjacent segment, even if vocalic, as in French /oseã/ which surfaces as [oseã] ‘ocean’. In other languages, vowel nasality, inherent or from an adjacent nasal consonant, may spread onto and across adjacent segments. In Apurinã, all vowels adjacent to a nasal vowel are obligatorily nasalized, e.g. [‘okĩ] ‘eye of’ + [ã] ‘liquid of’ = [o’kĩã] ‘eyeball’. Directionality of nasal spread across segments also varies. It may be mostly monodirectional as in Warao (Venezuela), where it is left to right, or bidirectional as in Barasano (Tucanoan; Colombia):

(6)

- a. Warao (Osborn 1966)
 

/inawaha/ -> [inãwãhã]	‘summer’
	(left to right)
  
- b. Barasano (Jones and Jones 1991)
 

/to-hɰ/	‘towards there’
/tĩbĩ-jã/ + /-hɰ/ -> [tĩbĩ-jã-hũ]	‘to Otter River’
	(left to right)
/gahe/ ‘other’ + /-ĩ/ ‘3.M’ = [gãhĩ]	‘another male’
	(right to left)

There is a hierarchy of segmental permeability to nasal spreading (e.g. Cohn 1993). Nasality always spreads, when it

occurs, through vowels, as in Apurinã. It typically also spreads through glides and through glottals, as in Seneca. It may also spread through less vocalic segments such as liquids and, more rarely, fricatives, as in Epena Pedee (Choco; Colombia):

(7) Epena Pedee (Harms 1994)

/wã/ 'go' + /-rú/ 'present' = [wãñú] 'go.PRES'

/sĩəso/ [ĩĩĩĩĩĩ] 'sugar cane'

Guaraní (Tupian; Paraguay) is an extreme case of bidirectional spreading across all consonants, including voiceless stops, and blocked only by stressed oral syllables:

(8) Guaraní (Walker 1999)

/<sup>n</sup>do-roi-<sup>n</sup>du-'pãi/ -> [nõõõĩnũ'pãĩ] 'I don't beat you'

/a,kãra'ɰ<sup>w</sup>e/ -> [ã,kãĩã'ɰ<sup>w</sup>e] 'hair (of the head)'

## 5. Vowel height and contextual nasalization

In most languages which show contextual nasalization (e.g. /NV/ -> [Nĩ]), all vowels are affected equally regardless of vowel height. However, Hajek (1997) notes the existence of two very different patterns of interaction between vowel height and preferential nasalization. In some languages, there is evidence that high vowels are preferentially nasalized, e.g. Chamorro (Austronesian; Guam), whilst in others, e.g. Thai, low vowels appear to be preferred targets:

(9)

a. Chamorro (Witucki 1974)

high: [dzæ:mũ] 'you like'      low: [mat.tu] 'arrived'

b. Thai (Noss 1964)

high: [mɯ:] 'hand'      low: [mã:] 'come'

## 6. Rhinoglottophilia

An association, sometimes termed "rhinoglottophilia", between vowel nasalization and glottal consonants has long been noted, e.g. by Matisoff (1975). In Thai there is predictable vowel nasalization of low vowels after word-initial /h/, e.g. /haː/ → [hãː] 'five'. In Pirahã (Mura; Brazil), there is optional nasalization after voiceless glottal stops and fricatives, e.g. [ʔapaí] ~ [ʔãpaí] 'head', [hói] ~ [hóĩ] 'one'.

## 7. Nasalization as word-boundary marker

In a small number of languages, nasalization serves as a word-boundary marker—evidence of such a phenomenon is found in Tashlhiyt (Berber; Morocco), where the oral vowels /i u a/ may be nasalized in word-final position:

(10) Tashlhiyt (Willms 1972)

non-final:	[ˈmɪːʊanɪɛ]	'our mother'
final:	[ɲˈtɪːsã ʔadisɪːçɛnɪ ,wã]	'it is he who made it'

## 8. Geographical distribution

There appears to be strong areal influence in the distribution of contrastive nasal vowels around the world. As the map shows, they are concentrated in the following areas: the equatorial regions of South America and Africa, the northern part of the South Asian subcontinent, and throughout large parts of North America. Phonemically contrastive nasal vowels are, with few exceptions, otherwise absent from most of Eurasia, the northern and southern extremes of the Americas and Africa, as well as Australia and the Pacific.

## 9. Nasal vowels in West Africa

The inset map shows the complexity of nasal vowel systems in West Africa, an area already identified as having a high density of such systems. It distinguishes among languages that have no nasal vs. oral contrast, those with only a two-way oral vs. nasal contrast, and those that have larger four-way systems incorporating vowel length. It also indicates which languages have some kind of nasal spreading across segments.

@	1. No nasal vs. oral vowel contrast	20
@	2. Two-way nasal vs. oral vowel contrast (/ĩ/ vs. /V/) without nasal spreading	7
@	3. Two-way nasal vs. oral vowel contrast (/ĩ/ vs. /V/) with nasal spreading	4
@	4. Four-way nasal vs. oral vowel contrast (/ĩ/ vs. /ĩː/ vs. /V/ vs. /Vː/) without nasal spreading	5
@	5. Four-way nasal vs. oral vowel contrast (/ĩ/ vs. /ĩː/ vs. /V/ vs. /Vː/) with nasal spreading	4
total		40

**Values for Map 10A. Nasal Vowels in West Africa**

[Map 10A about here]