Phonological Variation and Sound Change in Yami on Orchid Island

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This study investigated the sound change in progress in the Yami diphthongs /ay/ and /aw/ (e.g., *mangay* "go", *araw* "day, sun") on Orchid Island. The interpretation of the direction of change has been centralization and upward movement, thus [ay] and [aw] alternate with [əy] and [əw], respectively. In addition, [əy] moves forward to [iy], whereas [əw] moves backward to [uw]. This paper reports the results of qualitative and quantitative analyses to answer the following two questions: (1) What is the direction of the chain shift of (ay) and (aw)? Does it undergo changes of raising or falling? and (2) To what extent is the variation of (ay) and (aw) influenced by a combination of internal factors and external factors?

Our qualitative analysis revealed that the nucleus raising rule is an innovation in Yami and has progressed faster and longer in (ay) than in (aw). The same rule has also spread to environments such as a-i and a-o across morpheme boundaries. While (ay) is raised to the peripheral high front vowel /i/ in the raising areas, another change, in prefixes with the high front vowel (e.g., *mi-/pi-/ni-*), is reversing the direction and has begun to lower and diphthongize the nucleus /i/ to /ey/.

Our quantitative analysis tested the raising rule in word final position. The raising rule has been identified as associated with geographical differences. However, the raising and non-raising areas also tend to be associated with language vitality. Thus an interpretation on the relationship between ethnic identity and raising is proposed.

Key words: /ay/, /aw/, sociolinguistic variation, sound change in progress, Yami

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1. Introduction

The advance of research on sound change in progress has been considered the greatest achievement in contemporary sociolinguistics (Chambers 1995:147). One of the most important studies in this line of research is the raising and fronting of (ay) and (aw) in English dialects.

Labov's seminal work on linguistic change in progress on the island of Martha's Vineyard (1963, 1972) has established a paradigm of sociolinguistic variation, combining a quantitative study with an anthropological focus over the last three decades. He correlated centralization of the /ay/ and /aw/ diphthongs with social factors (i.e., identity, occupation, age and ethnicity) and linguistic factors and predicted real time changes from apparent time data collection.

Interestingly, according to preliminary studies by Li & Ho (1988) and Rau (1995), phonological variation in (ay) and (aw) have also occurred in the Yami language on Orchid Island. Both studies found that /ay/ and /aw/ diphthongs undergo sound change, and that the centralization of the two diphthongs /ay/ and /aw/ is related to regional differences.

1.1 The Yami speech community

Yami is an Austronesian language spoken on *Lanyu* (Orchid Island), a small offshore island located in the Pacific Ocean 60 kilometers southeast of Taiwan (see Figure 1). According to the Council of Indigenous Peoples (2005), there are 3,599 Yami, some of whom spend several months a year in Taiwan earning a living.

The Yami language is a Philippine Batanic language, related to Ivatan and Itbayat of Batanes. However, Mandarin Chinese has been spoken on the Island since 1945, when Mandarin Chinese became the national language of the country.
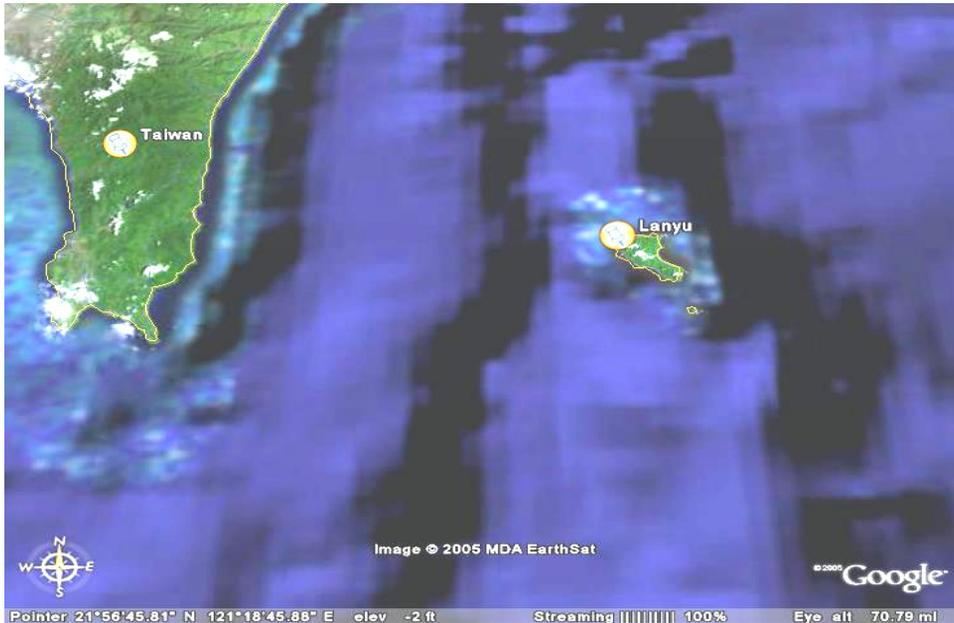
Figure 1: *Lanyu* located in the Pacific Ocean 60 kilometers southeast of Taiwan (adapted from http://google.earth.com)

As shown in Figure 2, there are six villages on the Island from the southwest to the northeast coast clockwise: Imowrod, Iratay, Yayo, Iraralay, Iranomilek and Ivalino.

In and near Imowrod are the airport, post office, clinic, and a hotel. Right across Imowrod at the opposite side of the island is Ivalino, where the Lanyu Nuclear Waste Plant is located. The administrative center of the island is at Yayo, where a hotel and a secondary school can be found. Iraralay and Iranomilek are further away from the government offices and tend to better preserve the Yami language. However, all villages have primary schools with Mandarin Chinese as the only medium of education. Recently, with the development of tourism, an increasing number of remodeled homes have been opened for room and board for tourists, especially on the more scenic beach on the northeast coast.

Figure 2: Geographic description of *Lanyu* (adapted from http://google.earth.com)

1.2 Previous sociolinguistic studies on (ay) and (aw) variation

(ay) and (aw) are two of the best-known sociolinguistic variables and have been studied in the speech of a wide range of English speakers with relatively consistent social and phonological constraints across many communities.

In Labov's pioneering work on Martha's Vineyard (1972), he focused on realizations of the diphthongs (ay) and (aw), such as *nice* and *mouse*. The results show that the nuclei of the vowels were centralized by men, particularly middle-aged fishermen, and decreased with age and with weaker island identity. Furthermore, the centralization (raising) was correlated with certain linguistic and social factors.

Many other studies have also documented (ay) and (aw) variation in various English-speaking communities, such as Lumbee Native American English (Schilling-Estes 2000), islands off the coast of North Carolina (Wolfram & Schilling-Estes 1995, 1996, 1997, Schilling-Estes 1996, 1997, Schilling-Estes & Wolfram 1997, Wolfram, Hazen,

and Schilling-Estes 1999), Detroit (Eckert 1996), Pittsburgh (Johnstone, Bhasin, and Wittkofski 2002), Martha's Vineyard (Blake & Josey 2003, Josey 2004), Canada (Chambers 1973), and England (Milroy 1996). All these studies have indicated that (ay) and (aw) display different patterns of variation and social meanings.

The diphthong /ay/ has been found to be monophthongized as [a] in the U.S. south (Wolfram & Schilling-Estes 1996), e.g., tahm "time" and tahd "tide", but only the white tend to centralize the /ay/ before the voiceless obstruent, such as raht "right" and whate "white". In the studies of (aw) fronting, Eckert (1989) on Pittsburgh and Labov (1984) on Philadelphia English found that females tended to reduce (aw) raising as their social statuses increased, whereas males demonstrated a curvilinear pattern, in that only the middle working class tended to raise (aw). In a recent study in the Pittsburgh speech community, Johnston, Bhasin, and Wittkofski (2002) discovered that /aw/ is further monophthongized to [a] as in [at] (spelled 'aht') for 'out' or [dantan] (spelled 'dahntahn') for 'downtown'.

Several studies on variation of (ay) and (aw) have focused on Ocracoke Island and Smith Island, North Carolina (Wolfram & Schilling-Estes 1995, 1996, Schilling-Estes 1996, 1997, Schilling-Estes & Wolfram 1997, and Wolfram, Hazen, and Schilling-Estes 1999). The islanders of Ocracoke are known as 'hoi toiders' (their pronunciation of 'high tiders'), turning [ay] into [oy], and [aw] into [ay], such as hice 'house' and dine 'down'. The backing of [ay] to [oy] is a social stereotype, a feature commonly associated with the islander, whereas the glide fronting of [aw] to [ay] remains a social indicator because there is no stylistic variation among the islanders. As a social stereotype, the backing of [ay] to [oy], as in 'hoi toiders', was shared mostly by the middle aged male speakers with strong identities with the island (Schilling-Estes 1997). However, the young women on the island preferred the standard variant [ay] (Schilling-Estes & Schrider 1996). Among the Lumbee Indians in Outer Banks of North Carolina, /ay/ is raised, e.g., [roId] 'ride', and /aw/ is glide-fronted, and/or raised, e.g., [saInd] or [seInd] 'sound'.

The variables of (ay) and (aw) are equally salient in the studies of English dialects in other English speaking countries. The famous 'Canadian raising' (Chambers 1973) has been under American influence and the diphthong (aw) has been subsequently affected. Using the methods of comparative sociolinguistic dialectology, Hung, Davison, and Chambers (1993) explored the development of (aw)-fronting. The results showed that the only systematic variation in (aw)-fronting still occurred in Montreal, whereas in Vancouver, Toronto, and Victoria, (aw) has become Americanized.

Trudgill (1990) observed that the northern dialects in England still preserve the more conservative variants [i] and [u] of the two diphthongs (ay) and (aw) respectively. Thus 'night' is pronounced as neet, and 'house' as hoose. Milroy (1996) investigated the

conversational speech of a sample of Tyneside (England) residents in the diphthong /ai/. He also found that [ei] is a conservative allophone close to Middle English /i:/ which is the source of modern /ai/.

The patterns of phonological changes in (ay) and (aw) are similar in Australian (e.g. Horvath 1985:69) and New Zealand English (Maclagan, Gordon, and Lewis 1999), in that the (ay) is backed and the (aw) is centralized and fronted. But New Zealand English demonstrated further changes in glide, that is /y/ is lowered to /e/ and /w/ is lowered and fronted to a central vowel. Furthermore, Maclagan, Gordon, and Lewis (1999) noticed that professional women in New Zealand tended to be conservative in the pronunciations of (ay) and (aw) but quite innovative in changing the front vowels (e.g., 'hit' is pronounced as 'hut'). This corresponds to Labov's prediction (1990) that lower middle class women are conservative in using stigmatized variants but take the lead in the sound change of a non-stigmatized variant.

Forty years after Labov's Martha's Vineyard study, Blake & Josey (2003) went back and found a change in the linguistic pattern predicted by Labov. The results indicated that there is a decreasing rate of /ay/ centralization and a return to mainland speech among Vineyard men, which was caused by social and economic restructuring and resulting ideological changes taking place on the island. Similarly, Josey (2004) found that the decentralization of /ay/ and /aw/ on Martha's Vineyard is caused by the same factors.

To sum up, the two diphthongs /ay/ and /aw/ are undergoing sound changes in many English speaking countries. However, each variable also demonstrates its own unique rate and path of change. Furthermore, the previous studies also found relationships between internal (e.g., voiced vs. voiceless obstruents) and external factors, such as social class and gender, with sound change.

However, the relationships between variation and gender, along with other social factors, such as ethnicity and style, have been investigated more in the qualitative paradigm than in the quantitative one. The fallacy of equating sex with gender has been criticized (e.g., Mendoza-Denton 2004). In addition, Eckert (2001) also questioned the validity of using the unidimensional definition of style. In Eckert's (2000) study of Detroit adolescents, she found that the raising and backing of (ay) interact with gender and social group categories. The female burnouts are in lead, even exceeding the rate of backing by their male counterparts. Thus she emphasized the importance of interpreting sound change in relation to style and gender based on the concept of "community of practice" (Eckert & McConnell-Ginet 1992) to generate an "emic" meaning.

Although all the studies reviewed so far have been cases in English speaking countries, (ay) and (aw) variation is certainly not restricted to those areas. However, very little research has been conducted on these variables in minority languages. The

only preliminary studies on (ay) and (aw) on Orchid Island can be found in Li & Ho (1988), Rau (1995), Chen (1998), and Rau and Dong (2006).

1.3 Preliminary studies on phonological variation in Yami

All the aforementioned studies on Yami had different foci in their investigation, but all observed phonological variations in passing. They identified several phonological variables in Yami,[1] including the voiced labiodental fricative /v/, voiced uvular fricative /ʁ/, glottal stop /ʔ/, and diphthongs /ay/ and /aw/. The elderly tended to retain [v] and [ʁ], while the younger generation tended to substitute [f] and [ʔ], respectively. In addition, there is centralization of the two diphthongs due to regional differences. According to Rau & Dong (2006), the variable (aw) might be realized by [əw], [uw], or [aw] in words such as *attaw* 'sea' and *araw* 'sun, day'. On the other hand, the variable (ay) might be realized by [iy], [əy], and [ay] in words such as *vazay* 'work' and *mangay* 'go'. The variables (ay) and (aw) are primarily pronounced as [ay] and [aw] respectively in Imowrod and Iratay; however, they are undergoing sound change in progress in Yayo, Iraralay, Iranomilek and Ivalino.

The interpretation of the direction of change has been centralization and upward movement, thus [ay] and [aw] alternate with [əy] and [əw], respectively. In addition, [əy]

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[1] There are twenty consonants (Table A), four vowels, and four diphthongs (Table B) in Yami. All the symbols in the tables represent standard Yami orthography. The IPA symbols, whenever different from the orthography, are placed in square brackets.

Table A: Inventory of Yami consonants

	Labial	Alveolar	Retroflex	Palatal	Velar	Uvular	Glottal
Stop	p, b	t	d		k, g		' [ʔ]
Fricative	v [v, f]		s [ʂ]			h [ʁ]	
Nasal	m	n			ng [ŋ]		
Liquid		l	r [ɻ]				
Affricate				c [tʃ], j [dʒ]			
Trill		z [ř]					
Glide	w			y			

Table B: Inventory of Yami vowels

	Front	Central	Back
High	i		
Mid		e [ə]	o [ʊ] ~ [u] ~ [o]
Low		a	
Diphthong	ay, aw, oy, iw		

moves forward to [iy], whereas [əw] moves backward to [uw]. However, Rau & Dong (2006) further observed occurrences of centralization in a few words in the typical non-raising areas, such as *alilíkey* 'all very small' and *manganiáhey* 'scary'. Among the typical raising areas, as reported in Rau (1995), Ivalino used more non-raising variants than Iraralay, where the raised variants [əy] and [əw] were most common. Yayo and Iranomilek had further developed fronting and monophthongization [i] and [u] for the diphthongs.

In previous studies, the general directions of sound change of the two diphthongs have been claimed to be (ay): ay > əy > iy and (aw): aw > əw > uw. But interestingly, the front vowel [i] has been observed by Rau and Dong (2006) to undergo lowering and diphthongization to [əy], as in *mi ~ mey* 'go' in the raising areas. It seems that a regular reversal (Ho 1988): ay > əy > iy > əy is underway.

1.4 Phonological variation in other Batanic languages

Phonological variation has almost never been dealt with in historical linguistics. For example, in Sheerer's comparisons between the Batan dialect and other Philippine and Formosan languages (1908), the two diphthongs were reconstructed as *ay and *aw. Since no sociolinguistic surveys were conducted on the variations of these diphthongs, there is no way to judge if the non-raised variants are really older than their raised counterparts. However, some variants for (ay) and (aw) were recorded in the same study. For example, the word for 'man, male' has the following reflexes: *magakay* (Batan), *laki* (Bontok), *lagey* (Tiruray), and *laloy* (Banawi). Similarly, the word for 'sun, day' has reflexes as follows: *arao* (Batan), *axu* (Bontok), *ago* (Tinggian), *ageo* (Pangasinan), *gay/gey* (Moro Magindanau), *araw* (Tagalog). In Reid's (1971) comparisons of word lists and phonologies in Philippine minor languages, he also recorded /ay/ and /i/ variation for the word 'swim' in Ivatan (*mayawat*) and in Itbayaten (*miawat*).

There are anecdotes in several other studies on Batanic languages that indicate phonological variation in (ay) and (aw). Benedek (1987, 1991) used Iranomilek speech as the basis for his comparison with other Bashiic languages, i.e., Ivatan and Itbayat. He noted that there was inconsistency in his transcription of word final /o/ and /aw/ due to insufficient information on Yami phonology. Tsuchida et al. (1987, 1989) chose to juxtapose Imowrod and Iranomilek dialects in their data presentations. The (ay) and (aw) variations between the two dialects are apparent in their collected sentences; however, no systematic investigation was attempted. Finally, the words with final (ay) and (aw) were transcribed differently in West's (1995) Yami word list. Although her source of data is based on the Iraralay dialect, she chose to transcribe some centralized (ay) but left (aw) completely as non-raising.

It seems previous studies have all alluded to phonological variations in different dialects in Yami and other Batanic languages; however, the systematic patterns of phonological variation is yet to be found. Thus the purpose of this paper is to fill this gap by examining the directions of sound change of (ay) and (aw) in detail and determining the linguistic and social factors that are correlated with the sound change.

2. Methodology

This puzzling issue of phonological variation and sound change of (ay) and (aw) was approached from a sociolinguitic variationist paradigm to answer the following three questions: 1) What is the direction of the chain shift of (ay) and (aw)? Does it undergo changes of raising or falling? 2) To what extent is the variation of (ay) and (aw) influenced by a combination of internal factors and external factors? and 3) What social meanings can be attributed to the envelope of variation? A combination of quantitative and qualitative methods was used to answer the aforementioned research questions.

2.1 Data

The data consist of four corpora: 1) Corpus A is a collection of 11 short narratives from *si amen macinanao* in Iraralay, explaining Yami customs and cultural events, as part of the data for the first author's research project on Digital Archiving Yami Language Documentation (http://www.hrelp.org/grants/projects/index.php?year=2005); 2) Corpus B is the *Yami New Testament* (1994), translated by speakers of Iranomilek and Iraralay; 3) Corpus C contains lyrics of 14 clapping songs (Knight & Lu 2005) collected mostly from Iraralay and Ivalino speakers with a few examples from Yayo and Iratay, combining ceremonial lyrics with non-ceremonial melody to express solidarity and praises; and 4) Corpus D was built from 20 narratives in Rau & Dong (2006) and more narratives from Dong & Rau (1999, 2000) to ensure a balanced representation of age, sex, and location of the speakers.

2.2 Analysis procedures

Corpora A through C were used for a qualitative analysis. The nature of the three corpora is suitable for a heuristic and exploratory study to identify sound change patterns that have not been found in previous studies and generate hypotheses for phonological variation of (ay) and (aw).

Maa-neu Dong, an experienced Iratay speaker from the non-raising area with high literacy skills in Yami, was invited to comment on the transcriptions of Corpus A,

focusing on the tokens of (ay) and (aw) produced by the Iraralay speaker from the raising area. She was particularly asked to identify any differences between her pronunciation and the transcribed variants. She was further asked to comment on Corpus B, the Yami New Testament, translated by speakers from the raising area, to identify any transcriptions that are different from her dialect. In addition, she was consulted to clarify the meanings of the lyrics in Corpus C and comment on the transcriptions made by the original authors, one of whom is from the raising area.

For the quantitative investigation, a variable rule analysis (VARBRUL) was conducted on Corpus D to identify the internal and external factors that account for nucleus raising in (ay) and (aw). The two variables were calculated separately in two analyses.

In numerous sociolinguistic variation studies, VARBRUL has been used to determine the favoring, disfavoring, or lack of effect of various factor groups (i.e., linguistic environment or internal factors and social or external factors). Thus, the quantitative part of this study applied GOLDVARB 2001 (Robinson et al. 2001) to conduct a multivariate analysis of the data and to show how /ay/ and /aw/ variations correlate with various internal and external factors.

3. Results from the qualitative analysis

There are two dialect areas on the island based on the nucleus raising or non-raising of word final (ay) and (aw). Iratay and Imowrod are considered the non-raising areas whereas the other four villages are the raising areas. This grouping is based on an impressionistic account by Dong, which also corresponds with the results of Rau's preliminary results (1995). Typical examples cited to illustrate the differences between the raised and unraised (ay) and (aw) include: *mehakay* ~ *mehakey* ([ay] ~ [əy]) 'man, male'; *malaw* ~ *malew*, *malow* ([aw] ~ [əw] ~ [uw]) 'worry'. However, a close examination of the Yami New Testament, translated mostly by the speakers of the raising area, reveals that the dialectal variation is speech is not reflected in writing. All the raised variants of (ay) and (aw) were transcribed as non-raised in the Bible. These stylistic differences between speaking and writing (orthography) actually provide a clue to the more prestigious status of the non-raised variants of (ay) and (aw), although they say nothing about the general question of power and solidarity of the different varieties on the island. In fact, no one from Orchid Island would admit to the researchers which variety has more prestige; nonetheless, the dialect of the husband carries more power than that of the wife, because it is usually the wife who accommodates to the husband's accent, not the other way around (Dong, personal communication).

3.1 Phonological variation of (ay) and (aw)

The variables (ay) and (aw) are approaching stereotypes, in that they not only demonstrate stylistic variation as mentioned above but were consciously avoided by the native speakers in their transcriptions for the Bible. In the following excerpt (1) from Corpus A, *si aman macinanao* comments on the variation between *ivey* and *ivay*, while discussing the importance of the *ivey* fish caught in the evening. All the relevant tokens are underlined for further discussion in the following paragraphs.

(1) *o   iv<u>ey</u>   iya   am,*
     NOM[2]   fish.name   this   TM
     i-panci d(a) ori no   kadoan l-ili   a   iv<u>ay</u>   koan da,
     IF-call 3PG that GEN other   RED-village LIN fish.name say   3PG
     mi-áng<u>ay</u> ori aka   no   iv<u>ey</u>,
     AF-same   that and   GEN fish.name
     ta   yamen   Jirara<u>ley</u>   am,
     because   1PNEXCLF village.name   TM
     i-panci   namen   a   iv<u>ey</u>,
     IF-call   1PGEXCL   LIN   ish.name
     sira   do   Jimowrod   a   Jirat<u>ey</u>   am,
     3PNOM   LOC village.name LIN village.name   TM
     i-panci da   iv<u>ay</u>,
     IF-call 3PG fish.name
     "*Ivey* is called *ivay* in other villages. But it has the same meaning as *ivey*. We in Iraraley call it *ivey*, whereas those in Imowrod and Iratey call it *ivay*."

As shown in excerpt (1), the word final (ay) indicates variation. The speaker draws the distinction between his raised pronunciation of *ivey* and the non-raised *ivay* in the other two villages, i.e., *Imowrod* and *Iratey*. Notice in his reference to *Iratey*, he uses his raised variant [əy], although the speakers from that non-raising area would refer to their own village as *Iratay*. However, in the token of *miángay* 'same', contrary to our expectation, he chose the unraised variant, the only word final unraised (ay) in the 11 narratives he contributed. One possible explanation might be that his attention was temporarily drawn to the unraised variant *ivay*. When this word occurs in the reduplicated form later in the

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[2] Abbreviations: 1PGEXCL = first person plural genitive exclusive, 1PNEXCLF = first person plural nominative exclusive free, 3PNOM = third person nominative, 3PG = third person genitive, GEN = genitive, IF = instrumental focus, LIN = linker, LOC = locative, NOM = nominative marker, RED = reduplication, TM = topic marker

text, he sticks to the raised variant *miangangey* 'all the same'.

The nucleus raising of (ay) and (aw) occurs in word final position, but if *-ay* or *-aw* is immediately followed by a suffix, no raising occurs. This indicates the non-raised variants /ay/ and /aw/ are the phonemic representations, thus raising is a variable rule. The contrast between word final and suffixed (ay) and (aw) is shown in example (2) from Corpus A. The same pattern of contrast can be found in Corpus C.

(2)

Word final position	Followed by a suffix
manehaw<u>ey</u> 'holds one's fists and looks angry with eyes wide open'	*ji manehaw<u>ay</u>-i* 'not hold a ceremony of *manehaway*'
kapeysiasi<u>y</u> 'then dismiss'	*misiasi<u>ay</u>-i* 'dismiss'
mamozw<u>ow</u> 'chase away'	*ji vozw<u>aw</u>-a* 'not chase something away'
mar<u>ew</u> 'daytime'	*paka-m-ar<u>aw</u>-en* 'cause to go overnight'

So far, we have observed that word final (ay) and (aw) seems to be the most easily affected position; however, some idiosyncratic cases seem to be determined by lexical diffusion (Chen 1972). For example, words such as *alilík<u>ey</u>* 'all small' and *manganiáh<u>ey</u>* 'scare' have completed their sound change to the raised variant in the non-raising areas, whereas word final (ay) raising in words, such as *akók<u>ey</u>* 'How are you?', *vah<u>ey</u>* 'house', and *mang<u>ey</u>* 'go', is only occurring in the raising areas with some variation. The raising rule appears to have occurred earlier in (ay) than (aw) because although word final (aw) raising, such as *arar<u>ew</u>* 'days', occurs in the raising areas, no tokens with raised (aw) in word final positions have been found in the non-raising areas.

3.2 Raising in a-i and a-o

The nucleus raising rule is not restricted to word final diphthongs (ay) and (aw) but also applies to /a/ in a-i and a-o combinations in other positions. But the rule seems to follow an implicational scale with the following hierarchy: morpheme internal > word boundary > morpheme boundary. In other words, the raising rule has affected almost all the a-i and a-o across morpheme boundaries, such as *asa keyli* 'one village' and *makowbot* 'go out', as shown in (3). However, word boundaries following bound pronouns display variations in that the raising rule applies more freely to the hesitation marker *i* (e.g., *to dey* 'just') than any other words (e.g., *deytoro* 'they give it'). Finally, the raising rule only begins to apply morpheme internally. The raised /ey/ and /ow/ variants, such as *maseyrem* 'evening' and *kalowdan* 'deep sea' are restricted to the raising areas. Interestingly, the non-raised variants /ay/ and /aw/ also occur in their speech; however, the /ay/ in *rayyon*

'flying fish season' is probably diphthongized from /a/, while the /aw/ in *katawtao* 'self' is a reduplicated form. In fact, the raised variant *katowtao* is also possible.

(3)

Morpheme internal	Word boundary	Morpheme boundary
*(-) *maseyrem* 'evening' (< *ma-sairem*) *(+) *rayyon*[3] 'flying fish season'	(-) *deytoro* 'they give it' (< *da itoro*) (+) *to dey* 'just' (< *to da i*[4])	(+) *asa keyli* 'one village' (< *asa ka-ili*) (+) *iseysanan* 'hotel' (< *isa-isan-an*)
(-) *kalowdan* 'deep sea' (< *ka-laod-an*) (+) *katawtao* 'self' (< *ka-tao-tao*)	(-) *sirewri* 'they that' (< *sira ori*)	(+) *makowbot* 'go out' (< *maka-obot*), (+) *oyówyat* 'strength' (< *oya-oyat*), (+) *mówney* 'long time' (< *ma-onay*) (+) *Imowrod* 'village name' (< *ima-orod*)

*(-) Iraralay only
*(+) Iraralay and Iratay

Other evidence in support of the hypothesis that the raising rule is an innovation can be found in traditional lyrics. As mentioned above in (3) that *maseyrem* 'evening' is derived from *masairem*. The form *lairem*[5] 'evening' is found in Corpus C, produced by an Iraralay female singer in a love song set to the melody of clapping songs (Knight & Lu 2005). In addition, there is one case of non-raised word final /aw/ followed by a pause, e.g., *imaziniaw* 'outsider, other ethnic group', produced by a male Iraralay singer in his account of the origin of clapping songs.

However, some established [əy] forms are beginning to be raised even further to [iy], i.e., [ay] > [əy] > [iy]. The examples found in Corpus A, as shown in (4), illustrate several examples that usually have the -ey forms on the island but have undergone

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[3] The Iratay variant is *rayon*.

[4] The hesitation marker or filler *i* occurs frequently after bound pronouns and *akma* 'like' in set phrases. The unraised form *akmay* can still be found in a traditional lyric by an Iratay singer in Corpus C, although all the other singers from the raising areas used *akmey*.

[5] The /l/ occurs in old festival lyrics or *raod* to replace other segments in speech. For example, *lairem* vs. *sairem* 'evening', *veley* vs. *vahey* 'house', *alorod* vs. *aorod* 'song', *langara* vs. *tangara* 'raise one's head'.

further raising and fronting to the high front vowel /iy/.

(4)

iy	ey
piciylilian 'each village'	*piceylilian*
tiyesa 'each one'	*teyesa*

3.3 A new development

As discussed in the previous paragraphs, raising in (ay)[6] seems to have progressed faster in the Yami phonological system than (aw), so that raising has been completed in some word final (ay) in certain words in the traditionally non-raising areas. In addition, the lowering and diphthongization rule is beginning to affect /i/ across morpheme boundaries, which are found to be the most easily affected environment in an innovative rule application.

Based on a close examination of Corpus B, three prefixes with /i/ were identified as undergoing lowering and diphthongization change in the raising area: *pi-*, *mi-*, and *ni-*. The first two are transitive and intransitive verb prefixes, respectively, whereas the last one refers to the superlative degree in collocation with the genitive pronoun *na*. The following examples in (5) illustrate the different spellings in the Bible and Dong's Iratay spellings.

(5)

Prefix	pi-	mi-	ni- … na
Bible (Iranomilek and Iralalay)	*pey-pey-pangayan* 'meaning'	*mey-yangay* 'the same'	*ney-manowji na* 'the last'
Iratay	*pi-pi-pangayan*	*mi-yangay*	*ni-manowji na*

The same sound change occurring in the superlative *ni-* has spread to some archaic perfective *-in-* but not to the more productive perfective *ni-*. For example, *pey-ney-nozyan* 'place of prayer' in the Bible is derived from *p-in-i-nozian*[7] with a reanalysis.

The prefix *pey-* seems to have been affected by the lowering and diphthongization rule earlier than *ney-*, based on examples such as *p-in-ey-rawalow* 'was ruined' and *p-in-ey-kavali* 'was broken in half', in Corpus C by an Iraralay singer. This indicates

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[6] A similar variation between *-ey* and *-ay* is also found in Siraya in Adelaar (2000), as pointed out by an anonymous reviewer.

[7] The perfective *-in-* only occurs in archaic forms where the infix is no longer productive. For productive use, the prefix *ni-* is used to indicate perfectivity.

-in- is not affected by the rule. In addition, the grammaticalized form *mi* 'go' from *mangay* 'go' also has the lowered and diphthongized counterpart *mey* in the Bible.

The other evidence in support of the variation between /i/ and /ey/ can be found in *si aman macinanao*'s account of the traditional clapping songs in celebration of the completion of a work house in Corpus A. Unlike the raising rule which is well established, the lowering and diphthongization rule is more recent because there is much more variation in the tokens with *(mi-)/(pi-)*. The *mey-/pey-* forms are more frequent than the *mi-/pi-* counterparts. Examples with the same root *kariag* are illustrated in (6).

(6) Words derived from *kariag*

/ey/	/i/
mey-kariag 'clap hands'	*ni-mi-kariag* 'clapped hands to sing'
pey-kariag-an 'place where people clap hands to sing'	*ka-pi-key-kariag*[8] 'clapping and singing'
i-ka-pey-kariag 'reason to clap hands to sing'	

In summary, whereas the (ay) raising has progressed to the high front vowel /i/, some prefixes with the high front vowel /i/ are beginning to undergo a lowering and diphthongization rule to /ey/ [əy], making an interesting loop, i.e., ay > əy > iy > əy. The (aw) variable, on the other hand, undergoes the raising rule in a slower pace. Thus we have not seen any reversal changes from /o/ [u] to /ew/ [əw].

4. Quantitative analysis

In the following analysis, we only discuss the results of word final diphthongs due to space limitations. A comprehensive quantitative analysis testing all the hypotheses generated from our qualitative analysis awaits future studies.

4.1 Generation of hypotheses

To clarify and explain the variation of (ay) and (aw) in Yami, based on the theoretical work in sociolinguistic variation studies, six hypotheses were formulated for the quantitative study:

According to Kaye & Lowenstamm (1981), a coda is more often modified than an

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[8] The /ey/ is *-key-* is a type of reduplication. See Rau & Dong (2005) for details.

onset. In our observations of the raising phenomenon, (ay) and (aw) occurring in word final positions seem to be more prone to modification than any other positions, thus:

Hypothesis 1: Word-final positions of (ay) and (aw) promote raising, while non-word final positions inhibit it.

According to Labov (1972), the favoring preceding consonants in centralized /ay/ are lateral and nasal. The ordering of the effect of the preceding phonological environment of (ay) in Blake & Josey's (2003) Martha's Vineyard is: nasal > voiceless obstruent > lateral > voiced obstruent. We would like to test whether the same hierarchy might apply to (ay) and (aw) raising in Yami or whether it might be language specific, thus:

Hypothesis 2: Preceding nasals promote the production of the raised (ay), while voiced obstruents inhibit it.

Building on hypothesis 2, it is further predicted that:

Hypothesis 3: Preceding nasals promote the production of the raised (aw), while voiced obstruents inhibit it.

Previous studies (e.g., Rau 1995) indicate that (ay) and (aw) raising is a phonological feature specific to the northeast coast of the island, thus:

Hypothesis 4: Yayo, Iraralay, Iranomilek, and Ivalino villages on the northeast coast promote the raised production of (ay) and (aw), while Iratay and Imowrod inhibit it.

Many studies have shown that males and females within a community exploit linguistic resources differently (e.g., Eckert 1996, 2000, Labov 1963, 1972). Thomas (1988) investigated a South Wales community and found women were more likely than men to preserve local Welsh dialect features. The gender differences are certainly related to identities and social network in the respective communities. Thus, we have the following hypothesis:

Hypothesis 5: Men promote the raised production of (ay) and (aw), while women inhibit it.

Finally as a direct test of sound change in progress, we assume raising is continuing in the younger generation, and thus:

Hypothesis 6: Younger people promote raised (ay) and (aw), while the elderly inhibit it.

4.2 Coding

All the tokens of (ay) and (aw) in Corpus D were coded. The spoken data yielded 1607 (ay) and 420 (aw) tokens. Like Labov's Martha's Vineyard's database (1972), (aw) also occurs less frequently than (ay) in this study. The dependent variable in this study is the raised /ay/ and /aw/. All of the raised diphthongs [iy, əy, əw, uw] were coded the same as application of the raising rule; on the other hand, non-raised diphthongs [ay, aw]

were coded as the non-application forms.

There are six factor groups for the independent variables, including three phonological factor groups and three social factor groups (see Appendix A for (ay) and B for (aw)). Several illegible tokens of the dependent variable were not coded, for instance, when a speaker was too excited to speak clearly.

5. Results

After the initial VARBRUL run, recoding the factors within groups, and eliminating non-significant factors or factor groups, the results demonstrate reliable values. Word position, age, and gender factor groups were eliminated. Thus, we cannot confirm three hypotheses: Hypothesis 1 (Word-final positions of (ay) and (aw) promote raising, while non-word final positions inhibit it), Hypothesis 5: (Men promote the raised production of (ay) and (aw), while women inhibit it), and Hypothesis 6: (Younger people promote raised (ay) and (aw), while the elderly inhibit it). However, since our focus is only on word final (ay) and (aw), position is no longer a relevant issue for us. Furthermore, since very few Yami speakers under 30 years of age could carry on a conversation in Yami without code-switching with Mandarin, it will probably be very difficult to pursue hypothesis 6. Therefore, in the following sections, we only discuss the effect of preceding segments and regional differences.

Before we move on to the results, a brief explanation of how to interpret VARBRUL values is in order. Note that there is a standard formula to interpret the VARBRUL weights. For each factor, there is a value (i.e., weight) ranging from 0.00 to 1.00. VARBRUL factor values of more than 0.5 indicate a favoring effect by the factor while values of less than 0.5 indicate a disfavoring effect. A value of 0.5 means that the factor has no significant effect on nucleus raising.

5.1 The case of /ay/

Table 1 shows the variable patterning of raised /ay/. The results of (ay) yielded 1607 tokens from 46 speakers.

Table 1: The Variable patterning of raised /ay/

	Unraised N / %	Raised N / %	Totals N
Villages			
Yayo	63 / 17.5	304 / 82.5	367
Iranomilek	91 / 21.6	330 / 78.4	421
Iraralay	7 / 26.9	19 / 72.1	26
Ivalino	37 / 60.6	24 / 39.4	61
Iratay	553 / 82.9	114 / 17.1	667
Imowrod	54 / 83.1	11 / 16.9	65
Total	805 / 50.3	796 / 49.7	1607
Preceding Segment			
Liquid / Trill	74 / 32.9	151 / 67.1	225
Voiced obstruent	88 / 33.8	172 / 66.2	260
Vowel (vowel & semi-vowel)	39 / 44.3	49 / 55.7	88
Voiceless obstruent	148 / 52.5	134 / 57.5	282
Nasal	456 / 58.7	296 / 41.3	752
Total	805 / 50.1	802 / 49.9	1607
All Speakers (46)			

As indicated in Table 1, the total percentage of raised /ay/ tokens is 49.9%. In the village factor group, Yayo has the greatest percentage of raised tokens with 82%, exceeding Iranomilek (78.4%) and Iraralay (72.1%). Ivalino (39.4%) actually patterned closer to the nonraising areas than the raising areas. Furthermore, in the linguistic environment, the greatest percentage of raised /ay/ is liquid & trill /r, l, z/ (67.1%). This is followed by voiced obstruent with 66.2%.

The final results from the VARBRUL analysis are presented in Table 2, which presents that the input probability has a value of 0.486. Most importantly, the total Chi-square has a value of 18.9326, less than 20.52 (*df* = 4, p = 0.001). Thus, we can interpret VARBRUL weights (values) to find out the influence of the factors. Social group presented in Table 2 shows the probability that /ay/ would be raised as [əy] or [iy] according to regional differences: Imowrod and Iratay strongly disfavor raising of /ay/ (P*i* = 0.167); however, the other villages including Yayo, Iraraley, Iraomilek, and Ivalino strongly favor raising (P*i* = 0.793). That is to say, the results confirm Hypothesis 4: Yayo, Iraralay, Iranomilek, and Ivalino villages on the northeast coast promote the raised production of (ay), while Iratay and Imowrod inhibit it.

Table 2: VARBRUL result for /ay/ raising

	Weight
Social Factor	
Yayo / Iraralay / Iranomilek / Ivalino	0.793
Imowrod / Iratay	0.167
Linguistic Factors	
Peceding Segement	
Voiced obstruent	**0.767**
Liquid / Trill	**0.602**
Vowel	0.489
Voiceless obstruent	**0.432**
Nasal	**0.395**

Input Probability = 0.486
Total Chi-square = 18.9326 (df = 5, p = 0.001, Chi-square = 20.52)
Chi-square/cell = 1.8933
Log likelihood = -760.271

Moreover, the results show that preceding segments including voiced obstruents (e.g., /d, g, v, h/) and liquid/trill (e.g., /r, l, z/) are the immediate phonetic environments favoring the raised /ay/. On the other hand, the vowel factor has no effect on /ay/ raising (Pi = 0.489), such as /i/ (e.g., *maviay* 'alive'), central and back vowel /a, o/ (e.g., *kangaay* 'usual', *isaboay* 'lift'), and semi vowel /w/ (e.g., *makajiway* 'diligent, industrious'). Furthermore, there are two other factors inhibiting (ay) raising, i.e., voiceless obstruent (Pi = 0.432) and nasal (Pi = 0.395). That is, preceding voiceless obsruents /p, t, k, s/ in words such as *cinapay* 'vegetable', *miatay* 'pass by', *mehakay* 'male' and nasals /n, m, ŋ/ (e.g., *aonay* 'long time', *pangamay* 'cursing', and *nongay* 'move forward') inhibit /ay/ raising.

The ordering of the effect of the preceding segments of (ay) in the present study is scaled as follows:

Voiced obstruent (0.767) > Liquid & trill (0.602) > Vowel & semi vowel (0.49) > Voiceless obstruent (0.43) > **Nasal (0.40)**

Obviously, our results differ from Labov's (1972) and Blake & Josey's (2003) studies in that nasals /n, m, ŋ/ disfavor /ay/ raising in the present study, while voiced obstruents /d, g, v, h/ promote /ay/ raising. In other words, our results do not support

Hypothesis 2: Preceding nasals promote the production of the raised (ay) and (aw), while voiced obstruents inhibit it. This implies the hierarchy established in English is language specific.

5.2 The case of /aw/

Now let us turn to the variation of /aw/. The results of (aw) yielded 406 tokens from 46 speakers. The frequencies and VARBRUL probabilities of the raised /aw/ are displayed in Table 3. Like the results of /ay/, the results of /aw/ show that Yayo, Iraralay, Iranomilek, and Ivalino villages strongly favor the raising of /aw/ with (Pi = 0.796). However, Imowrod and Iratay villages disfavor the raising (Pi = 0.125). Again, the result confirm Hypothesis 3: The villages on the northeast coast promote the raised production of (ay) and (aw), while the other two on the southeast coast inhibit it.

Table 3: The frequencies and VARBRUL probabilities of raised /aw/

	Raised N	Total N	VARBRUL Weight
Scoial Factor			
Yayo / Iraralay / Iranomilek / Ivalino	168	239	**0.796**
Imowrod / Iratay	15	152	**0.125**
Linguistic Factor			
Precding segment			
Liquid / Trill	95	177	**0.628**
Voiced obstruent	17	41	**0.464**
Voiceless obstruent	54	145	0.399
Vowel	17	43	0.344

Input Probability = 0.389

Total Chi-square = 11.2334 (df=4, Chi-square = 13.28, p = 0.01)

Chi-square/cell = 1.4042

Log likelihood = -188.928

The factor of preceding nasals was deleted due to its small number of tokens (only 15) and lack of statistical significance. Thus, as shown in Table 3, preceding liquid & trill factor /r, l, z/ promote raising in such words as *mararaw* 'noon', *iyaipasalaw* 'swallow', and *nivozaw* 'leave'. Voiced obstruent /d, g, v, h/ (e.g., *midadowdaw* 'very sad', *mavokahaw* 'worry') slightly inhibits /aw/ raising. This is followed by voiceless obstruent /p, t, k, s/ (e.g., *yapapaw* 'miss', *attaw* 'sea', *manakaw* 'steal', and *kazisaw* 'cursing'). Moreover, the most inhibiting factor is a vowel or semi-vowel /i, a, o, w/

(e.g., *katoaw* 'out', *miyoyowyaw* 'go to play', *kapitotowaw* 'appear') with the probability weight of 0.344.

The ordering of the effect of the preceding phonological environment of (aw) in the present study is scaled as follows:

Liquid & trill (0.628) > Voiced obstruent (0.464) > Voiceless obstruent (0.399) > Vowel (0.344).

All in all, the results indicate that voiced obstruents inhibit /aw/ raising. But the tokens with nasals were too small to have any significant effect. Thus the results partially confirm Hypothesis 3. Nevertheless, it still indicates the hierarchy established for English is language specific.

5.3 Discussion

Our results confirmed that the word final (ay) and (aw) raising rule applies in the four villages on the northeast coast of the island, whereas the other two villages on the southwest coast remain primarily unraised. A closer look at the percentages of (ay) raising in Table 1 allows us to see the respective frequencies of raising in Yayo and Ivalino. As shown in Figure 2, Yayo is the administrative center on the island. From the frequent use of the raised variants of the variable (ay) there, it can be inferred that the innovative (ay) raising is considered prestigious now. On the other hand, Ivalino speakers displayed half as much raising as their neighbors, although in the statistical analysis, Ivalino was still grouped with the raising areas.

Although the raising rule only indicates geographical differences but does not have any relationship with age or gender; nevertheless, whether any relationship with social identity is being developed remains to be seen, especially when the raising areas tend to preserve Yami much more effectively than do the non-raising areas (Rau 1995).

We have also determined the preceding phonetic environments in favor of raising for both (ay) and (aw). As shown in previous studies, each variable has its own history and patterns of variation. Although liquids and trills favored raising for both (ay) and (aw), voiced obstruents promoted (ay) raising but inhibited (aw) raising. This pattern is language specific and is part of the internalized grammar of a Yami native speaker.

One drawback of this quantitative analysis is the small size of the (aw) tokens, which is only half as many as the (ay) tokens. Therefore the results can only be considered preliminary.

6. Conclusion

Our qualitative analysis has revealed that the nucleus raising rule is an innovation in Yami and has progressed faster and longer in (ay) than in (aw). The same rule has also spread to environments such as a-i and a-o across morpheme boundaries. While (ay) is raised to the peripheral high front vowel /i/ in the raising areas, another change, of prefixes with the high front vowel (e.g., *mi-/pi-/ni-*) is reversing the direction and has begun to lower and diphthongize the nucleus [i] to [əy].

So far, we have only tested the raising rule in word final position in the follow up quantitative study. The raising rule has been identified as associated with geographical differences. However, the raising and non-raising areas also tend to be associated with language vitality. Perhaps a speculation on the relationship between ethnic identity and raising is not implausible, especially when the innovations are led by Iraralay, the same area that preserves Yami the best on the island.

Finally the raising and lowering rules seem to play different roles in the language. Whereas the word final raising (ay) and (aw) was considered predictable and was still transcribed as the non-raised variants in the Bible, other raised variants in a-i and a-o are represented by the raised variants. This indicates the former has stylistic variation (writing vs. speaking) but the latter does not. Thus the word final (ay) and (aw) can be considered as sociolinguistic variables, whereas the (a-i) and (a-o) are only sociolinguistic indicators. Furthermore, the lowering and diphthongization rule is also represented by the spoken variants in the Bible, which indicates (i) is another case of sociolinguistic indicator. The exact patterns of phonological variation in the sociolinguistic indicators await future studies.

Appendix A: The coding sheet for (ay)

Dependent variable:

    FG1: Production of raised (ay)

        1 = raised (ay) production

        0 = un-raised (ay) production

Independent variable:

    FG2: Word position

        f = (ay) occurs in word-final (e.g., *kararay* 'classmate')

        m = (ay) occurs in medial position (e.g., *angayan* 'take')

    FG3: Preceding segment

        i = high front vowel (e.g., *maviay* 'alive')

        a = central vowel (e.g., *kangaay* 'usual')

        o = back high vowel (e.g., *isaboay* 'lift')

        w = semi-vowel (e.g., *makajiway* 'diligent, industrious')

        d = retroflex stop (e.g., *adaday* 'all, full')

        t = alveolar stop (e.g., *miatay* 'pass by')

        p = labial stop (e.g., cinapay 'vegetable')

        s = retroflex fricative (e.g., rasarasay 'bottom board')

        k = velar stop (e.g., *mehakay* 'male')

        z = alveolar trill (e.g., *vazay* 'thing')

        r = retroflex liquid (e.g., *kararay* 'companion, friend')

        l = alveolar liquid (e.g., *awalay* 'Ouch!')

        n = alveolar nasal (e.g., *aonay* 'long time')

        m = labial nasal (e.g., *pangamay* 'cursing')

        ŋ = velar fricative (e.g., *nongay* 'move forward')

        h = uvular fricative (e.g., vahay 'home')

    FG4: Villages

        Y = Yayo

        I = Iranomilek

        Z = Iraralay

        V = Ivalino

        M = Imowrod

        T = Iratay

    FG5: Age

        m = under 55

        o = 55 +

    FG6: Gender

        f = female

        m = male

Appendix B: The coding sheet for (aw)

Dependent variable:

    FG1: Production of raised (aw)

        1 = raised (aw) production

        0 = un-raised (aw) production

Independent variable:

    FG2: Word position

        f = (aw) occurs in word-final (e.g., *pakaw* 'ceiling')

        m = (aw) occurs in media position (e.g., *arawan* 'day')

    FG3: Preceding consonant

        i = high front vowel (e.g., *makaniaw* 'taboo')

        o = back high vowel (e.g., *mitotoaw* 'out')

        w = semi-vowel (e.g., *nowaw* 'blister')

        d = retroflex stop (e.g., *midadowdaw* 'very sad')

        t = alveolar stop (e.g., *attaw* 'sea')

        p = labial stop (e.g., *yapapaw* 'miss')

        s = retroflex fricative (e.g., *kazisaw* 'cursing')

        k = velar stop (e.g., manakaw 'steal')

        z = alveolar trill (e.g., *nivozaw* 'leave')

        h = uvular fricative (e.g., *mavokahaw* 'worry')

        r = retroflex liquid (e.g.*, mararaw* 'noon')

        l = alveolar liquid (e.g., *iyaipasalaw* 'swallow')

        n = alveolar nasal (e.g., *meynaw* 'strong fishy taste')

        m = labial nasal (e.g., *tazmamaw* 'illusion')

    FG4: Villages

        Y = Yayo

        I = Iranomilek

        Z = Iraralay

        V = Ivalino

        M = Imowrod

        T = Iratay

    FG5: Age

        m = under 55

        o = 55 +

    FG6: Gender

        f = female

        m = male

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