A TONAL GRAMMAR OF KERE (PAPUAN) IN TYPOLOGICAL PERSPECTIVE

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DEDICATION

For the Kere community, Poppa, and Casey, of course.

me truly understand how critical the issue of language loss is in these communities. For all of this support, I am extremely grateful.

Finally, I would like to thank my family (Rarrick and Teeters) and friends, especially my Dani and my wonderful cohortians. Thank you for always supporting my work and helping me laugh through the tough days. Without your encouragement, words of advice, and pictures of dogs, I don't know where I would be. I love you all immensely.

ABSTRACT

While tonal systems have typically been classified as 'pitch accent' or 'true tonal', there is growing evidence that systems instead have a variety of features which vary across languages, rather than falling into discrete categories. These category labels have been used widely in literature about the languages of New Guinea, despite the fact that the languages of this region exhibit a variety of tonal phenomena, and few are well-understood by tonal phonologists. Kere is an endangered Trans New Guinea language of Chimbu province in Papua New Guinea which has a complex, sparse tonal system that has yet to be adequately documented and described. After describing the segmental phonology of the language, this dissertation describes and presents an analysis of the tonal system of Kere, focusing on the following questions:

- What are the phonological rules of tone in this language?

- Is Kere a pitch-accent or tonal language, or something in between, like Kuman?

- How can a model of interrelated varieties with differences in tone (proposed here) apply to other situations in Trans New Guinea languages?

- What does this system tell us about tone systems typologically?

This work aims to add to phonologists' and typologists' understanding of tonal systems across languages.

In order to typologize Kere's tonal system, I compare its tonal features to those of other Trans New Guinea languages (especially Kuman), as well as other languages around the world. Based on this comparison, I argue that the Kere data add to the growing evidence that tonal

systems make up a multi-dimensional matrix of features, rather than having clear end points

along a single continuum like 'pitch accent' or 'true tonal'. Thus, tonal typology should be

primarily property-driven. This dissertation aims to broaden our understanding of what is

possible in tonal systems around the world (Donohue 1997; Donohue 2005) and to add to the

description of an endangered language with an unusual tonal system.

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ABBREVIATIONS & SYMBOLS[1]

1	First person
2	Second person
3	Third person
ant[2]	anterior
C	Consonant
con	Consonantal
cont	Continuant
cor	Coronal
conj	Conjunction
dem	Demonstrative
emph	Emphatic
F	Features
H	High tone
H⁺	Extra high tone
imp	Imperative
indf	Indefinite
indic	Indicative
int	Intensifier
L	Low tone
L⁺	Extra low tone
lat	Lateral
nas	Nasal
nfut	Non-future tense
P	Place (of articulation)
pl	Plural
poss	Possessive
rd	Rounded

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[1] Many of these abbreviations and rules follow the Leipzig glossing rules (Comrie, Haspelmath & Bickel 2015).

[2] All feature abbreviations are taken from Odden (2005).

TBU	Tone-bearing unit
seq	Sequential
sg	Singular
son	Sonorant
SR	Surface representation
syl	Syllabic
top	Topicalizer
UR	Underlying representation
U	Unspecified tone
V	Vowel
vb	Verb
v́	Syllable with high tone[3] (only marked on nucleus)
v́⁺	Syllable with extra high tone (only marked on nucleus)
ˈC	Primary stress
ˌC	Secondary stress
C̦	Syllabic consonant
$	Syllable boundary
#	Word boundary
Ø	Null segment
*	Ungrammatical utterance
%	Postlexical tone
?	Questionably grammatical utterance

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[3] Low tone is unmarked

Phoneme	Orthographic representation
/p/	p
/b/	b
/t/	t
/d/	d
/k/	k
/g/	g
/s/	s
/m/	m
/n/	n
/ɾ/	r
/l/	l
/w/	w
/j/	y
/i/	i
/u/	u
/ɛ/	e
/ɔ/	o
/a/	a

CHAPTER 1
INTRODUCTION

Kere is a variety of Sinasina (ISO 639-3 sst) spoken in the Simbu province of Papua New Guinea. Like many languages of the area, Kere's tonal system is unlike the dense lexical tonal systems of Chinese languages (Yip 1995), and is unlike the pitch accent systems found in languages like Japanese (Haraguchi 1988; Pierrehumbert & Beckman 1988) and other Papuan languages (Foley 1986). As a tonal grammar[4], this dissertation aims to describe Kere's phonology, especially that of its tonal system, and to place it in typological perspective by comparing it to other systems found in New Guinea and around the world. The contributions of this work include adding to the description of an endangered and previously unreported language and to linguists' understanding of tonal systems in general and in Trans New Guinea languages in particular. I also provide an analysis of the segmental and non-tonological suprasegmental phonology of this language. My research questions are as follows:

- What are the phonological rules of tone in this language?

- Is Kere a pitch-accent or tonal language, or something in between, like Kuman?

- How can a model of related varieties with differences in tone apply to other situations in New Guinea?

- What does this system tell us typologically?

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[4] A "tonal grammar" is a work which addresses the phonological rules and processes of tone in a language in addition to the grammatical function of tone. This term is used throughout literature for languages with lexical or postlexical tone (Cope 1966; Khoali 1991; Elimelech 2005).

In order to address these questions, I have organized this dissertation into five chapters. This first chapter addresses background information on this language and the autosegmental-metrical approach I use in my analysis. It also addresses my methodology and fieldwork procedures and the conventions I use throughout this dissertation. In chapter 2, I discuss segmental phonology, including Kere's phonemes and their allophones, phonotactics, phonological rules, and rhythm and stress. In chapter 3, I address lexical tonal phonology, looking at patterns found from the tonemic level through changes in discourse. Chapter 4 provides a discussion of the tonal patterns presented in chapter 3 and compares the tonal system of Kere to those of other languages, including Kuman, other Trans New Guinea languages, and languages around the world. Throughout this dissertation, I also address the model of varieties which is currently called "Sinasina" and address the best practices for documenting and labeling similar varieties. Finally, in chapter 5, I provide a summary of my analysis and conclusions and make suggestions for further research on Kere and other languages of New Guinea.

FIGURE 1. MAP OF KERE IN RELATION TO PAPUA NEW GUINEA
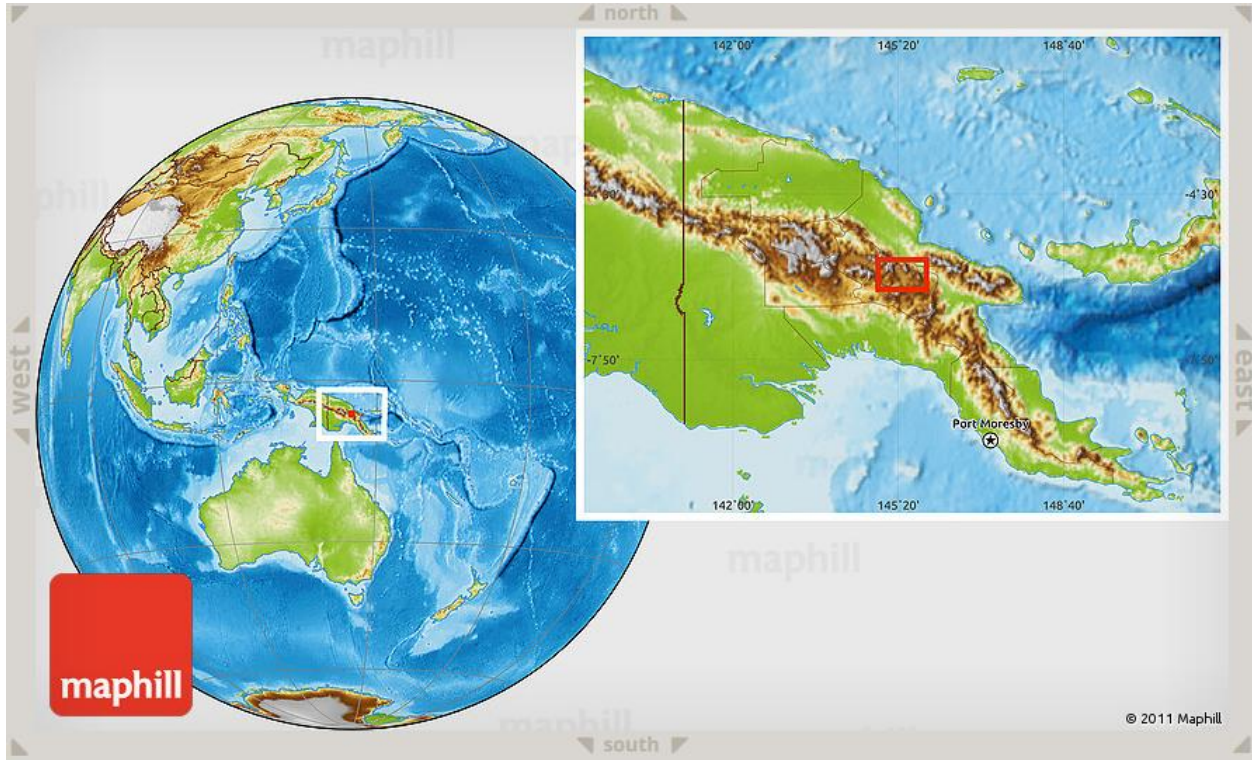
(Maphill 2011)

1.1. Language background

Based on my own survey, Kere is spoken by fewer than 1000 individuals, few of whom are under thirty, in the Sinasina-Yonggamugl district of the Chimbu province of Papua New Guinea highlighted in Figure 1 above. It is a member of the Chimbu family and is thus related to other Chimbu languages in the Trans New Guinea group, including Kuman, Dom, Chuave, Golin, Nomane, and Salt-Yui (Capell 1949a; Foley 2000; Lewis, Simons, and Fennig 2015; Wurm 1961), see Figure 2. Kere is a variety of what has been labeled in the past as 'Sinasina' (ISO 693-3 sst), and is primarily spoken in a group of villages, including Du, Silma, Mondia, and Gateway. These villages are approximately a one-hour drive (approximately 25 km) south of

Kundiawa, the capital of Chimbu Province, and a two-hour drive (approximately 80 km) west of

Goroka, the capital of Eastern Highlands Province, as seen in the maps below (Figure 3, Figure

4, and Figure 5). The basic word order of this language is SOV and it is synthetic, as is the case

for closely-related languages (Foley 2000; Evans 2010).

FIGURE 2. KERE AND THE CHIMBU-WAHGI SUBGROUPING
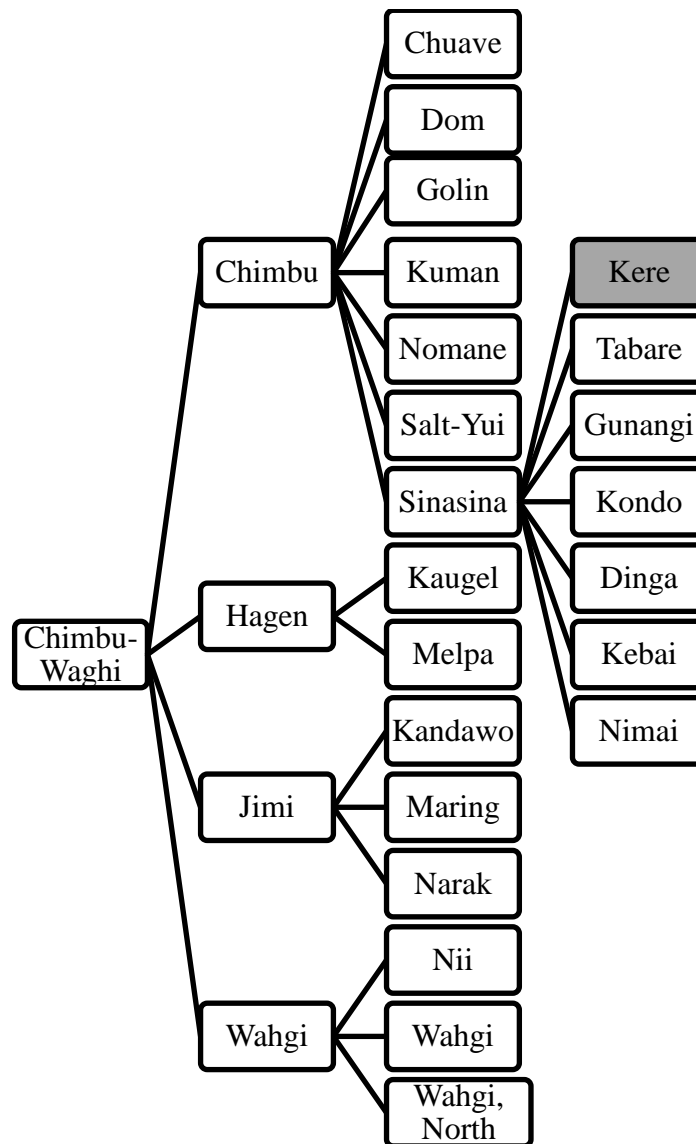
(reproduced from Rarrick 2014; based on Capell 1949a; Foley 2000; Lewis, Simons, and Fennig 2015; Wurm 1961)

1.1.1. Endangerment

While Wurm (1981) reports that there are approximately 25,000 speakers of Sinasina, Kere is clearly endangered for a variety of reasons; its overall speaker numbers are low (less than 1000), there are no child speakers, and its domains of use are fairly restricted. In schools, English and Tok Pisin are spoken. Kere is used in some everyday conversations amongst older community members and occasionally in church services and music. In each of these environments, however, Tok Pisin is also used and is the primary language of individuals under forty. It is unlikely that there are any living monolingual speakers of Kere due to this pervasiveness of the use of Tok Pisin.

Members of the Kere community are aware of its endangered status. Individuals often report that younger people do not speak the language, and that language shift to Tok Pisin and English is rampant, which is an issue for small languages in the province and across the country (Hardie 2003; Aikhenvald 2010). In more urban settings in Chimbu province, like Kundiawa, Kuman is also used as it has a much higher number of speakers and is indigenous to the area surrounding the town (Hardie 2003). Because the Kere villages are also quite remote, elders additionally report that young women do not want to move there once they are married to a Kere man, as is consistent with their patrilocal traditions; instead men are moving to their wives' villages, which has led to few individuals under thirty continuing to live in the village and speaking Kere regularly. Despite this, members of the Kere community have quite positive attitudes towards their language and there is interest in revitalization efforts.

FIGURE 3. MAP OF SINASINA IN RELATION TO THE TOWN OF KUNDIAWA AND NEARBY LANGUAGES

245 Ipili
299 Enga
300 Kyaka
301 Melpa
302 Maring
403 Huli
404 Onobasulu
405 Kaluli
410 Kasua
411 Fasu
412 Foi
413 Fiwaga
414 Samberigi
415 Erave
416 Wiru
417 Imbongu
418 East Kewa
419 West Kewa
420 Angal Enen
421 Angal Heneng
422 Angal
423 Umbu-Ungu
424 Bo-Ung
425 Nii
426 North Wahgi
427 Narak
428 Kandawo
429 Kuman
430 Wahgi
431 Dom
432 Golin
433 Dadibi
434 Folopa
435 Pawaia
436 Gimi [gim]
437 Nomane
438 Salt-Yui
439 Chuave
440 Sinasina

PAPUA NEW GUINEA
MAP 9

0 10 20 30 40 km

Language Families
Trans-New Guinea

— — — Province boundaries

Note: White areas are sparsely populated or uninhabited.

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FIGURE 4. MAP OF SINASINA IN RELATION TO THE TOWN OF GOROKA AND NEARBY LANGUAGES

PAPUA NEW GUINEA
MAP 10

Language Families

Austronesian
Trans-New Guinea

Notes:
1. White areas are sparsely populated or uninhabited.
2. Dashed lines show overlap of language areas.
3. Parentheses show the number of times a language's number appears on map, if more than once.

— — — Province boundaries

0 10 20 30 40 km

367 Gende
368 Faita
371 Urigina
372 Sinsauru
374 Pulabu
376 Waube
387 Yabong
390 Awad Bing
429 Kuman
435 Pawaia (2)
436 Gimi [gim]
437 Nomane
438 Salt-Yui
439 Chuave
440 Sinasina
441 Siane
442 Tokano
443 Dano
444 Biyom
445 Tauya
446 Sausi
447 Asas
448 Kesawai

449 Isabi
450 Alekano
451 Benabena
452 Yaweyuha
453 Yagaria
454 Keyagana
455 Fore
456 Simbari
457 Yipma
458 Kenati
459 Owenia
460 Awa
461 Kosena
462 Usarufa
463 Kanite
464 Inoke-Yate
465 Abaga
466 Kamano (2)
467 Ontenu
468 Awiyaana
469 South Tairora
470 North Tairora
471 Gadsup

472 Binumarien
473 Agarabi
474 Mari [hob]
475 Watiwa
476 Rawa
477 Saep
478 Nekgini
479 Madi
480 Ngaing
481 Nankina (2)
482 Ma (2)
483 Iyo
484 Wasembo
485 Ufim
486 Awara
487 Adzera
488 Wampur
489 Waffa
490 Safeyoka
491 North Watut
492 Middle Watut

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(Lewis, Simons, and Fennig 2015)

FIGURE 5. MAP OF SINASINA VARIETIES & TRIBAL BOUNDARIES

(Hide et al. 1979: 1)

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Language shift and the decrease in speakers living in the community have also occurred very quickly. Approximately fifty years ago, Kere was the primary language of this community. At that time, no one spoke English and few spoke Tok Pisin (Ian Hughes, pers. comm.). Certain aspects of their traditional lifestyle are also endangered, including the making of traditional instruments, courtship ceremonies, and tending to crops and pigs. My research has also focused on documenting and preserving information of this sort in Kere, as this is a concern of the Kere community, so many of the texts on which my analysis relies are related to these subjects.

While Kere is an endangered language, its tonal system is being lost especially quickly. The youngest generation of speakers, who are thirty to forty years old, often do not produce the same tonal patterns as older speakers. At least one speaker does not produce lexical tone and had little metalinguistic knowledge about the tonal system. While older speakers will also often produce minimal pairs for tone when asked about this feature of their language, younger speakers are more likely to claim that such words are pronounced identically. Occasionally, younger speakers state that there is some difference in these instances, but are unsure of what it is. In words with high tone and more than two syllables, speakers younger than sixty tend to also produce variants with all low tones. This is likely related to the fact that lexical tone is especially sparse (with fewer words overtly specified for tone, see 3.3.6) in Kere and there are few minimal pairs for tone, especially in polysyllables. While Kere is certainly at risk of being lost in the next fifty years, I expect that its tonal system will be lost before then.

1.1.2. Varieties of Sinasina

Previous literature reports that Guna (known to the people of Sinasina as 'Gunangi') and Tabare are dialects of Sinasina (Lewis, Simons, and Fennig 2014; McVinney and Luzbetak

1954). However, in this area, there instead seems to be a network of varieties[5] with varying degrees of mutual intelligibility. This network includes Gunangi, Tabare, and Kere and other varieties. Similar situations are fairly common in the languages of New Guinea (Wurm & Laycock 1961:137-138; McElhanon 1971:136). In Sinasina, there seem to be an additional four varieties within this network: Nimai, Dinga, Kondo, and Kebai. These variety names also correspond to tribal labels, which are seen in some anthropological literature (Hide et al. 1979). Of these six varieties, Kere seems most closely related to Tabare, and many speakers report that the only difference between these two varieties is "tone" or "tune". This claim is further addressed in 3.5 and the relationship between these varieties is discussed in 4.5.

Tone differences among dialects of a language are found in languages around the world, including in Swedish (Gårding 1998) and Japanese (Abe 1998; Igarashi 2014). However, it is not clear whether tone is the primary difference between Tabare and Kere and the extent to which it affects mutual intelligibility. Comparative word list data suggests that there are also notable lexical differences, and understanding mutual intelligibility in this region is further complicated by language contact, multilingualism, (Salisbury 1962) and issues of identity. This dissertation will also address notable differences in tonal phonology between Kere and other varieties found in Sinasina (3.5) and best practices for labeling varieties (4.5) in this region.

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[5] I use the term 'variety' here, as it is neutral to linguistic identity and mutual intelligibility, unlike 'dialect', which suggests high levels of mutual intelligibility and a single linguistic identity.

1.2. Tone in an autosegmental-metrical framework

Early research defines tonal languages as those in which each syllable has a relative and tonemic pitch. These languages are found in eastern Asia, Africa west of Ethiopia and south of the Sahara, southwestern Mexico, New Guinea, and languages indigenous to the United States (Pike 1948). Since there is a wide range of tonal phenomena across languages, however, Hyman (2001) considers a language to have tone if some indication of pitch is in the lexical representation of any number of morphemes. Lexical tone is tone which is a feature of the word, while postlexical tone is tone which makes use of syntactic structure and operates across word boundaries, such as intonation (Crystal 2008). Considering Hyman's (2001) definition, Kere certainly has lexical tone to an extent and is considered a tonal language. Here, tone is defined as a phonological quality related to voice pitch, that is independent of segments and may be lexical or postlexical. A "tonal" language, however, is defined here as a language which has lexical tone.

Previous research has suggested that Papuan languages tend to have this sort of "true" (lexical) tone or pitch accent (Foley 1986; Hardie 2003; van der Hulst 2010). Languages with tone can have a range of tonal density, depending on relative number of tone-bearing units which are specified for tone in the lexicon, compared to those for which pitch is predictable or unspecified (Gussenhoven 2004). Pitch accent systems are those in which there is at least one type of tonal marker, such as high tone or some series of tones, which is restricted to specific, accented syllables, typically no more than one per word (Gussenhoven 2004; Hardie 2003). From this tonal marker, all other tones in the word are predictable in these systems (Crystal 2008).

It is important to note that an increasing body of recent research argues in favor of a continuum-based or feature-based approach to tonal typology, rather than a strict dichotomy between pitch accent and tone languages (Donohue 1997; McCawly 1978; Hardie 2003; van der Hulst & Smith 2010; Uchihara 2016). Tonal data from Kuman (Hardie 2003), a closely-related language, also supports this claim, as the tone system of this language seems to share features with both pitch-accent and dense lexical tone systems. This dissertation also addresses the benefits of these approaches in light of my analysis of Kere.

The autosegmental approach assumes that suprasegmental features such as stress and tone are autonomous elements that operate on separate tiers from segments and are associated with tone-bearing units (Gussenhoven 2004). This approach helps account for many tonal phenomena, including tonal assimilation (spreading) and contour tones which have simultaneous conflicting features, such as [+hightone] and [-hightone] (Odden 1995). It has also accounted for especially complex tonal assimilation and other tonal processes in a variety of languages including Igbo (Niger-Congo) (Goldsmith 1976), Siane (Gorokan) (James 1994), and Fore (Gorokan) (Scott 1990). This framework includes the association convention and obligatory contour principle, which account for underspecification, tone spreading, and other features of tonal phonology. A number of intermediate tiers have been proposed to account for language-specific phenomena and mid tones (Gussenhoven 2004).

Metrical phonology is a phonological theory which developed initially as a hierarchical theory for stress, based on prominence relations between both syntactic and morphological constituents. While this theory now also addresses syllable structure and phonological boundaries, it assumes that words and phrases have an underlying metrical structure with weak

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and strong nodes which shapes stress patterns (Crystal 2008). An Autosegmental-Metrical model for intonational phonology relies on the idea that segments like vowels and consonants operate on a separate tier from tones. This approach also assumes that the segmental tier maps on to a hierarchy of tiers which make up the utterance. Tones can then reference different levels of this structure in different ways. These models can be used to account for a variety of lexical and postlexical tonal systems (Gussenhoven 2004) and will be the framework for my analysis of Kere.

1.3. Intellectual merits of this dissertation

While tonal systems have been reported in several languages of the New Guinea highlands (Swick 1966; Bunn 1970; Hardie 2003), few have been adequately described. Furthermore, the available descriptions of these systems suggest that the languages of this area have unusual sets of tonal features, including Kuman (Hardie 2003), Dom (Tida 2000), and Wahgi (Phillips 1976). These languages have features which are unlike dense lexical tonal systems and unlike pitch-accent systems, like the morpheme's role of the tone-bearing unit in Kuman (Hardie 2003). While 'Sinasina' has been used as a language name throughout much of the existing literature on this region and is reported to exhibit tone (Capell 1948; McVinney & Luzbetak 1954), it has not been adequately described in the literature on any of its varieties. Capell (1948: 110) notes that, "some of the languages [of the New Guinea highlands] have a musical intonation; none, however, employs tone with a semantic significance." The analysis put forth in this dissertation suggests that this is not true of Kere. This dissertation also provides a description of the unusual tonal system of a variety which is underdescribed, endangered, and had not been reported by linguists before our work began with the Kere community.

This dissertation will also add to phonologists' and typologists' understanding of tonal systems across languages, as I compare the tonal features of Kere to those of other Trans New Guinea languages (especially Kuman), and other languages around the world. Despite the fact that many languages of this area are described as having pitch accent systems, there is substantial evidence from Kere and other languages that tonal systems should be described in terms of their features, rather than in terms of a binary classification with clear end points like 'pitch accent' or 'true tonal'. This dissertation aims to broaden our understanding of what is possible in tonal systems, address the benefits of the autosegmental-metrical framework in light of the Kere data, and lend support to the claim that tonal languages exhibit a range of tonal features. (Donohue 1997; Donohue 2005; Hyman 2009a; Hulst & Smith 2010).

Finally, the term 'Sinasina' has been used as a language name since as early as Capell 1948. In many different works, authors have used this label and reported two 'dialects' of this language: 'Tabare' and 'Guna' (Capell 1949; Wurm 1954; Wurm 1961; McElhanon 1971; Hardie 2003). However, this is not what speakers today believe is true of their language, and should be changed. In what follows, I provide suggestions for language labeling in documentation, especially in languages of the New Guinea highlands. This aims to contribute to best practices for language documentation and description in this region, focusing on speakers' use of *tok ples* labels and tribal identities, which have not always been considered in the past.

1.4. Methodology and fieldwork procedures

I collected the data used for this dissertation over thirty-five weeks of fieldwork in the highlands of Papua New Guinea between 2013 and 2016. This took place over four separate

trips, the longest of which was twenty-six weeks. Much of this time was spent in the Kere village of Du, with additional time spent working with Kere and Tabare people in the Tabare village of Mu and in Goroka in Eastern Highlands Province (see map). During my time there, I collected both video and audio recordings in Kere with a handful of recordings in Tabare for comparative purposes. My recordings of Kere total approximately 10 hours, while the Tabare recordings total approximately 2 hours. The Tabare data are entirely elicited, while approximately 2 hours of the Kere data were elicited, and 8 hours were naturalistic narratives and conversations. To the extent possible, recordings were balanced for gender and age, but older men are perceived to be better speakers of the language and have more prestige in the community and are therefore overrepresented in the data.

1.4.1. Kere documentation

This project was funded by the Endangered Languages Documentation Programme (ELDP) through the University of London which supported the video documentation of narratives in Kere (grant number MDP0305 awarded to Andrea Berez-Kroeker and Bafinuc Ilai). All of the associated recordings have been time-aligned in ELAN with transcription and translation into Tok Pisin and English. To the extent possible, my analysis relies on these natural data and approximately half of the examples provided here are from naturalistic data. I also elicited data and recorded interviews with speakers to WAV files using a Zoom H2N solid-state digital audio recorder at 44.1KHz/16 bits. Using the pitch track feature in Praat (Boersma & Weenink 2015), and the grouping tool available in Toney (Bird & Lee 2014), I was able to find and classify tonal patterns across the data. All video recordings of narratives have been archived (with permission) with the Endangered Languages Archive (ELAR). All audio recordings are

archived (with permission) with Kaipuleohone, University of Hawai'i Digital Archive

(https://scholarspace.manoa.hawaii.edu/handle/10125/42637), and will be made publicly

available in 2019.

1.4.2. Elicitation of tonal patterns

In order to understand the tonal patterns of Kere, I began by using word lists for

elicitation of lexical items in isolation. These elicitation sessions were primarily conducted in

Tok Pisin, while some were conducted in English. I started by collecting a 200 item Swadesh list

(Swadesh 1971) in Kere and then elicited items which are specified for tone in Kuman (Hardie

2003) (see Appendix A). Next, I identified words from these data with different tonal patterns

using Toney and Praat and re-elicited them from male and female speakers from a variety of ages

and backgrounds, including members of different clans and churches. In these sessions, I asked

consultants to translate words from Tok Pisin or English to Kere and to say these words slowly

and quickly in order to find if tone interacts with length and other segmental phonological

patterns. Later, I asked participants to reproduce these words in a variety of contexts to find

word-level, phrase-level, and sentence-level interactions and patterns, as well as the interactions

between lexical and postlexical tone.

To find patterns for nouns, I asked for phrases which included adjectives, adpositions,

possessives, and numerals, focusing on items with different underlying tonal patterns. To find

patterns for verbs, I asked for phrases which included active and stative verbs in transitive and

intransitive clauses, in addition to phrases with and without adverbial phrases. Finally, in order to

understand morphotonemic interactions, I elicited phrases which involve affixation and

compounding. For nouns, this focused on demonstratives and nominal compounds found in

naturalistic speech. For verbs, this focused on serial verbs and verbs with different polarities and aspect.

To find tonal interactions across clauses and in sentences, I asked speakers to produce a list of words which had different patterns in isolation and then to use them in various frames. These frames included those which put the target word in initial, medial, and final position within the sentence. Some of these included words with tone adjacent to the target word, while others did not. I also asked for translations of various coordinated and subjunctive clauses.

In order to elicit postlexical tonal patterns, I also used some frames which were declaratives, and others which were questions. An example of these types of frames is provided below. I also asked consultants to repeat words with different tonal patterns three times, in order to elicit list intonation. Consultants were also asked to create natural sentences for given words, as this proved to be a more natural task for most speakers and produced more natural responses. All patterns found in elicitation were also attested in the narrative video recordings.

(1)   Sample frame:
        _____ ne (kwí) da.
        'You say _____ (again)'

1.4.3. Understanding relationships between Kere and Tabare

Speakers of Kere often claim that tone is the only difference between Kere andTabare and that speakers understand each other well, despite this difference. In order to understand the nature of the relationship between the varieties of Sinasina (discussed in 4.5) and the role of tone in this relationship, I interviewed Tabare and Kere people about their understandings of this

relationship, in addition to comparing Swadesh lists for the varieties, and recording self-reported

comprehension and ability to identify varieties for Tabare and Kere audio clips. I chose to focus

on Kere and Tabare as opposed to other varieties because Kere was reported by speakers to be

most similar to Tabare. To test speakers' abilities to identify varieties out of context, I collected

short narratives from eleven speakers of Kere and nine speakers of Tabare. I also collected

narratives from three speakers of Gunangi and two speakers of Kondo. To the extent possible,

these recordings were balanced for gender and primarily came from fluent older speakers. I then

clipped the files into segments lasting between fifteen and thirty seconds and mixed them into

two random orders. Finally, I asked three Kere speakers and five Tabare speakers to listen to one

of the orders and to identify the language or *tok ples*. Participants were not told that the

recordings were from varieties of Sinasina and were also asked to rate how well they understood

each selection on a five-point Likert scale (Carifio & Perla 2007) in which '5' corresponded to

fully understanding and '1' corresponded to not understanding at all. The results of this, as well

as information about lexicostatistics from the Swadesh lists are addressed in 3.5 and 4.5, and a

summary of the data appears in Appendix B.

1.5. Conventions

Throughout this dissertation, I have made use of several abbreviations, symbols, and

orthographic symbols for Kere. Generally, abbreviations and glosses follow the Leipzig glossing

rules (Comrie, Haspelmath & Bickel 2015) and feature abbreviations from Odden 2005. A list of

all abbreviations and symbols is provided following the table of contents.

In examples, phonemic representations are written between slashes, while the surface realizations are written between square brackets and the English gloss is written in single quotes, as in the following.

(2)　Example structures:
/wagai/
[ˈwa.gai]
'good'

Both orthographically and in phonetic transcription, high tone is marked with an acute accent of the corresponding vowel or syllabic consonant. Low tone is not marked, as it is quite common and is defined as the absence of high tone in this language (see 3.2); however, there are words which are not specified for tone and are identical to words with all low tone in isolation (see 3.2.1). When referencing underlying tonal structures and their associations, L, U, or H (for low, unspecified, or high tone, respectively) is written above a phonetic form with association lines drawn between to represent the assignment of tone (Donohue 1997; Gussenhoven 2004; Crystal 2008). Likewise, syllabic consonants are marked with a combining stroke underneath both orthographically and phonetically.

(3)　H
　　　|
　　　pĺ̩
　　　'salt'

All other orthographic symbols are provided with the list of abbreviations and symbols. When referring to an orthographic representation, rather than a phonetic one, words within the body of the text are written in *italics* with a following gloss in single quotes, such as *wagai* 'good'.

CHAPTER 2
SEGMENTAL & NON-TONOLOGICAL SUPRASEGMENTAL PHONOLOGY

This chapter addresses the segmental and non-tonal suprasegmental phonology of Kere. I describe these aspects of the phonology of this language and compare my analysis to that found in the literature on related languages, especially Tabare (McVinney & Luzbetak 1954) and Kuman (Piau 1985; Hardie 2003; Pfantz & Pfantz 2005). Here, I provide phoneme charts for the consonants and vowels of Kere along with example words and my suggestions for their orthographic correspondences (2.1). In 2.2, I address stress and rhythm in the language, as a stress assignment rule is required early in this language. In 2.3, I address ten segmental phonological rules and their critical orderings. Finally, phonotactics of both vowels and consonants and permissible syllable structures are discussed in 2.4. Like many languages of the highlands of Papua New Guinea, the segmental phonology of Kere is not typologically unusual, but it has not been described in previous literature, and such a description will be essential in discussing the tonal system of this language (see chapter 3).

2.1. Phonemes

Kere has fourteen consonant phonemes, (including plosives, fricatives, nasals, a tap, a lateral, and approximants,) and five vowel phonemes, summarized in the figures below. This phoneme inventory is moderately symmetrical (Hararay & Paper 1957) and is consistent with the Tabare inventory reported by McVinney & Luzbetak (1954). It is also relatively simple, as is

common in Trans New Guinea languages (Foley 2000). There is only one fricative phoneme in Kere, but this is not especially unusual in Trans New Guinea languages (Pike 1964; Foley 2000) or languages in general (Maddieson 2013). Like many Trans New Guinea languages, there is a voicing distinction for plosives, but not other consonants in Kere (Pike 1964; Foley 2000). Example words for each of the Kere phonemes, including minimal and near-minimal pairs are provided in Table 2 below. For the purposes of this dissertation, I have devised an orthography which represents each phoneme as well as high tone. This is also summarized in column 2 of Table 2.

There is little variation of these phonemes, apart from the rule-based interactions described in 2.3. Voiceless plosives tend to occur unaspirated, but aspirated plosives do occur in free variation. As mentioned above, only plosives have a phonemic voicing distinction. This language does not have the glottal fricative /h/ which has been reported in several other Trans New Guinea languages (Pike 1964; Foley 2000) or any affricates. In Kere, Tabare, and other languages the velar nasal /ŋ/ (McVinney & Luzbetak 1954; Pike 1964) is considered to be a part of the consonant inventory. This consonant, however, is not considered to be part of Kuman's inventory (Piau 1985; Hardie 2003)[6.] The five vowels attested in Kere are found in most highlands languages (Pike 1964), including Kuman (Piau 1985; Hardie 2003) and many languages around the world (Maddieson 1984).

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[6] Further comparison of the segmental phonology of Kere and Kuman is provided in 2.4.

FIGURE 6. CONSONANT AND VOWEL PHONEMES

	Labial	Alveolar	Palatal	Velar
Plosive	p b	t d		k g
Fricative		s		
Nasal	m	n		ŋ
Tap		ɾ		
Lateral		l		
Glide	w		j	

Front   Back

High   i   u

Mid   ɛ   ɔ

Low   a
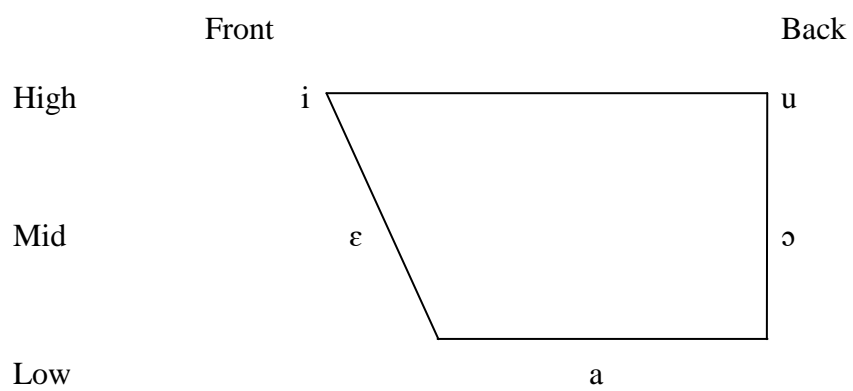
TABLE 1. DISTINCTIVE FEATURES OF VOWEL AND CONSONANT PHONEMES

	p	b	m	t	d	s	n	ɾ	l	j	k	g	ŋ	w	i	u	ɛ	ɔ	a
Syllabic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
Consonantal	+	+	+	+	+	+	+	+	+	-	+	+	+	-	-	-	-	-	-
Continuant	-	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+	+	+
Voice	-	+	+	-	+	-	+	+	+	+	-	+	+	+	+	+	+	+	+
Nasal	-	-	+	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-
Lateral	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Sonorant	-	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+	+	+
Coronal	-	-	-	+	+	+	+	+	+	+	-	-	-	-					
Anterior	+	+	+	+	+	+	+	+	+	-	-	-	-	-					
High	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	-	-	-
Low															-	-	-	-	+
Back	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
Round	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-
Tense															+	+	-	-	-

(based on Piau 1985; Hardie 2003; Odden 2005)

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TABLE 2. PHONEMES & EXAMPLES

Phoneme	Orthographic representation	Example word	Gloss
/p/	p	pá	'go-IMP'
/b/	b	ba	'month'
/t/	t	ta	INDF
/d/	d	da	'speak'
/k/	k	ka	'language'
/g/	g	gam	'skin'
/s/	s	slatal	'many'
/m/	m	mri	'heart'
/n/	n	na	1.SG
/ɾ/	r	ra	'DEM.PL'
/l/	l	aglá	'stand-IMP'
/w/	w	we	EMPH
/j/	y	yal	'man'
/i/	i	ki	'dog'
/u/	u	ku	'taste'
/ɛ/	e	ke	'build, cook'
/ɔ/	o	koma	'front, first'
/a/	a	kan	'see'

Previous research on Trans New Guinea languages demonstrates a handful of unique features of segmental phonology in these languages, but few of these features are found in Kere. Many related languages have prenasalized stops, including Wahgi (Chimbu-Wahgi) (Luzbetak 1954; Phillips 1976), Kafe (Gorokan) (Ford 1994), Kuman (Chimbu-Wahgi) (Piau 1985; Hardie 2003; Pfantz & Pfantz 2005), and Kanite, Benabena, and Gahuku (all Gorokan) (Young 1962). The plosives found in Kere and Tabare (McVinney & Luzbetak 1954), however, are not prenasalized. Some languages of the highlands of Papua New Guinea also tend to have unusual lateral consonants (Capell 1949a). Chimbu languages in particular tend to have a velar lateral /ʟ/ (Capell 1948), which is found in Kuman (Piau 1985; Hardie 2003; Pfantz & Pfantz 2005) and Wahgi (Phillips 1976), but this is not the case for either Kere or Tabare (McVinney & Luzbetak 1954). The only lateral consonant currently found in Kere is the alveolar lateral approximant /l/, despite the fact that Capell 1949a reports the velar lateral in Sinasina. Piau (1985) also reports that the distribution of [ɾ] is predictable in Kuman, appearing only word-medially, but this is not the case in Kere, seen in *ra* 'those' (DEM.PL) in Table 2 above.

2.2. Non-tonological suprasegmental phonology

This subsection addresses stress and rhythm in Kere at the word and phrasal levels. Stress in this language is not primarily indicated with high pitch, although it does interact with tone to an extent (see 3.3.7). Instead, duration is a primary indicator of stress, which is common in tonal languages in New Guinea (Zanten & Dol 2010). As in many other languages, stress can be used to indicate sentential prominence, but here, I focus on stress at the word and phrasal levels (2.2.1), and how its assignment pertains to the trochaic rhythm of Kere (2.2.2).

2.2.1. Stress

Languages of Papua New Guinea can have predictable or contrastive stress (Cahill 2011). Kere has predictable stress, much like Hua (Haiman 1980). As mentioned above, stress in this language is indicated by vowel duration, and syllables with primary stress tend to be longer than others. Syllables with secondary stress are slightly longer than unstressed syllables. Vowels with primary stress are typically at least fifty percent longer than unstressed syllables, but can be more than twice as long. Vowels with secondary stress tend to be much shorter than those with primary stress, and slightly longer than unstressed vowels. These ratios were calculated from two speakers (one male and one female) from recordings of naturalistic narratives. Average vowel durations from between sixty and seventy-five consecutive vowels are provided in the figure below. In order to find the average durations of vowels with primary, secondary, and no stress, I measured each vowel duration of consecutive syllables in continuous speech from one male and one female speaker using Praat (Boersma & Weenink 2015). I then averaged the durations of the vowels with the same type of stress for each speaker, and compared the durations, which are summarized below. These ratios are typical for languages which use duration to indicate stress (Fry 1955).

FIGURE 7. AVERAGE DURATIONS OF STRESSED AND UNSTRESSED SYLLABLES

Figure 7. Average durations of stressed and unstressed syllables. A bar chart plotting average vowel duration (seconds) on the y-axis (0.000 to 0.140) for three categories on the x-axis. Primary stress: 0.120 and 0.085. Secondary stress: 0.073 and 0.058. Unstressed: 0.058 and 0.055.
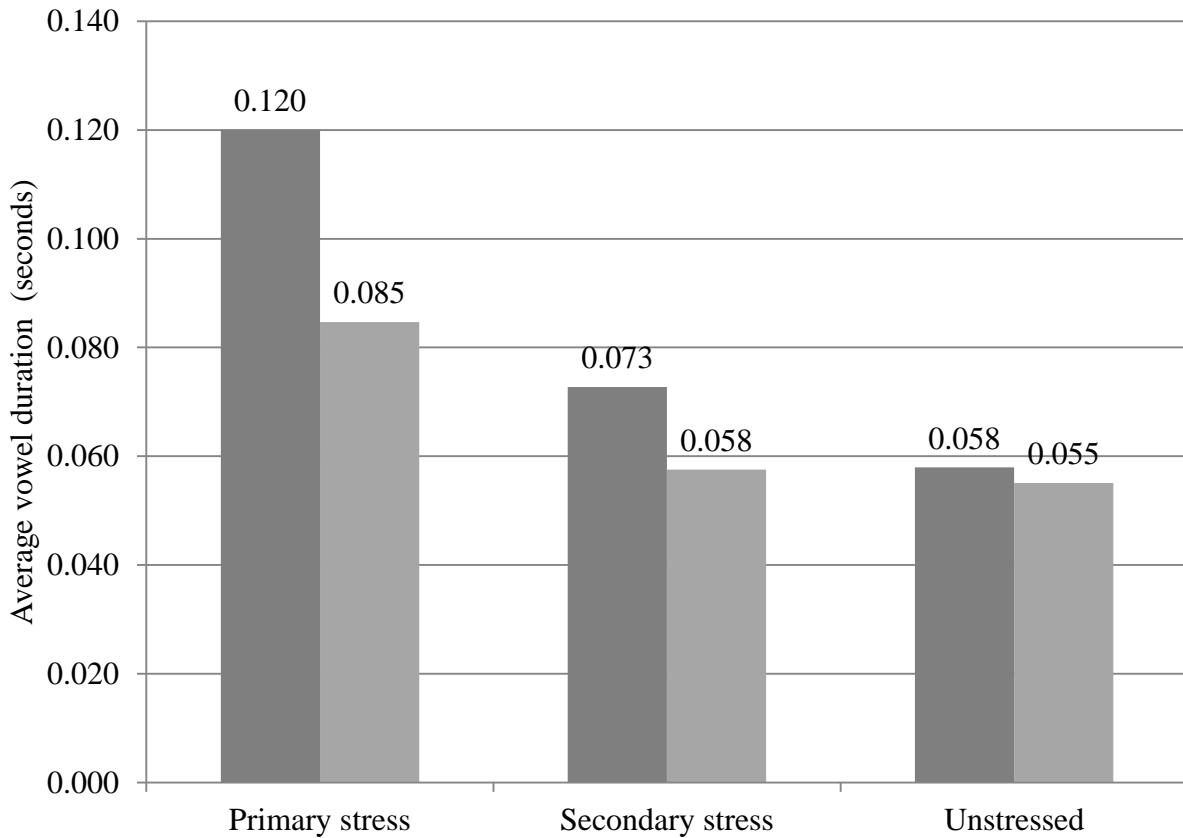
At the word level, primary stress is initial, while secondary stress is assigned to alternating syllables from left to right, as seen in the examples of disyllabic, trisyllabic, and polysyllabic words below. Suffixation changes stress patterns only when it changes the number of syllables in a word. This is seen in *glabna* 'my tongue' in (12) and (13) which are provided and discussed in detail in 2.2.2 below. These words behave predictably based on their number of syllables, rather than on their number of morphemes, unlike Kuman (Hardie 2003). Occasionally, subject pronouns can be included in the same phonological word as a following verb. When this occurs, the stress is assigned as if it were a single word, with primary stress falling on the initial syllable of the pronoun, and secondary stress on following alternating syllables. One such example is seen in (7). I consider this predictable increase in vowel duration to be stress, rather

than vowel length because rules assigning stress to initial (and following alternating) syllables is not unusual typologically. A rule requiring long vowels in initial (and following alternating) syllables is less common and motivated based by other phonetic and phonological features, such as rhythm, in this case.

(4) /aɾi/ → [ˈa.ɾi]
'leaf'

(5) /gilsubɛ/ → [ˈgil.su ˌβɛ]
'pain'

(6) /kɛbnabai/ → [ˈkɛb.na ˌβa.i]
younger.sibling
'younger brother/sister'

(7) /nɔ   s-mɛna-dɔ-bai/ → [ˈnɔzmɛ ˌnadɔ ˌβai]
1SG   hit-out-take-1SG
'I chased it out'

UR	nɔ smɛnadɔbai
Stress Assignment	ˈnɔzmɛ ˌnadɔ ˌβai]
SR	[ˈnɔzmɛ ˌnadɔ ˌβai]

(DOI: https://elar.soas.ac.uk/Collection/MPI971073; kere027)

In compounds, only one of the words can receive initial primary stress, while secondary stress is assigned to the first syllable of the other word and alternating non-initial syllables. In (8) below, the first word of the compound receives initial primary stress, while in (9), the second

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word receives initial primary stress. Which word will receive stress is predictable based on the number of full trochees within the phrase. If there are no degenerate feet, stress is assigned from left to right. If there are degenerate feet, as in (9) due to the odd number of syllables, then trochees are formed based on each word's number of syllables, and primary stress is assigned to the first full trochee.

(8) /kabɛ jɔblagɛ/ → [ˈka.βɛˌjɔ.blaˌgɛ]
    meat-bone
    'flesh (of an animal)'

UR   /kabɛ jɔblagɛ/
Stress Assignment   ˈka.βɛˌjɔ.blaˌgɛ
SR   [ˈka.βɛˌjɔ.blaˌgɛ]

(9) /di kuba/   → [ˌdiˈku.βa]
    hit-stick
    'axe'

UR   /di kuba/
Stress Assignment   ˌdiˈku.βa
SR   [ˌdiˈku.βa]

At the phrasal level, some patterns of stress clash emerge. 'Stress clash' refers to the occurrence of adjacent stressed syllables and tends to be avoided cross-linguistically (Crystal 2008). Kere has a handful of methods for decreasing the occurrence of stress clash within phonological phrases. While words with an even number of syllables tend to retain their word-level patterns within phrases, and trisyllabic words allow some stress clash between primary and

secondary stress, monosyllabic words undergo re-assignment of stress. When a monosyllabic

word is in phrase-initial position, it frequently occurs with secondary stress, rather than primary

stress, as in (9). A following polysyllabic word receives primary stress on its initial syllable

instead, seen in (10). In isolation, the possessive *no* 'I' receives primary stress, as does the

topicalizer *i*, while the noun *bona,* 'pig', occurs with initial primary stress followed by an

unstressed syllable. In this utterance, however, taken from a narrative about slaughtering pigs, *no*

instead occurs with secondary stress, while the other word-level patterns remain unchanged. This

pattern suggests that Kere does not allow stress clash amongst syllables with primary stress, but

does allow it across syllables with primary and secondary stress in different words.

(10) /nɔ   bɔna-i/   →   [ˌnɔˈbɔ.naˈji]
      1.SG.POSS   pig-TOP
      'my pig'

      UR   /nɔ bɔnai/
      Stress Assignment   ˌnɔˈbɔ.naˈji
      SR   [ˌnɔˈbɔ.naˈji]

When a trisyllabic word is followed by another polysyllabic word, stress clash with

secondary stress and primary stress is permitted. This is seen in (11) below. In isolation both

words have initial primary stress and secondary stress on the final syllable. When joined together

to create the phrase *bonana gomlege* 'knee', these stress patterns do not change and allow the

stress clash between the final syllable (*-na*) and the initial syllable (*gom*). This is another instance

in which Kere permits stress clash in a case where secondary stress is immediately followed by

primary stress.

(11) /bɔna+na gɔmlɛgɛ/ → [ˈbɔ.na ˌnaˈgɔm.lɛ ˌgɛ]

      leg-1.SG segment

      'knee'

UR	/ bɔnana gɔmlɛgɛ/
Stress Assignment	ˈbɔ.na ˌnaˈgɔm.lɛ ˌgɛ
SR	[ˈbɔ.na ˌnaˈgɔm.lɛ ˌgɛ]

2.2.2. Rhythm

In terms of rhythm, stress is assigned to trochaic, or bounded left-dominant, feet (Crystal 2008). As seen at both the word and phrasal levels, stress is assigned from left to right and stressed syllables are followed by unstressed syllables, apart from the exceptions previously discussed. The occurrence of vowel syncope seen in 2.3 below likely serves to preserve these trochaic feet, especially in words that are underlyingly trisyllabic (Kager 1997; Haike 2004). In such trisyllabic words, secondary stress occurs on the final syllable, but there is no following syllable for a full trochee, leaving a degenerate foot. In Kere, as in many languages, deletion of a medial vowel in these words allows for stress to be only assigned to full trochees. Examples for vowel syncope (see rule 3, 2.3) are provided below, along with their stress patterns without syncope (12) and (14) and with syncope (13) and (15). In (15) below, there is also a deletion rule which applies and is discussed in Rule 3 "Vowel Syncope".

(12) /glabi-na/

    tongue-1SG.POSS

    'my tongue'

    UR   /glabi-na/

    Stress Assignment   ˈgla.biˌna

    SR   [ˈgla.βiˌna]

(13) /glabi-na/

    tongue-1SG.POSS

    'my tongue'

    UR   /glabi-na/[7]

    Stress Assignment   ˈglab.na

    SR   [ˈglaβ.na]

(14) /nigɛdoa/

    bad

    'bad'

    UR   /nigɛdoa/

    Stress Assignment   ˈni.ɣɛˌdo.a

    SR   [ˈni.ɣɛˌdo.a]

---

[7] This example undergoes plosive lenition (rule 2), vowel syncope (rule 3), and re-assignment of stress and refooting. The entire derivation is as follows:

    UR   /glabi-na/

    Stress Assignment   ˈgla.biˌna

    Plosive lenition   ˈgla.βiˌna

    Vowel syncope   ˈgla.βˌna

    Stress Re-assignment   ˈglaβ.na

    SR   [ˈglaβ.na]

(15) /nigɛdoa/   →   [ˈnig.do.ˌa][8]

    bad

    'bad'

UR	/nigɛdoa/
Stress Assignment	ˈnig.do.ˌa
SR	[ˈnig.do.ˌwa] [9]

Looking at large phrases and narratives, it is clear that Kere relies on fixed word stress, like Czech, Polish, and Swahili (Ladefoged & Johnson 2011). Although at the phrasal level, there are some changes in stress to avoid the occurrence of two consecutive primary stresses, this language is quite consistent in its assignment of fixed word stress; primary stress is initial and alternating syllables receive secondary stress in following syllables, which are grouped into trochees.

2.3. Phonological rules

Many of the phonemes of Kere have rule-based allophonic variants. Here, I provide segmental phonological rules and their critical orderings, while phonological rules which pertain to tone are addressed in chapter 3. The phonemes and each of their allophones, accompanied by examples, are summarized below in Table 3. Morphophonemics in this language, like Kuman , is

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[8] Like (13), this example undergoes vowel syncope (rule 3), and re-assignment of stress and refooting. The entire derivation is as follows:

UR	/ nigɛdoa /
Stress Assignment	ˈni.gɛ.ˌdo.a
Vowel syncope	ˈni.g.ˌdo.a
Stress Re-assignment	ˈnig.do.ˌa
SR	[ˈnig.do.ˌa]

[9] This surface form is less common than [ˈni.ɣɛ.ˌdo.a].

strongly tied to verbal morphology, and verbal morphology tends to be complex with heavy affixation and frequent occurrences of verbal compounds and serial verbs (Piau 1980; Piau 1985; Hardie 2003). Since this is not the focus of this dissertation, the relationship between morphology and phonology in Kere will only be addressed in detail as it pertains to tone (see 3.4.4 for morphotonemics).

<div align="center">Rule 1: Consonant voicing</div>

$$[+\text{cons}] \rightarrow [+\text{voice}] / \begin{bmatrix} +\text{syl} \\ -\text{cons} \end{bmatrix} \underline{\quad\quad} \begin{bmatrix} +\text{syl} \\ -\text{cons} \end{bmatrix}$$

Intervocalic consonants are voiced in fast speech. Similar types of phonological rules are common across Papuan languages (Daniels 2010) and languages in general (Schachter 1969). Both stops (16) and fricatives (18) become voiced intervocalically. This happens within words and across morpheme boundaries, as seen below in (17) which is a compound. All other phonemes are voiced underlyingly. Consonant voicing does not apply across word boundaries, seen in (19), in which the /k/ of the second word *kana* 'you see' does not occur as [g]. It is also clear that plosives only become voiced between vowels, and not adjacent other voiced consonants, demonstrated in (20) below, *kabkawa* 'bird'. In this example, the second /k/ is not pronounced as [g], despite being surrounded by two voiced sounds [b], and [a].

(16) /kupa/ → [ˈku.ba]
        'pork'

Underlying Representation (UR)	/kupa/
Stress assignment	ˈku.pa
Consonant voicing	ˈku.ba
Surface Representation (SR)	[ˈku.ba]

(17) /di+kuba/ → [ˈdi.guˌba]
        hit-stick
        'axe'

UR	/dikuba/
Stress assignment	ˈdi.kuˌba
Consonant voicing	ˈdi.guˌba
SR	[ˈdi.guˌba]

(18) /asurisuri/ → [ˌaˈzu.riˌzu.ri]

sneeze

'sneeze (VB)'

UR	/asurisuri/
Stress assignment	ˌaˈsu.riˌsu.ri
Consonant voicing	ˌaˈzu.riˌzu.ri
SR	[ˌaˈzu.riˌzu.ri]

(19) /nɛ ka-n-a/ → [ˈnɛ kaˌna]

2sg see-2SG-INDIC

'you look'

UR	/nɛ kana/
Stress assignment	ˈnɛ kaˌna
Consonant voicing	-
SR	[ˈnɛ kaˌna]

(20) /kabkawa/   →   [ˈkab.kaˌwa]
     'bird'

UR	/kabkawa/
Stress assignment	ˈkab.kaˌwa
Consonant voicing	-
SR	[ˈkab.kaˌwa]

Rule 2: Plosive lenition

$$\begin{bmatrix} -\text{son} \\ -\text{cont} \\ -\text{cor} \end{bmatrix} \rightarrow [+\text{cont}] \;/\; [+\text{syl}] \; \underline{\quad} \; \begin{bmatrix} +\text{syl} \\ -\text{stress} \end{bmatrix}$$

Between vowels, non-coronal plosives in syllables without primary stress are realized as fricatives, as seen in (22), but not in the stressed medial syllable in (23). This rule is found widely in related languages (Pike 1964; Daniels 2010). In (26) (p. 41), it is clear that this rule is does not apply to coronal plosives, as /d/ does not become [z] or [ð] in (24). This rule does not apply across word boundaries, which is also common across languages and seen in this example (Maddieson 1984). Plosive lenition is optional in slow speech, but occurs consistently in rapid speech.

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(21) /ɔɾɛki/   →   [ˈɔ.ɾɛ́ˌɣi]

    LHL   LHL

    big

    'big'

UR	/ɔɾɛ́ki/
Stress assignment	ˈɔ.ɾɛ́ˌki
Consonant voicing	ˈɔ.ɾɛˌgi
Plosive lenition	ˈɔ.ɾɛˌɣi
SR	[ˈɔ.ɾɛ́ˌɣi]

(22) /abɛ/ → [ˈa.βɛ]

    'sun'

UR	/abɛ/
Stress assignment	ˈa.bɛ
Consonant voicing	-
Plosive lenition	ˈa.βɛ
SR	[ˈa.βɛ]

(23) /ɛdi-baɾ-a/   →   [ˈɛ.di ˌba.ɾa]

today-happen-decl

'(this is what) happens today'

UR	/ɛdibaɾa/
Stress Assignment	ˈɛ.di ˌba.ɾa
Consonant voicing	-
Plosive lenition	-
SR	[ˈɛ.di ˌba.ɾa]

(24) /nɔ   s-mɛna-dɔ-bai/ → [ˈnɔzmɛ ˌnadɔ ˌβai]

1SG   hit-out-take-1SG

'I chased it out'

UR	/nɔ smɛnadɔbai/
Stress Assignment	ˈnɔ.smɛ ˌna.dɔ ˌba.i
Consonant voicing	ˈnɔz.mɛ ˌna.dɔ ˌba.i
Plosive lenition	-
SR	[ˈnɔz.mɛ ˌna.dɔ ˌba.i]

<div align="center">Rule 3: Vowel syncope</div>

$$\begin{bmatrix} +\text{syl} \\ -\text{cons} \\ +\text{front} \\ -\text{stress} \end{bmatrix} \rightarrow \emptyset \, / \, \underline{} \, C_0 V_0$$

Front vowels are deleted in non-final unstressed syllables. This type of rule is found in many languages (Odden 2005), and, in Kere, would counterbleed plosive lenition, so it must occur afterwards. This is seen in (25) below, which would be *[glabna] if the rules were reversed. Vowel syncope applies left to right and can apply across morpheme boundaries within a single phonological phrase, also seen in (25) and (26). It can only apply to one vowel per word, however, also seen in (26) and the incorrect derivation provided in (27). In careful speech, this rule may not apply, but when a word has three syllables, the retention of the medial vowel is strongly dispreferred. This may be the case because stress is assigned to trochees in this language (see 2.3). It is also important to note that when a vowel is deleted, its tone is preserved, as predicted by the autosegmental approach (Crystal 2008). This tone preservation is discussed further in 3.2.3 and 4.4.

(25) /glabi+na/ → [ˈglaβ.na]

   tongue + 1SG.POSS

   'my tongue'

UR	/glabina/
Stress assignment	ˈgla.biˌna
Consonant voicing	-
Plosive lenition	ˈgla.βiˌna
Vowel syncope	ˈglaβ.na
SR	[ˈglaβ.na]

(26) /daigi-ɾi-s-maldɔ-wɛ/ → [dagiɾismaldɔwɛ]

   tie-CONJ-hit-COMP-EMPH

   'tied (it) very strongly'

UR	/daigiɾismaldɔwɛ/
Stress Assignment	ˈda.iˌgi.ɾiˌsmal.dɔˌwɛ
Consonant voicing	-
Plosive lenition	-
Vowel syncope	ˈdaˌgi.ɾiˌsmal.dɔˌwɛ
Stress Re-assignment	ˈda.giˌɾi.smalˌdɔ.wɛ
SR	[ˈda.giˌɾi.smalˌdɔ.wɛ]

(27) /daigi-ɾi-s-maldɔ-wɛ/ → *[dagiɾsmaldɔwɛ]

tie-take-hit-COMP-EMPH

'tied (it) very strongly'

UR	/daigirismaldɔwɛ/	
Stress Assignment	ˈda.iˌgi.ɾiˌsmal.dɔˌwɛ	
Consonant voicing	-	
Plosive lenition	-	
*Vowel syncope	ˈdaˌgi.ɾˌsmal.dɔˌwɛ	
Stress Re-assignment	ˈda.giɾˌsmal.dɔˌwɛ	
SR	*[ˈda.giɾˌsmal.dɔˌwɛ]	

(28) /nigɛdoa/ → [ˈniɣdoˌa]

'bad'

UR	/ˈnigɛˌdoa/
Stress assignment	ˈnigɛˌdoa
Consonant voicing	-
Plosive lenition	ˈniɣɛˌdoa
Vowel syncope	ˈniɣ.doˌa
SR	[ˈniɣ.doˌa]

Words in which identical syllables occur consecutively are also resistant to vowel syncope, seen in (29) below. The stress assignment of this word is also slightly unsual, but this is likely related to morphophonology.

(29) /asurisuri/ → [ˌaˈzu.riˌzu.ri]
    'sneeze (VB)'

UR	/asurisuri/
Stress assignment	ˌaˈsu.riˌsu.ri
Consonant voicing	ˌaˈzu.riˌzu.ri]
Plosive lenition	-
Vowel syncope	-
SR	[ˌaˈzu.riˌzu.ri]]

<u>Rule 4: Glide insertion</u>

$$\emptyset \rightarrow \begin{bmatrix} -\text{syl} \\ -\text{cons} \\ \alpha \text{ rd} \end{bmatrix} / \begin{bmatrix} +\text{syl} \\ \alpha \text{ rd} \end{bmatrix} \underline{\quad} [+ \text{syl}]$$

A glide is optionally inserted between vowels. Following unrounded vowels, [j] is inserted, while [w] is inserted following rounded vowels. Insertion occurs can occur between any two vowels. This rule is is bled by vowel syncope, and may emphasize the between vowels (Jackson 2007; Keerio et al. 2012), as Kere does not permit diphthongs. Glide insertion is not reported in Tabare (McVinney & Luzbetak 1954), but is common across languages (Maddieson 2013).

(30) /abla+i/ → [ˈa.blaˌji]

  unmarried.woman-DEM

  'the unmarried woman'

UR	/abla+i/
Stress assignment	ˈa.blaˌi
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	ˈa.blaˌji
SR	[ˈa.blaˌji]

(31) /s-ki-mi-o/ → [ˈski.miˌjo]

  hit-NEG-kill-INTER

  'don't get killed?'

UR	/s-ki-mi-o/
Stress assignment	ˈski.miˌo
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	ˈski.miˌjo
SR	[ˈski.miˌjo]

(32) /mɔ-a/   →   [ˈmɔ.wa]

     stay-INDIC

     'stay'

UR	/mɔa/
Stress assignment	ˈmɔ.a
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	ˈmɔ.wa
SR	[ˈmɔ.wa]

(DOI: https://elar.soas.ac.uk/Collection/MPI971073; kere002)

Rule 5: Vowel deletion

$$V \rightarrow \varnothing \underline{\hphantom{xx}} \begin{bmatrix} + \text{ cons} \\ + \text{ son} \end{bmatrix}$$

In rapid speech, a vowel may be deleted if it is immediately followed by a sonorant: /j/, /l/, /m/, or /n/. This rule is feeds sonorant syllabification, demonstrated in (35) below. It is also would be bled by glide insertion, as seen in (33), and therefore must occur subsequently. Vowel deletion is separate from vowel syncope, as it is optional and unrelated to stress. However, whenever a vowel with which tone co-occurs is deleted through either rule, its tone is preserved (Gussenhoven 2004; Odden 2005) and this tone co-occurs instead with the next tone-bearing

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unit. This is demonstrated below in (34) (which also demonstrates sonorant syllabification) and

is discussed in 3.2.

(33) /di-m-i-a/ → [ˈdim.ja]

     say-3SG-NFUT-INDIC

     'he said'

UR	/dimia/
Stress assignment	ˈdi.miˌa
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	ˈdi.miˌja
Vowel deletion	ˈdim.ja
Stress re-assignment	ˈdim.ja
SR	[ˈdim.ja]

(34) /nil/ → [nĺ]

water

'water'

UR	/nil/
Stress assignment	ˈníl
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	ˈnl
Sonorant syllabification	ˈnĺ
SR	[ˈnĺ]

Rule 6: Sonorant syllabification

$$\begin{bmatrix} + \text{ cons} \\ + \text{ son} \end{bmatrix} \rightarrow [+ \text{ syl}] \; / \; VC\underline{\quad}C_0 \,]_\sigma$$

When a consonantal sonorant occurs in coda position and follows another consonant, it is syllabic. This environment normally occurs after vowel syncope has occurred, and these rules are in a feeding relationship. An example of this is provided below, in which the deletion of /i/ creates an environment in which the syllabification of /l/ can occur. Syllabic consonants in this language are fairly common, especially in final syllables.

(35) /amil/ → [ˈa.ml̩]

'white pandanus'

UR	/amil/
Stress assignment	ˈa.mil
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	
Vowel deletion	ˈa.ml
Sonorant syllabification	ˈa.ml̩
SR	[ˈa.ml̩]

(36) /kamil   kul/   →   [kaml̩ kul]

     sky   grass

    'mountain (above speaker's location)'

UR	/kamil kul/
Stress assignment	ˈka.mil ˌkul
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	ˈka.ml ˌkul
Sonorant syllabification	ˈka.ml̩ ˌkul
SR	[ˈka.ml̩ ˌkul]

Rule 7: Nasal assimilation

$$\begin{bmatrix} + \text{nas} \\ + \text{cor} \\ - \text{syl} \end{bmatrix} \rightarrow [\alpha\, P] \,/\!\!\underline{\quad} \begin{bmatrix} -\text{cont} \\ \alpha\, P \end{bmatrix}$$

The alveolar nasal /n/ assimilates in place to a following voiced plosive (see (40) with rule 8 below). Nasal assimilation must occur after sonorant syllabification, because syllabic nasals are resistant to place assimilation, seen in the incorrect derivation in (38). This assimilation is always followed by deletion of the given plosive, and therefore an example for both rules is provided in (40) below.

(37) /kamin   giɾua/   →   [ˈkam.n̩ ˌgi.ɾu ˌwa]

    time   night

    'night'

UR	/kamin giɾua/
Stress assignment	ˈkam.in ˌgi.ɾu ˌa
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	ˈkam.in ˌgi.ɾu ˌwa
Vowel deletion	ˈkam.n ˌgi.ɾu ˌwa
Sonorant syllabification	ˈkam.n̩ ˌgi.ɾu ˌwa
Nasal Assimilation	-
SR	ˈkam.n̩ gi.ɾu ˌwa

(38) /kamin   giɾua/   →   *[ˈka.m̩ŋ ˌgi.ɾuˌwa]
     time   night
     'night'

UR	/kamin giɾua/
Stress assignment	ˈka.min ˌgi.ɾuˌa
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	ˈka.min ˌgi.ɾuˌwa
Vowel deletion	ˈka.mn ˌgi.ɾuˌwa
Sonorant syllabification	ˈka.m̩ṇ ˌgi.ɾuˌwa
Nasal Assimilation	*[ˈka.m̩ŋ ˌgi.ɾuˌwa]
SR	*[ˈka.m̩ŋ ˌgi.ɾuˌwa]

(39) /dɛm-g-u-m-ɛ/ → [ˈdɛm.guˌmɛ]

intestines-NEG-come-3SG-DECL

'their stomachs rumble'

UR	/ dɛmgumɛ /
Stress assignment	ˈdɛm.guˌmɛ
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal Assimilation	-
SR	[ˈdɛm.guˌmɛ]

Rule 8: Plosive deletion

$$\begin{bmatrix} -\text{cont} \\ \alpha\,\text{Place} \\ +\text{vd} \end{bmatrix} \rightarrow \varnothing\ /\ \begin{bmatrix} +\text{nas} \\ \alpha\,\text{Place} \end{bmatrix} \underline{\quad} C_0\ \begin{matrix} V \\ -\text{stress} \end{matrix}\ C_0\ ]_\sigma$$

When a voiced plosive follows a homorganic nasal in an unstressed syllable, it is deleted. This rule is in fed by nasal assimilation, demonstrated below. In (40), *gan* 'child' and *gau* 'skin' form the compound *gangau* 'young child'. This word's status as a compound is further justified by these phonological changes in addition to its change in meaning (Haiman 1980; Nespor & Ralli 1996; Haspelmath & Sims 2010). Outside of this compound, *gan* is always pronounced as

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[gan] with a final alveolar nasal, and *gau* is [gau] with an initial voiced velar stop. Within the compound, the nasal becomes velar and the initial plosive of *gau* [gau] is deleted. In stressed syllables, this rule does not apply. This is seen in (46) which is provided near the end of this section (on p. 61), as it exemplifies many of the segmental phonological rules in this language and their critical orderings. The example in (41) below also demonstrates that nasal assimilation and plosive deletion only occur with voiced plosives.

(40) /gan + gau/   →   [ˈga.ŋau]

    child + skin

    'young child'

UR	/gan+gau/
Stress assignment	ˈganˌgau
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal assimilation	ˈgaŋˌgau
Plosive deletion	ˈga.ŋau
SR	[ˈga.ŋau]

(41) /kuban kanua/ → [ˈku.βan ˌka.nua]

  dream see

  'to dream'

UR	/kuban kanua/
Stress assignment	ˈku.ban ˌka.nua
Consonant voicing	-
Plosive lenition	ˈku.βan ˌka.nua
Vowel syncope	-
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal assimilation	-
Plosive deletion	-
SR	[ˈku.βan ˌka.nua]

(42) /ampi/ → [ˈam.pi]

     sister-DEM

     'the sister'

UR	/ ampi /
Stress assignment	ˈam.pi
Nasal assimilation	-
Plosive deletion	-
SR	[ˈam.pi]

(DOI: https://elar.soas.ac.uk/Collection/MPI971073; kere001)

Rule 9: Vowel reduction

$$\begin{bmatrix} +\text{syl} \\ -\text{low} \\ -\text{back} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{high} \\ -\text{tense} \end{bmatrix} / \underline{\quad} \begin{bmatrix} +\text{con} \\ +\text{son} \end{bmatrix}$$

Before consonantal sonorants, non-low front vowels become [ɪ]. This rule must occur before vowel assimilation. Here, this rule is is fed by with vowel syncope, as vowel deletion can create an environment in which a tense vowel occurs before a sonorant. However, it is also bled by vowel syncope, as a vowel which would otherwise assimilate can be deleted. Vowel reduction of this sort is common across the world's languages (Maddieson 2013).

(43) /nil/ → [ˈníl][10]

       water

       'water'

UR	/nil/
Stress assignment	ˈníl
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal assimilation	-
Plosive deletion	-
Vowel reduction	ˈníl
Vowel assimilation	-
SR	[ˈníl]

---

[10] This pronunciation is less common than [nl̩].

(44) /ki+na/ → [ˈkɪ.na]

    teeth-1SG.POSS

    'my teeth'

UR	/kina/
Stress assignment	ˈki.na
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal assimilation	-
Plosive deletion	-
Vowel reduction	ˈkɪ.na
Vowel assimilation	-
SR	[ˈkɪ.na]

$$\begin{bmatrix} +\text{syl} \\ +\text{front} \end{bmatrix} \rightarrow [\alpha \text{ F}] \ / \begin{bmatrix} +\text{syl} \\ +\text{front} \\ \alpha \text{ F} \end{bmatrix} C_0 \underline{\quad}$$

Front vowels can totally assimilate to a preceding front vowel. This change is optional, but tends to occur in rapid speech. Here, this rule would be bled by vowel syncope, but since it is impossible to tell whether a deleted vowel has assimilated or not, their ordering is inconsequential.

(45) /igɛ-na/ → [ˈɪ.ɣɪˌna]

house-1SG.POSS

'house'

UR	/igɛna/
Stress assignment	ˈi.gɛˌna
Consonant voicing	-
Plosive lenition	ˈi.ɣɛˌna
Vowel syncope	-
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal assimilation	-
Plosive deletion	-
Vowel reduction	ˈi.ɣɪˌna
Vowel assimilation	ˈɪ.ɣɪˌna
SR	[ˈɪ.ɣɪˌna]

(46) /di-ɛntɔ-bɛn-a/   →   [ˈdɪn.tɔˌbn̩.a]

     say-1SG.SBJ-2SG.OBJ-INDIC

     'I'm telling you'

UR	/diɛntɔbɛna/
Stress assignment	ˈdi.ɛnˌtɔ.bɛˌna
Consonant voicing	-
Plosive lenition	ˈdi.ɛnˌtɔ.βɛˌna
Vowel syncope	ˈdin.tɔˌβna
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	ˈdin.tɔˌβn̩.a
Nasal assimilation	-
Plosive deletion	-
Vowel assimilation	-
Vowel reduction	ˈdɪn.tɔˌβn̩.a
SR	[ˈdɪn.tɔˌβn̩.a]

<u>Rule 11: Flap trilling</u>

/ɾɾ/ → [r]

When a sequence of flaps occurs in fast speech, the sequence is realized as a trill. This

occurs most frequently across word boundaries, or after vowel syncope, and is thus fed by vowel

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syncope. Phonetically, there is little difference between a series of flaps and a trill, which is a

motivation for this type of rule.

(47) /s-ɾɛ-ɾɛ/   →   [ˈsrɛ]
        hit-SEQ-SEQ
        'hit then'

UR	/sɾɛɾɛ/
Stress assignment	ˈsɾɛɾɛ
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	ˈsɾɾɛ
Sonorant syllabification	-
Nasal assimilation	-
Plosive deletion	-
Vowel reduction	-
Vowel assimilation	-
Flap trilling	srɛ
SR	[srɛ]

(48) /bɛɾɛ+ɾɛ/ → [ˈbɛɾ.ɾɛ]

    do-SEQ

    'do and'

UR	/bɛɾɛ+ɾɛ/
Stress assignment	ˈbɛ.ɾɛˌɾɛ
Consonant voicing	-
Plosive lenition	-
Vowel syncope	ˈbɛɾ.ɾɛ
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal assimilation	-
Plosive deletion	-
Vowel assimilation	-
Vowel reduction	-
Flap trilling	ˈbɛ.rɛ
SR	[ˈbɛ.rɛ]

<u>Rule 12: Identical vowel deletion</u>

$$\begin{bmatrix} +syl \\ \alpha\,F \end{bmatrix} \rightarrow \varnothing \; / \; \underline{\hspace{1cm}} \begin{bmatrix} +syl \\ \alpha\,F \end{bmatrix}$$

A vowel is deleted when it precedes an identical vowel. Occasionally, both vowels are articulated in these types of sequences, but this is uncommon, and occurs only in extremely careful speech. This is unlike what McVinney and Luzbetak (1954) report for Tabare.

(49) /ta   aɾɛ/   →   [taɾɛ]
        some people
        'some people'

FIGURE 8: SPECTROGRAM AND WAVEFORM FOR *TA ARE* 'SOME PEOPLE'
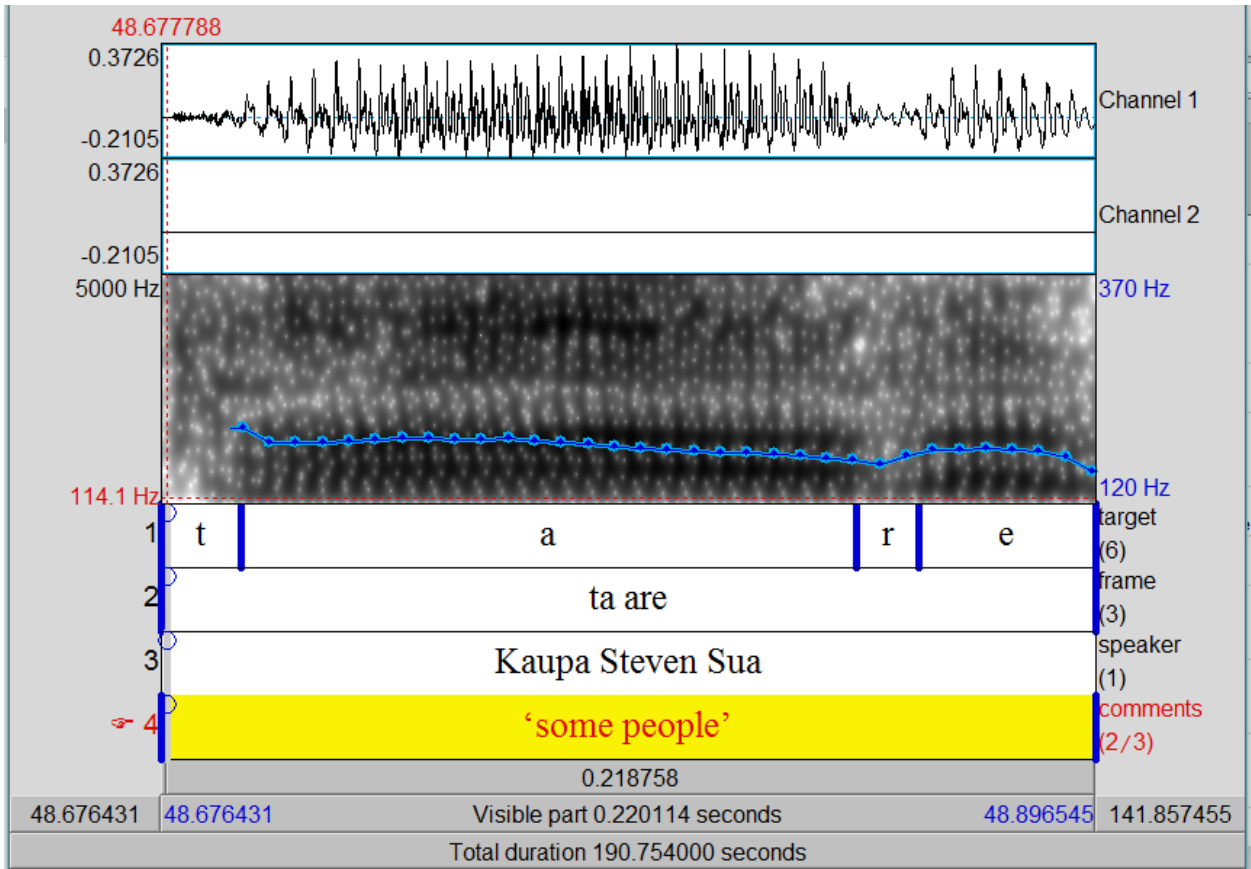
(50) /agai-i/   →   [ˈa.ɣaˌi]

place-DEM

'that place'

FIGURE 9: PITCH TRACK FOR *AGAI I* 'THAT PLACE'
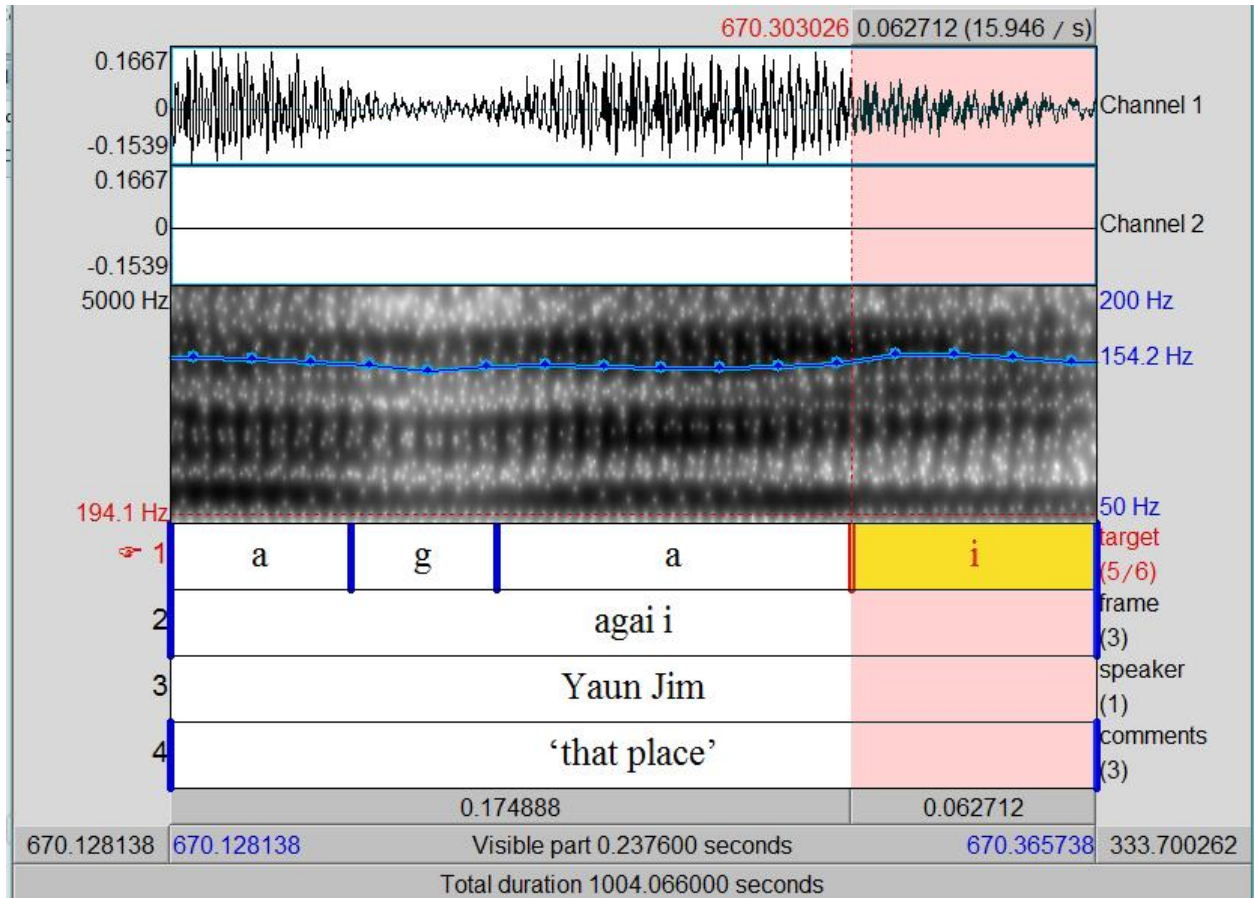
In their grammar of Tabare, McVinney & Luzbetak report "double vowels" which seems to be a sequence of identical vowels and there is no mention of vowel deletion in these instances. The environment in which adjacent identical vowels occur in Tabare is typically across word or morpheme boundaries and this rule is not critically ordered with any other rule in their analysis (McVinney & Luzbetak 1954).

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There are other similarities and differences between the phonological rules I analyze for Kere and those reported by McVinney & Luzbetak for Tabare. Unlike Tabare, Kere exhibits little free or rule-based variation in vowel quality (McVinney & Luzbetak 1954). In both Kere and Tabare, there is plosive lenition word-medially, but in Tabare it is not clear whether this happens only between vowels or in any word-medial environment. Additionally, a rule which predicts nasal place based on the surrounding vowel quality is reported in Tabare (McVinney & Luzbetak 1954), but is not found in Kere.

Hardie's 2003 analysis of Kuman includes several phonemes and corresponding phonological rules which are not found in Kere. There is also a rule in which the Kuman trill phoneme /r/ is realized as [t] before a nasal. This is not found in Kere with the corresponding tap phoneme /ɾ/. However, Hardie (2003) also reports a glide insertion rule similar to the one I describe above. Generally, the phonological rules I provide in this section are common both in the languages of the New Guinea highlands and in languages around the world (Maddieson 1984). A summary of the phonemes of Kere and their allophones, along with a list of the non-tonal phonological rules and their critical orderings are provided in the figures below.

TABLE 3. PHONEMES AND THEIR ALLOPHONES

Phoneme	Allophones	Example words	Glosses
/p/	[p]	[pi]	'go'
/b/	[b] [β]	[bo] [aβɛ]	'sugarcane' 'sun'
/t/	[t]	[tɛɾan]	'one'
/d/	[d]	[dowa]	'fire'
/k/	[k]	[kabkawa]	'bird'
/g/	[g] [ɣ]	[gan] [niɣidoa]	'boy' 'bad'
/s/	[s] [z]	[su] [azurizuri]	'two' 'sneeze'
/m/	[m] [m̩]	[mɔl] [amḿ̩]	'stay' 'breast'
/n/	[n] [n̩] [ŋ]	[ń̩] [amń̩] [kaŋowa]	'water' 'sit down' 'knot'
/ŋ/	[ŋ] [ŋ̩]	[plaŋai] [dbŋ̩aɾa]	'you hear' 'I say'
/ɾ/	[ɾ] [r]	[aɾɛ] [srɛ]	'person' 'hit and'
/l/	[l] [l̩]	[abla] [pĺ̩]	'woman' 'salt'
/w/	[w]	[waɣai]	'good'
/j/	[j]	[jal]	'man'
/i/	[i] [ɪ]	[igɛ] [kɪna]	'house' 'my dog'
/u/	[u]	[ulɛgɛ]	'ashes'
/ɛ/	[ɛ]	[ɛɾɛ]	'tree'
/ɔ/	[ɔ]	[ɔβɛ]	'ti leaf'
/a/	[a]	[aml̩]	'white pandanus'

FIGURE 10. KERE SEGMENTAL PHONOLOGICAL RULES AND THEIR CRITICAL ORDERINGS

Consonant voicing

Plosive lenition

Vowel syncope

Glide Insertion

Vowel deletion

Sonorant syllabification

Nasal assimilation

Plosive deletion

Vowel reduction

Vowel assimilation

Flap trilling

Flap deletion

Identical vowel deletion
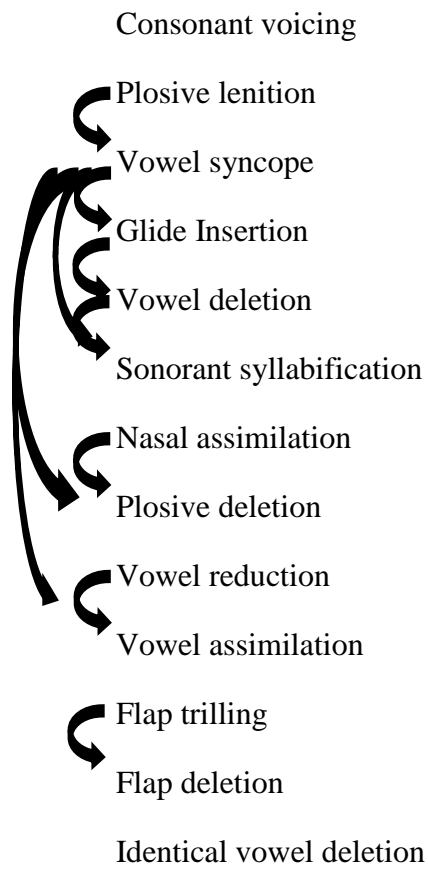
2.4. Phonotactics

In this section, I address constraints for how segments can be combined in Kere. First, I look at permissible syllable structures (2.4.1) and how these can be used to form words. Next, I address vowel phonotactics, including the lack of diphthongs in this language and frequency of vowel deletion (2.4.2). Lastly, I provide information about consonant phonotactics, focusing on the areally unusual existence of syllabic consonants in Kere (2.4.3). In each of these subsections, I also compare the phonotactic features of Kere to what has been reported for Tabare (McVinney and Luzbetak 1954) and other closely-related languages, including Kuman (Piau 1985; Hardie 2003; Pfantz & Pfantz 2005).

2.4.1. Syllables

In general, Trans New Guinea languages have fairly simple syllable structures, relying primarily on CV or CVC shapes (Foley 2000). Some languages, however, allow up to two consonants in coda position, including Wahgi (Phillips 1976) and Morobe province's Weri (Boxwell & Boxwell 1966). McVinney and Luzbetak (1954) report that Tabare allows closed syllables with up to two consonants in the onset. Kere allows V, CV, CVC, CCV, and CCVC, but the most frequent syllable structure is CV. Most syllables take the shape of V, CV, CVC, or CCV. The shape CCVC is less frequent. The frequencies of each syllable type from a 200-item Swadesh list, totaling 480 syllables, are summarized in Figure 8. An example of each syllable type and a hierarchical syllable representation are provided below. Each syllable type can occur in any position in a word, and individual words can be made up of a single syllable or many syllables. It is not uncommon for verbs to be made up of as many as seven syllables, like *dagirismaldowe* 'tie (it) very strongly'.

FIGURE 11. SYLLABLE FREQUENCIES

Syllable type	Count
CV	306
V	84
CVC	45
CCV	35
VC	7
CCVC	3
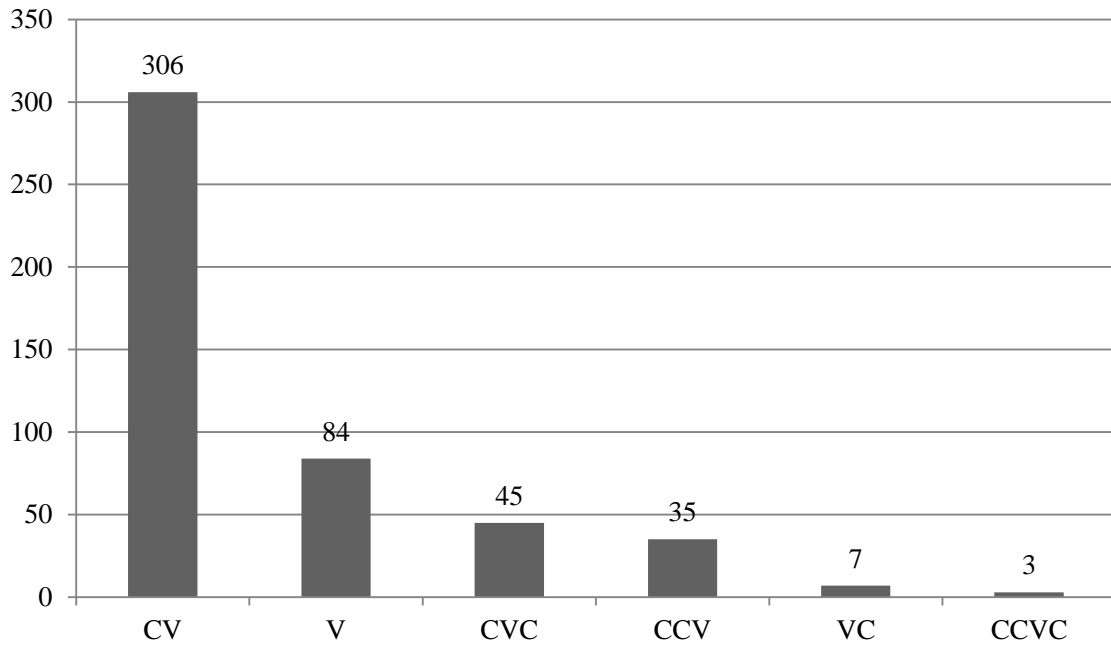
FIGURE 12. SYLLABLE STRUCTURES

Syllable type	Example word	Gloss
V	*i*	'this'
CV	*wá*	'come!'
CVC	*mun.mil*	'back'
CCV	*gwi*	'wind'
CCVC	*blen*	'your head'

FIGURE 13. KERE SYLLABLE TEMPLATE
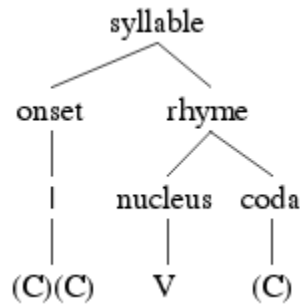
Consonant clusters in onsets begin with an obstruent and are usually followed by a sonorant. This increase in sonority before the nucleus of a syllable is very common across languages (Herbert 1986), and is seen in the examples below. However, there are some instances in which sonority does not increase. In several words, the fricative /s/ is followed by the obstruent /k/, as seen in (53) below. This pattern does not involve an especially large decrease in sonority and are not unusual typologically (Maddieson 1984). A more unusual pattern is the occurrence of a cluster of plosives in the onset. A plosive can occur before the plosive /b/. This occurs in several words, some of which are provided below. In onsets in which /p/ is followed by /b/, there is a small burst between the two plosives; otherwise, there is no perceptable transition between the plosives in a cluster.

(51) sla mele
     'how'

(52) kna
     'ear'

(53) /s+kɛ+ɾɛ/

    [skɛɾɛ]

    hit-cook-SEQ

    'kill and cook'

(54) /p+bai/

    [p-bai]

    go-1SG

    'I go'

(55) /d+bai/

    [dbai]

    talk-1SG

    'I talk'

With respect to neighboring varieties, the only types of consonant clusters in Tabare are [-coronal] voiceless plosives followed by homoroganic fricatives. These sequences are treated as allophones of their plosive counterparts. With labials, such sequences are in free variation, but with velars, they only occur before low back vowels (McVinney & Luzbetak 1954). In Kuman, syllables can take any shape fitting the template (C) V (C), although some consonant clusters in onset position are possible (Hardie 2003). Overall, Kere allows more complex syllable structures than other closely-related languages of Chimbu province.

2.4.2. Vowel phonotactics

Diphthongs (two vowel qualities in a single syllable) do not occur in Kere, but vowel + vowel sequences, like /ei/, and vowel + approximant sequences, like /aj/, certainly do. This is seen in the examples below. For example, in the spectrogram of (57), *ai* [aji] 'where', it is clear

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that this is a VCV sequence, as opposed to a diphthong, based on the clarity of the formants and duration of transitional [j] (Lehiste & Peterson 1961; Keerio et al. 2012). This is also seen above in the examples provided for rule 8, plosive deletion. Vowel sequences are assigned suprasegmental features independently, including stress and tone, which is especially strong evidence that they are a series of segments (Ladefoged & Johnson 2011). Thus, individual segments in a vowel sequence often occur with distinct tones and always occur with a stressed and unstressed member (see 2.2.1 and 2.2.2). It is not uncommon for Trans New Guinea languages to have vowel sequences (Pike 1964; Piau 1985), and there are also related languages with diphthongs, including Siane (Cahill 2011) and Kuman (Hardie 2003). There are constraints on the vowels which can occur in a VV sequence in Kuman (Piau 1985; Hardie 2003), but there are no such restriction in Kere; any two vowels can be adjacent. In (56) below, the word *eim* 'tail', normally pronounced [ɛim], is instead realized as [im] after deletion of the first vowel. This variation is limited to this lexical item and is not productive.

(56) /ɛim/ → [im]

'tail'
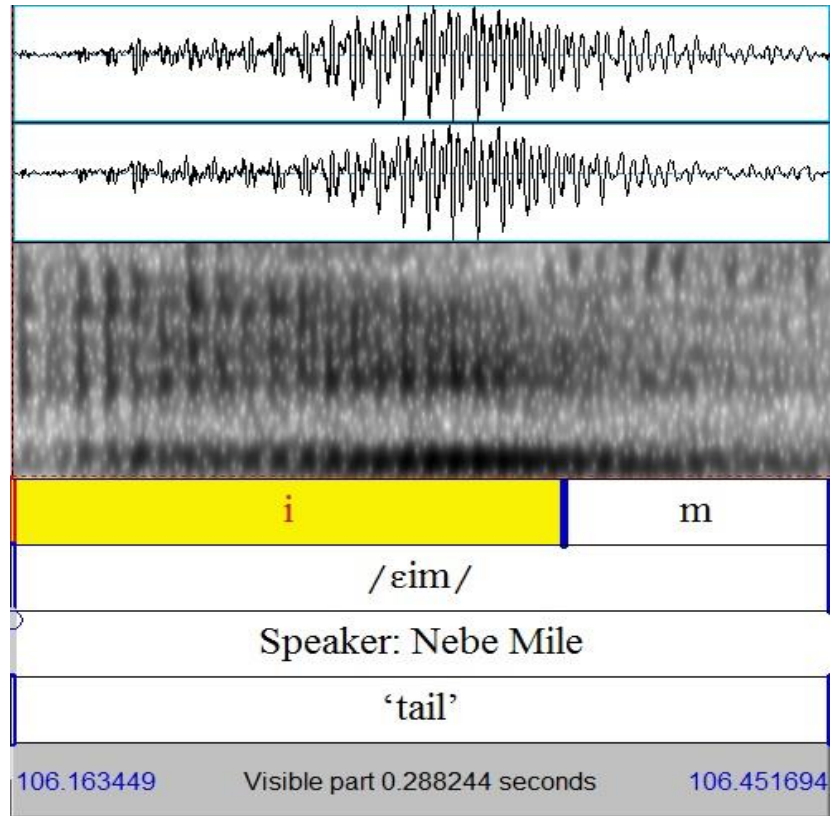
(57) /aji/ → [aji]

'where'
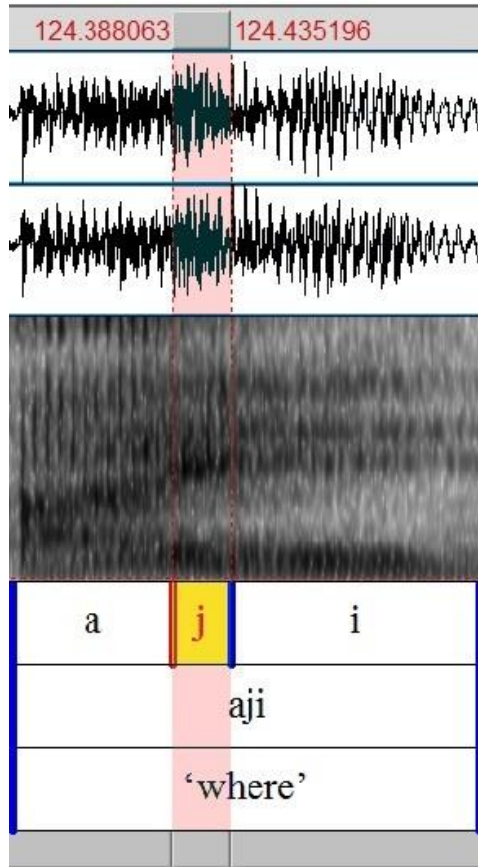
Another notable feature of vowels in this language is the frequency with which they are deleted. There are many words in this language in which a vowel has been deleted and replaced by a syllabic consonant or consonant cluster. A handful of examples are provided below.

(58) /nil/ → [ˈnl̩]

salt

'salt'

UR	/níl/
Stress assignment	ˈníl
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	ˈnl
Sonorant syllabification	ˈnl̩
Nasal assimilation	-
Plosive deletion	-
Vowel assimilation	-
Vowel reduction	-
Flap trilling	-
SR	[ˈnl̩]

(59) /kamin/ → [ˈka.mn̩]

'time, season'

UR	/kamin/
Stress assignment	ˈka.min
Consonant voicing	-
Plosive lenition	-
Vowel syncope	ˈkamn
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	ˈka.mn̩
Nasal assimilation	-
Plosive deletion	-
Vowel assimilation	-
Vowel reduction	-
Flap trilling	-
SR	[ˈka.mn̩]

(60) /abim/ → [ˈab.m̩]

'sister'

UR	/abim/
Stress assignment	ˈab.im
Consonant voicing	-
Plosive lenition	-
Vowel syncope	-
Glide insertion	-
Vowel deletion	ˈab.m
Sonorant syllabification	ˈab.m̩
Nasal assimilation	-
Plosive deletion	-
Vowel assimilation	-
Vowel reduction	-
Flap trilling	-
SR	[ˈab.m̩]

Vowel shortening occurs in other Trans New Guinea languages, including Kamano-Kafe (Drew & Payne 2007) and Hua (Haiman 1980), but deletion and replacement with a syllabic consonant is less common. As discussed in 2.3 (see 'Rule 13: Identical vowel deletion), identical vowels do not occur on the surface in immediately adjacent positions in Kere, but do so in Tabare (McVinney & Luzbetak 1954).

2.4.3. Consonant phonotactics

Turning to consonant phonotactics, there are a few unusual features of the consonants found in Kere. For this region, the frequent occurrence of syllabic [l̩], [m̩], and [n̩] discussed above is the most notable feature of consonant phonotactics in this language, as syllabic cononants are uncommon in neighboring languages, including Kuman (Piau 1985; Hardie 2003; Pfantz & Pfantz 2005),. These consonants are clearly syllabic for a few reasons. Firstly, stress patterns treat them as syllable nuclei, assigning stress as if they were a vowel. Secondly, they can bear tone, which is not typologically uncommon for syllabic consonants in tonal languages (Ladefoged & Johnson 2011). This is discussed further in chapter 3.

All of the consonant phonemes of Kere can occur word-initially, with the exception of /l/, /ɾ/, and /ŋ/. All three of these are found word-medially. Word-finally, all consonants occur apart from /ŋ/, /ɾ/, /w/, and /j/. This is summarized below and is unlike neighboring languages, including Tabare. In Tabare, /l/ and /ŋ/ can occur in any position, but /r/ is restricted to word-medial and word-final environments (McVinney & Luzbetak 1954). It is more similar to Dom, in which /l/ and /r/ cannot occur word-initially[11] (Tida 2006). Word-medially, all consonant

---

[11] In Dom, /ŋ/ is not considered to be a phoneme (Tida 2006).

phonemes occur, and all consonants apart from /ŋ/, /ɾ/, /w/, and /j/ are found word-finally. This is unlike Kuman which has several restrictions on the phonemes which can occur in either word-initial or word-final position (Piau 1985; Hardie 2003). Constraints on phonemes within the word are summarized in Table 4.

TABLE 4. CONSONANT PHONEME RESTRICTIONS WITHIN A WORD

	Word-initial	Word-medial	Word-final
/p/, /t/, /k/, /b/, /d/, /g/, /s/, /m/, n/	+	+	+
/l/	-	+	+
/ŋ/, /ɾ/	-	+	-
/w/, /j/	+	+	-

Geminates in this language are also possible after a vowel is deleted between two identical consonants, as seen in (61). This happens most frequently with sonorants and /ɾ/, as seen in the examples below. When the flap is a geminate, this is realized as the trill [r] in fast speech, but in slow speech, the series of flaps may occur with a reduced vowel. This is unlike Tabare in which this sound is always a trill and never a flap (McVinney & Luzbetak 1954). This is also discussed in the flap-related rule 11 (2.3).

(61) (REPRODUCED FROM (48)) /bɛɾɛ+ɾɛ/ → [ˈbɛɾ.ɾɛ]

                        do-SEQ

                        'do and'

UR	/bɛɾɛ+ɾɛ/
Stress assignment	ˈbɛ.ɾɛˌɾɛ
Consonant voicing	-
Plosive lenition	-
Vowel syncope	ˈbɛɾ.ɾɛ
Glide insertion	-
Vowel deletion	-
Sonorant syllabification	-
Nasal assimilation	-
Plosive deletion	-
Vowel assimilation	-
Vowel reduction	-
Flap trilling	ˈbɛ.rɛ
SR	[ˈbɛ.rɛ]

2.5. Summary

There are thirteen consonant and five vowel phonemes in Kere. Most consonants can occur in any position within the word. Syllables tend to be CV, but V, CVC, and CCV are also

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common. There are a handful of phonological rules, including vowel syncope, which likely serve to preserve the preferred trochaic stress pattern of the language, especially in words that are underlyingly trisyllabic. Finally, stress clash is permitted between syllables with primary and secondary stress, but not between adjacent syllables with primary stress. In order to avoid this, primary stress on monosyllables within a phrase becomes secondary stress before another initial primary stress.

Typologically, the segmental and non-tonal suprasegmental phonology of Kere is not especially noteworthy or unusual, with the exception of its syllabic consonants which are uncommon areally, but not cross-linguistically. The consonant and vowel inventories of Kere are fairly simple, symmetrical, and consistent with what has been reported for other Trans New Guinea languages. The phonological rules of this language are fairly straightforward and tend to be clearly phonetically-motivated. The phonology of tone, however, is more typologically unusual, as is the case for many Papuan languages (Zanten & Dol 2010). The features of this tonal system may be able to provide insights for current phonological theory, especially with respect to describing and categorizing tonal systems and phenomena across languages. In the following chapter, I describe the tonal phonology of Kere, and in chapter 4 I provide my analysis of this system and its theoretical implications.

CHAPTER 3
TONE

In this chapter, I address the phonology of tone in Kere. As mentioned in section 1.2, Hyman (2001) considers a language to have lexical tone if some indication of pitch is in the lexical representation of any number of morphemes. Considering this definition, tone is defined here as a phonological quality related to voice pitch, and independent of segments, which may be lexical or postlexical. Tonal languages, however, are those which exhibit lexical tone. In 3.1, I address previous research on tone in the languages of New Guinea. In this section, I also provide a brief summary of the autosegmental-metrical approach on which my analysis relies; for more background on tone in general and this approach, see 1.2. The remainder of this chapter aims to describe the tonal patterns found in Kere, moving from the smallest level to larger levels. I start with the phonemic level (3.2), which includes the levels of tone and the types of nuclei with which tone can co-occur. Next, I address tone at the word (lexical) level (3.3), providing examples of the types of pitch patterns found on words with different numbers of syllables. In 3.4, I discuss tone at the phrasal level, looking especially at patterns of tone sandhi. Finally, in 3.5, I address notable differences in the use of pitch between Kere and Tabare, a closely related variety.

Throughout this dissertation, high tone is indicated by an acute accent on the corresponding syllable nucleus. Low tone is not marked. For clarity, in this chapter I have also written 'H' or 'L' for high tone or low tone (respectively) underneath a word when referencing the surface form, especially when minimal pairs for tone are provided. When referring to

underlying tone and its association with segments, the 'H' and 'L' abbreviations occur above a word with corresponding lines to represent these associations.

3.1. Previous research

There have been several attempts to classify the tonal phenomena found in the languages of New Guinea, with some authors arguing for two types of tonal systems (Capell 1949b) and others arguing for various three-way classifications of these systems (Wurm 1954; Pike 1964). In much of the literature describing these languages, authors have relied on the pitch-accent versus 'true' tonal dichotomy. Hardie (2003), however, analyzes the tonal system of Kuman in depth, arguing that this dichotomy is not appropriate for the kind of tone found in that language. My analysis of Kere further supports this. Below, I summarize some of the previous literature on tone in New Guinea, and provide an overview of the autosegmental-metrical approach which is the basis for the tonal analysis I present in this dissertation.

3.1.1. Tone in Trans New Guinea languages

Capell 1949b argues that in New Guinea, there are two types of tone systems: one in which tone is related to intonation (postlexical tone); and one in which tones distinguish lexical items (lexical tone). While Wurm (1954) claims that tonal languages of New Guinea tend to fall into three types -- tonal (i.e., lexical tone), semi-tonal (i.e., postlexical tone that does not carry lexical meaning, like intonation), and quasi-tonal (i.e., lexical tone with correlations with stress and length) -- Pike (1964) argues for a different three-way distinction for describing suprasegmental systems. He instead proposes (i) two subtypes of lexical tone systems in which

each syllable carries a distinctive tone, (one with contour tones and one without,) which he labels 'syllable tone' systems, as well as (ii) a lexical system in which the word is the tone bearing unit, which he labels as a 'word tone' system in addition to (iii) types of stress systems. More recent research, however, suggests that many Trans New Guinea languages are tonal (rather than relying on stress) and that such languages of this area tend to have a dense lexical tone system with distinctive tone on each syllable (Foley 2000). Many languages of New Guinea are also analyzed as having pitch accent (Foley 1986), a system in which tone can be lexical or postlexical, tones tend to be sparse (frequently unspecified), and a single tone predicts the following tones for the phonological word (van der Hulst 2010). While McVinney & Luzbetak (1954) mention that Tabare has phonemic pitch, they do not describe the system otherwise or provide any examples.

Despite the fact that Trefry 1969 denies the existence of tone in Kuman, the tonal system of Kuman is extensively studied in Hardie 2003, which concludes that the system shares features with both pitch accent and dense lexical tone (labeled as 'true tonal') systems. The idea that tonal systems may not be strictly pitch accent or tonal, but rather may make up a continuum of features is advocated in the literature. McCawley 1978 and van der Hulst & Smith 2010 suggest that the dichotomy between pitch-accent and tonal systems is not the best way to approach an analysis of tone in languages. McCawley (1978) argues that there are many languages at different stages apart from the two, and that research should instead discuss the variety of independent characteristics of different tonal systems. Van der Hulst & Smith (2010) argue that there is evidence that there is a continuum of non-intonational tonal systems which employ tone-spreading and tones in fixed positions to different extents. In chapter 4, I analyze Kere using a

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similar continuum-based framework and compare its tonal system to that of Kuman (Hardie 2003) and other languages. This analysis suggests that McCawley's (1978) feature-based approach to tonal typology is preferable to a dichotomous or continuum-based approach.

3.1.2. An autosegmental-metrical approach to tone

The autosegmental-metrical approach assumes that suprasegmental features, including lexical and postlexical tones, operate at levels independent from the segments. These levels make up a hierarchy based on strong and weak nodes. These tiers are then assigned to the tone-bearing or stress-bearing units of the language in such a way that suprasegments can reference different levels of the structure in different ways (Gussenhoven 2004; Crystal 2008). This approach has successfully accounted for unusual patterns of tonal assimilation and tonal processes in several languages, including Igbo (Niger-Condo) (Goldsmith 1976), Siane (Gorokan) (James 1994), and Fore (Gorokan) (Scott 1990). Since suprasegments are able to reference different levels of structure, they are also able to account for both lexical and postlexical tone and their interactions.

There are two major restrictions within an autosegmental-metrical approach: the association convention and the obligatory contour principle (Gussenhoven 2004; Crystal 2008). Each of these plays a role in the underlying tonal patterns, tonal associations, and tonological rules I provide here. According to the association convention, each tone-bearing unit must be assigned at least one tone and each tone must be assigned to at least one tone-bearing unit. The obligatory contour principle disallows identical adjacent tones in the underlying representation (Gussenhoven 2004; Crystal 2008). These principles will be considered in the underlying representations I provide for tone here and in subsequent chapters. In 4.4, I address how the tonal system of Kere provides evidence to support an autosegmental-metrical approach to tone.

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3.2. Phonemic level

Kere has two levels of lexical tone: high and low. High tone is indicated by a higher pitch (F_0) relative to surrounding sounds, while low tone is phonetically the absence of this higher pitch. As discussed further in the following section, tone is contrastive for monosyllables. This is demonstrated with the minimal pairs in (62) and (63) below, as well as many other minimal pairs for tone in Kere. While many languages with tone have both lexical and morphological tones (Ladefoged & Johnson 2011), only lexical tones have been found in Kere, and the rules for tone do not typically interact with segmental phonological rules.

(62) kwi
   L
   'and then' (conj)

   kwí
   H
   'wing'

(63) are
   L
   'sun'

   aré
   LH
   'people'

3.2.1. Tones and their allotones

Both high tone (phonetically realized by a higher pitch) and low tone (phonetically realized by a lower pitch) are level tones, but they do have allotones. High tone has an extra high variant which occurs in sequences of high tones (discussed in 3.4). Low tone has only a single allotone. While Hardie 2003 does not report allotones in Kuman, they are common across languages (Odden 1995). While they are not considered allotones, a slightly lower F_0 tends to occur with low vowels, like /a/, compared to high vowels, like /i/ and /u/. This is common across languages (Cahill 2007) and related to intrinsic pitch (see 4.4.3). Additionally, there are words which are unspecified for tone. Phonetically, these are identical to words with all low tones in isolation, but they exhibit different behaviors in phrases. This is seen in the differences between (64) and (65) below.

(64) H   U
    púl +   wagai
    knife +   new/good

    H   L%[12]
    | \ \ |
    púl wágái
    H HHL%
    'new knife'

---

[12] This boundary tone is related to postlexical tone produced with this particular naturalistic occurrence of this phrase, not the unspecified tonal pattern of this word.

(65) H   L

    púl   +   alme

    knife   +   under

    H   L

    | | \

    púl alme

    H   LL

    'under a knife'

3.2.2. Syllables as the tone-bearing units

High tone can co-occur with any syllable nucleus, whether vowel or syllabic consonant, as seen below. There is no close relationship between vowel height and tone, which is unlike Kuman (Hardie 2003), but common typologically (Schuh 1978). Examples in which various vowel qualities and syllabic consonants co-occur with high or low tone are provided below. In each of these examples, the vowel or sonorant forms the nucleus of a syllable. For example, the word *pĺ* 'salt' in (66) is monosyllabic (a derivation is provided in (73)), while (71) k*amń* 'time, season', and (72) *amḿ* 'her breast' are disyllabic. These examples, along with evidence from vowel syncope (see 2.3), suggest that the syllable is the tone-bearing unit in Kere (Pierrehumbert & Beckman 1988; Yip 1995; Hardie 2003).

  (66) kwí

     H

     'wing'

  (67) kwi

     L

     'new'

(68) ku

L

'taste'

(69) agl-á

LH

stand-IMP

'stand!'

(70) pĺ̩

H

'salt'

(71) kamń̩

LH

'time, season'

(72) am-ḿ̩

LH

breast-3SG.POSS

'her breast'

Tone shifts from one segment to another seen in (73) and one syllable to another in (74). This further suggests that the syllable is the tone-bearing unit (TBU) in Kere (Bao 1990; Pike 1964; Yip 2002).

(73) /nil/ →   [ˈnĺ̩]
      H   H
      'water'

          UR   /níl/

          Vowel deletion   ˈnl

          Sonorant syllabification   ˈnl̩

                                            H
                                         |
          Tone assignment   ˈnl̩

          SR   [ˈnĺ̩]

(74) /glabi+na/ →   [ˈglaβ.ná]
      LH + L   LH
      tongue-1SG.POSS
      'my tongue'

          UR   /glabína/

          Plosive lenition   ˈgla.βi ̩na

          Vowel syncope   ˈglaβ.na

                                      L   H[13]
                                    | |
          Tone assignment   ˈglaβ.na

          SR   [ˈglaβ.ná]

---

[13] In this example, contour leveling (3.3.5) also takes place.

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If this were a system in which the tone-bearing unit was the word, as is the case in many Papuan languages (Pike 1964), then the expected surface pattern of *glabná* 'my tongue' would be [glabnâ] with a falling contour tone on the final syllable. Although a contour-leveling rule would create the correct output, the types of patterns we find in Kere suggest that this is a system in which the word is not the tone-bearing unit. If the tone-bearing unit was the morpheme, as is the case in Kuman (Hardie 2003), the expected surface pattern for this bimorphemic word would be [glăbna]. Instead, the single high tone simply reassigns to the syllable with the next nucleus, despite the fact that it is across a morpheme boundary. Since this language does not have a long versus short vowel distinction, it is unlikely that the TBU for this language is the mora. However, if this were the case, we might expect the high tone to assign to the next mora, which would most likely be the nearest heavy syllable (Yip 2002; Odden 2005). In the preceding example, there is no heavy syllable, so it is not possible to rule out the mora as the tone-bearing unit, but as mentioned above, without a vowel duration distinction and other rules based on the mora, this is unlikely. Overall, examples of patterns like that of *glabná* 'my tongue' in Kere strongly suggest that the tone bearing unit of this language is the syllable and that tones are assigned from left to right after segmental rules like vowel syncope have occurred (Yip 2002; Odden 2005). This leads us to the first rule, as formulated below. Additionally, a final tone can spread to remaining syllables (3.4.5).

Tonal Rule A: Tone association

A single tone is assigned to each syllable from left to right.

Remaining tones are associated with the final syllable.

3.2.3. Tone and segmental phonology

In Kere, tone does not typically interact with segmental phonological rules, but there is one exception. When a medial unstressed vowel or a high vowel is deleted in fast speech, its tone is preserved (as mentioned in 2.3 and demonstrated below). This is predicted by the autosegmental approach (Gussenhoven 2004; Odden 2005) and lends support to its use. After vowel syncope, this tone can be reassigned to the new nucleus of the syllable, as is the case in monosyllables (73), or it can be reassigned to the nucleus of the following syllable, seen in (74) above.

The sonorants /l/, /m/, and /n/ can be syllabic, as discussed in 2.3, and syllabic consonants can carry tone. Voiced syllabic consonants co-occur with tone in other languages around the world, including Igbo (Ladefoged & Johnson 2011); however, the occurrence of syllabic consonants is not widespread in Trans New Guinea languages with tone, so this feature is uncommon areally and genetically (Haiman 1980; Foley 1986; Hardie 2003; Tida 2006). Examples of syllabic consonants which co-occur with high tone in Kere are provided in (70)-(72), reproduced below. These examples further support my analysis of syllables as the tone-bearing units of the language (Odden 1995; Yip 2002), as discussed in 3.2.3 below.

(75) [pĺ̩]
       H
       'salt'

(76) **[**kamń̩**]**

LH

'time, season'

(77) **[**am-ṃ́**]**

LH

breast-3SG.POSS

'her breast'

3.3. Lexical tone (word level)

In this section, I address lexical tonal patterns at the word level for words in isolation. Here, constraints are provided for monosyllables (3.3.1), disyllables (3.3.2), trisyllables (3.3.3), and polysyllables (3.3.4). Contrastive tonal patterns occur with each word length, but there are also constraints on the number of high tones which can occur with a single word and on initial high tone when possible. The patterns found in these words have implications for both underlying tonal patterns and rules for tonal associations, which are discussed throughout this section. Many tonal languages, including those of New Guinea, also tend to have morphotonemic interactions in which word or morpheme classes interact with the pitch levels across bound morphemes and the stem in different ways (McKaughan 1973:4; Foley 1986:64). These sorts of patterns are addressed in 3.3.6.

3.3.1. Monosyllables

In monosyllabic words, tone is contrastive. There are several minimal pairs for tone which demonstrate this for Kere and this is also the case in Kuman (Hardie 2003). Kere speakers are able to distinguish members of these pairs in isolation, which is why I treat these as minimal

pairs for tone, rather than homonyms. The existence of such minimal pairs suggests that the tonal

system of Kere may be more like a lexical tone system, as opposed to a pitch-accent system

(Hardie 2003; Donohue 2005). A handful of monosyllabic minimal pairs for tone are provided

below.

(78) [gwi]
      L
      'cold'

      [gwí]
      H
      'wind'

(79) [ki]
      L
      'dog'

      [kí]
      H
      'teeth'

(80) [blɛ]
      L
      'stick'

      [blɛ́]
      H
      'head'

3.3.2. Disyllables

There are also disyllabic minimal pairs for tone, but not all potential tonal patterns are attested in disyllables. A lexical tone system in which the tone-bearing unit is the syllable should allow the following possible surface tonal patterns in disyllabic words: HH, LL, HL, and LH. In Kere, however, only LL and LH occur. This suggests that there is some sort of constraint which bars high pitch from occurring initially in polysyllables in isolation (Ladd 1996). Such a constraint is further suggested by the phrasal data provided in the following section. A constraint of this type is typically found in pitch-accent systems which tend to have restrictions on where an accent can occur. Lexical tonal systems, however, tend to have few constraints on the position in a word in which a tone can occur (Hardie 2003; Hyman 2009a). In Hua, a Gorokan language, tone is only contrastive in stressed syllables (Haiman 1980). This is not true of Kere, however, as can be seen below, where tone is only contrastive in unstressed syllables in disyllabic words, but is contrastive in both stressed and unstressed syllables in longer and shorter words. The interaction between stress and tone is discussed further in 3.3.7). Some disyllabic minimal pairs for tone are provided below. Like the monosyllables, speakers are able to distinguish members of these pairs in isolation, and therefore they should be considered minimal pairs for tone, rather than homonyms.

(81) [kol-ɛ]

    LL

    'fetch-IMP'

    'fetch!'

    [kolɛ́]

    LH

    'half'

(82) [balɛ́]

    LL

    'sharpen up'

    [balɛ́]

    LH

    'plate'

(83) [aɾɛ]

    LL

    'sun'

    [aɾɛ́]

    LH

    'people'

Tonal Rule B: No initial [H]

/H/ cannot be associated with an initial syllable in a polysyllabic word.

In isolation, no polysyllable occurs with a high tone in initial position. This pattern suggests that there is a constraint which forces a high tone to associate with a non-phrase-initial syllable whenever possible. A high tone can then associate with an initial syllable when either: 1) there is no alternative tone-bearing unit, as is the case with monosyllables in isolation as in (84); or 2) it follows another word in a phrase as in (85). In both of these cases, disallowing initial high tone would violate the association convention (Gussenhoven 2004; Crystal 2009). This constraint does not occur in Kuman (Hardie 2003) or in Dom (Tida 2006). In Chuave, each word is required to have a high tone; therefore monosyllables always occur with high tone, and many longer words have initial high tone (Donohue 1997), which is quite different from what is found in Kere. The lack of initial high tone also suggests that there are syllables which are not specified for tone. In words like *wagai* 'good' (85), this explains the pattern of tonal spreading (discussed further in 3.4.5), as the word in isolation occurs with all low tones, but when it follows a word with a final high tone, it occurs with all high tones, suggesting that the entire word is unspecified for tone. Overall, this pattern is unusual areally (James 1994; Donohue 1997; Hardie 2003; Tida 2006) but not typologically (Yip 2002). This constraint is discussed further in 4.2.2.6.

(84) wá

    H

    'come'

UR	/wa/
	H
Tone association	|
	ˈwa
SR	[ˈwá]

(85) /pul   wagai/   →   [ˈpúl ˌwá.gáí]

    H   H   HHH

    knife good

    'good knife'
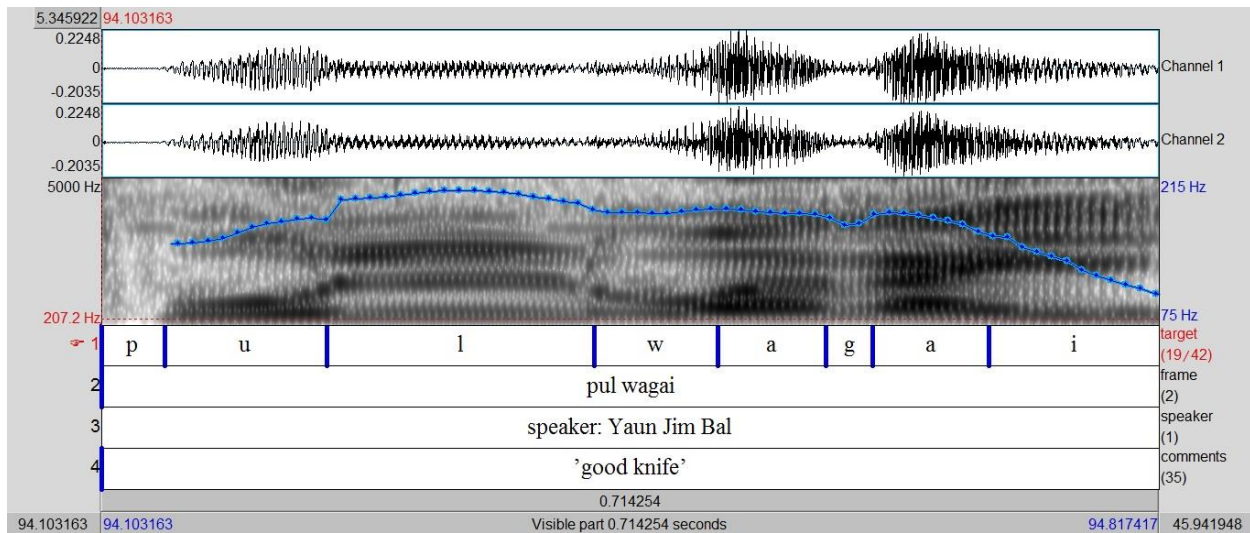
UR	/púl wagai/
	H
Tone association	|
	ˈpul ˌwa.gai
No initial /H/	-
	H
Tonal spreading	| \ \\
	ˈpul ˌwa.gai
SR	[ˈpúl ˌwá.gáí]

3.3.3. Trisyllables

Turning to trisyllables, the constraint against initial high tone is further supported. With trisyllables, a lexical tonal system without constraints and with two tones and three tone-bearing units would have eight surface tonal patterns. These would be LLL, HHH, LLH, LHL, LHH, HHL, HLH, and HLL. In Kere, only half of these are attested, none of which have initial high tone, which furthers the justification for a constraint on initial high tone. No minimal pairs have been found for tone in words with this many syllables, but four of the possible tonal patterns have been found in trisyllables: LLL, LLH, LHL, and LHH. These are demonstrated in the examples provided below.

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[14] In each pitch track, the first transcribed tier represents the segments, the second tier contains the entire word or phrase, the third tier contains the speaker's name, Koi Widu, in this example, and the last tier contains the English translation.

101

(86) /ɔblɛ-na/

     LLL

     eye-1SG.POSS

     'my eye'

(87) /duduá/

     LLH

     'stupid'

(88) /ɔrgí-blɛ/

     LHL

     big-head

     'very big'

(89) /yɔblágɛ́/

     LHH

     'bone'

These examples demonstrate that all possible patterns without initial high tone are found in trisyllables in Kere. This provides evidence for a feature-based approach to tonal typology, as a purely pitch-accent language would be expected to have more restrictions on permissible surface patterns and a prototypical lexical tone system would be unlikely to have any such restrictions (Foley 1986; Hardie 2003). Kere thus does not fit either prototype, as discussed in more detail in 4.1.

The existence of words that are LHL and LHH, like (88) and (89), respectively, has implications for what the underlying tonal patterns may be. In (89), the obligatory contour principle suggests that underlyingly, this word has a LH pattern (Yip 2002). Perseverative tone

spreading accounts for its LHH surface shape (Pierrehumbert & Beckman 1988; Scott 1990). If *yoblage* 'bone', instead had a LHH tonal pattern underlyingly, this would violate the obligatory contour principle (Odden 1995) and we would expect updrift, as predicted by Tonal Rule E below (see p. 116). This is not the case, and the two pitches are of the same height, seen in Figure 15 below. In (88), the high tone does not spread to the final syllable. Since there does not seem to be any environmental factor for predicting tone spreading in (89) but not in (88), there must be a difference in the underlying tonal patterns for these two words. Therefore, (88) is best analyzed as being LHL underlyingly. It is the existence of pairs like these which necessitate an analysis which includes both high and low tone in addition to perseverative tonal spreading.

FIGURE 15. PITCH TRACK FOR *yoblage* (LHH)

(DOI: http://hdl.handle.net/10125/42645)
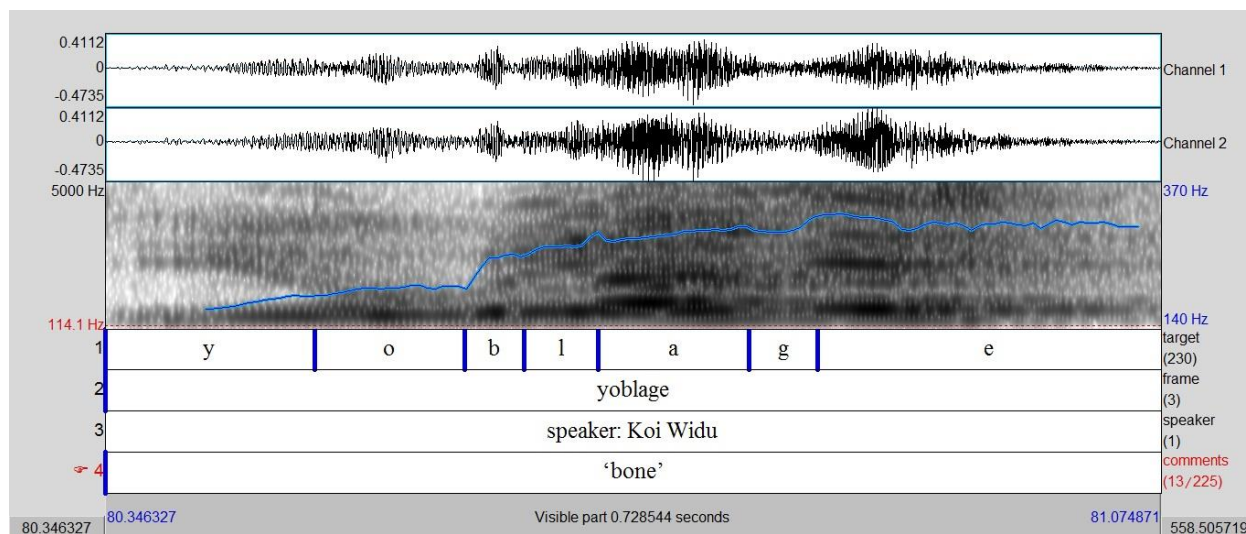
3.3.4. Polysyllables

The prohibition of high tone on initial syllables (except in monosyllables) is also upheld in words with more than three syllables. Like the trisyllables, no minimal pairs for tone have

been found for these polysyllables, but with these words there are also some lacunae in the possible tonal patterns expected from a lexical tonal system which has syllable-based tones. If Kere had a lexical tonal system without restrictions, then sixteen patterns would be possible in a sequence with four tone-bearing units (Yip 2002). In words with four syllables, only two patterns have been found. No words with more than three syllables and initial high tone have been attested. This is consistent with words with fewer syllables in isolation, as described above, and is addressed by Tonal Rule B: No initial [H]. The implications of these patterns are discussed further in 4.1, but examples of the two patterns attested in Kere are presented below.

(90) kamṇkawa
LLLL
'cloud'

(91) nigédoa
LHLL
'bad'

Another noteworthy feature of the tonal patterns of polysyllables in Kere is the lack of a LHLH pattern. As high tone is barred initially, a word with fewer than four syllables cannot have two high tones underlyingly. In words with at least four syllables, however, no words with more than one high tone in the underlying form have been found and are therefore likely prohibited in the language. This feature is unusual, as a prototypical pitch-accent language would bar more than one high tone underlyingly and on the surface, while a prototypical lexical tonal language would permit both (Hardie 2003). Kere, however, allows multiple high tones on a word on the

surface level, but not underlyingly, as exemplified by *yoblágé* 'bone'[15] which is LH underlyingly (3.3.3), but LHH at the surface. This restriction is summarized in Tonal Rule C below. This evidence of Kere fitting neither prototype supports my claim that a dichotomous approach to tonal typology is insufficient to account for the tonal phenomena of this language, as discussed in 4.1.

Tonal Rule C: No more than one /H/ per word

A word can have no more than one High tone underlyingly.

3.3.5. Additional rule for tonal association

Tonal Rule A: Tone association

A single tone is assigned to each syllable from left to right.

Remaining tones are associated with the final syllable.

Contour leveling is found throughout the data and is closely-related to perseverative spreading (3.4.5). As a reminder, tones in Kere as spread from left to right and remaining tones are associated with the final syllable. This is somewhat like Kuman in which tones are assigned to the morpheme from left to right (Hardie 2003), and unlike Dom, in which tones are assigned to the mora from right to left (Tida 2006). Tonal assignment from left to right is more common typologically, and clearly the case in Kere, based on examples like the following, in which the

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[15] This is underlyingly LH for two major reasons: 1) If it was LHH, we would expect updrift to apply, which it does not; 2) this is required by the obligatory contour principle of the autosegmental-metrical approach (Gussenhoven 2004).

word /ɛim/ 'tail', can be realized as [ɛím] or [ím]. The underlying tonal pattern of this word is LH, so when the surface realization is [ɛím], high tone only occurs on the second vowel, as seen below. When the first vowel is deleted, however, both tones are assigned to /i/, and a contour tone is created and then leveled by Tonal Rule D. The application of this rule to /ɛím/ is provided in (94).

Tonal Rule D: Contour leveling

A contour tone is replaced by a high tone.

This phonological rule for tone is required by an autosegmental-metrical approach, as there are no surface-level contour tones. The association convention of an autosegmental-metrical approach requires that all tones are associated to a TBU (James 1994; Gussenhoven 2004), which would result in a contour tone in words like *ím* 'tail' in (94), resulting in *[ǐm]. As there are no contour tones at the surface in Kere, this approach predicts that some rule must level them. Contour leveling of this sort is not typologically unusual (Anderson 1978), but it requires some additional rules (James 1994; Gussenhoven 2004), and is therefore addressed further in 4.4.2.

(92) /ɛim/ →   [ˈɛ.ím]

  LH   LH

  'tail'

		/ɛim/
	UR	
		LH
		L H
	Tone Association	| |
		ˈɛ.im
	SR	[ˈɛ.ím]

(93) /kɔmlɛgɛ/   →   [ˈkɔm.lɛ́ˌgɛ́]

  LH   →   LHH

  'yellow'

	UR	/kɔmlɛgɛ/
		L H
	Tone association	| \
		ˈkɔm.lɛˌgɛ
	No initial /H/	-
		L H
	Tonal spreading	| \ \
		ˈkɔm.lɛˌgɛ
	SR	[ˈkɔm.lɛ́ˌgɛ́]

107
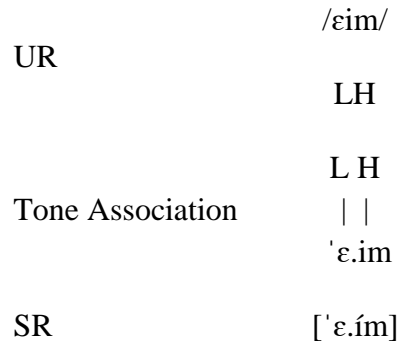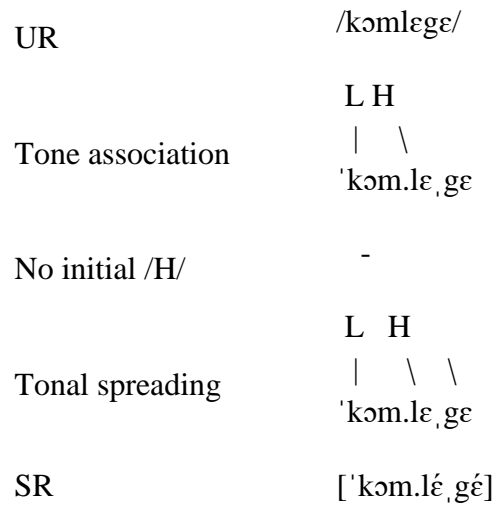
(94) /ɛim/ →   [ˈím]

    LH   H

    'tail'

UR	/ɛím/
Vowel deletion	ˈim
	L H \ | im
Tone association	
No initial /H/	-
	L H X | ˈim
Contour leveling	
SR	[ˈím]

3.3.6. Morphotonemics

Generally, there are few lexical morphotonemic patterns found in Kere at the word level which cannot also be attributed to the interaction between segmental and suprasegmental phonology. With affixed nouns and verbs, there is some tonal spreading across morpheme boundaries, but these are also accompanied by segmental phonological processes, such as vowel syncope which alter the number of TBUs of the stem. This is described below, while morphotonemics of noun and verb phrases are discussed in 3.4.4. The most unusual feature of lexical morphotonemics in Kere is the possible correlation between part of speech and the occurrence of high tone. Verbs seem to occur with lexical high tone less frequently than nouns do. While there are few other differences between nouns and verbs with respect to lexical

morphotonemics, there are some differences between the two categories with phrase-level tonal patterns, as discussed in 3.4.

There are several examples of changes in tonal spreading with affixed nouns. While some body parts occur with high tone in their base forms, at the surface level this tone shifts when a possessive suffix is added. However, this is only the case when vowel syncope and re-syllabification occur, as seen in (74) from 3.2.2 (reproduced below as (95). Therefore, this should also be considered an interaction between segmental and suprasegmental phonology, and not strictly a morphotonemic interaction. This is also the case for affixed verbs, such as (96), in which the high tone associates with the vowel of the affix after the final vowel of the stem is deleted.

(95)(Reproduced from (74))   /glabi+na/   →   [ˈglaβ.ná]

                              LHL   LH

                              tongue-1SG.POSS

                              'my tongue'

        UR   /glabina/

        Stress assignment   ˈgla.biˌna

        Plosive lenition   ˈgla.βiˌna

        Vowel syncope   ˈglaβ.na

                                               L   HL
                                               | | /
        Tone assignment   ˈglaβ.na

                                               L   HL
                                               | | X
        Contour leveling   ˈglaβ.na

        Tone spreading   -

        SR   [ˈglaβ.ná]

(96) /agla+ɛ/ → [ˈa.glɛ́]

    LHL   LH

    stand-3SG.NFUT

    '(one) is standing'

UR	/aglaɛ/
Stress assignment	ˈa.gla͵ɛ
Vowel deletion	ˈa.glɛ
Tone assignment	L HL | |/ ˈa.glɛ
Contour leveling	L HL | |X ˈa.glɛ
Tone spreading	-
SR	[ˈa.glɛ́]

It is slightly unusual that there is a possible correlation between part of speech and high tone, as this has not been reported in other Trans New Guinea languages (Wurm 1961; Haiman 1980; Scott 1990 Hardie 2003; Tida 2006). In Kere, verbs seem to occur with lexical high tone less frequently than other types of words. Based on a Swadesh list (Swadesh 1971) I collected in 2014, 29 of 202 Kere words I sampled had at least one lexical high tone in isolation. Additionally, 3 of 51 verbs I sampled had at least one lexical high tone in isolation. This seems to be representative of the rest of the Kere data I have collected, and suggests that while high tone is rather sparse in Kere, it may be especially sparse in verbs compared to other words. This

feature is discussed further in 4.2.2.9, and could be related to the fact that Kere does not rely on morphologically paradigmatic tone, unlike many other tonal languages (Hyman 2009b). In Iau, a language of Indonesian Papua, for example, there is extensive marked tone on both nouns and verbs; on nouns, tone is phonologically paradigmatic and on verbs, it is morphologically paradigmatic (Hyman 2009b). This is not the case in Kere, however, which only has phonologically paradigmatic tone- that which is contrastive on lexical items, but does not have a morphological function. In Kere, this tone occurs on both nouns, and less frequently, verbs.

3.3.7. Tone and stress

The examples of tonal shift in high tones following vowel deletion and syncope seen above in (73) and (74) are not the only examples of suprasegmental changes following these types of rules. Vowel deletion and syncope are also accompanied by the changes in stress in this language (see 2.3); so while stress and tone do not directly interact, they both change at the surface level when a word's number of syllables changes. This is seen in the difference between (97) and (98), in which the former is in careful speech and retains all three syllables, and the latter is in more rapid speech and is subject to vowel syncope and resulting in changes in the associations of segments with stress and high tone.

(97) /ɔɾɛki/   →   [ˈɔ.ɾɛ́ˌɣi]

    LHL   LHL

    big

    'big'

UR	/ɔɾɛ́ki/
Stress assignment	ˈɔ.ɾɛ́ˌki
Consonant voicing	ˈɔ.ɾɛˌgi
Plosive lenition	ˈɔ.ɾɛˌɣi
Tone assignment	LHL | | \\ ˈɔ.ɾɛˌɣi
SR	[ˈɔ.ɾɛ́ˌɣi]

(98) /ɔɾɛki/ → [ˈɔɾ.ɣí]

LHL   LH

big

'big'

UR	/ɔɾɛki/
Stress assignment	ˈɔ.ɾɛˌki
Consonant voicing	ˈɔ.ɾɛˌgi
Plosive lenition	ˈɔ.ɾɛˌɣi
Vowel syncope & re-footing	ˈɔɾ.ɣi
Tone assignment	L HL | |/ ˈɔɾ.ɣi
Contour leveling	LHL | \X ɔɾɣi
SR	[ˈɔɾ.ɣí]

Comparing this to other languages, Haiman (1980) notes that tone is only contrastive in stressed syllables in Hua. In Kere, this is clearly not the case. Monosyllables in isolation always occur with primary stress and tone is contrastive. In disyllables, tone is only contrastive on unstressed syllables, because initial syllables are stressed and High tone is barred from occurring with initial syllables, except in monosyllabic words (see 3.3.2). In longer words, tone can be contrastive on any non-initial syllable. The restriction on initial high tone in words with more than one syllable, therefore, seems to be related to its position in a phrase, rather than stress, and

reiterates the need for Tonal Rule B which bars assignment of high tone to an initial syllable in words longer than one syllable. This is unlike other languages of the highlands of Papua New Guinea, including: Hua (Gorokan) (Haiman 1980); Usarufa (Kainantu), in which stress is conditioned by tone (Bee & Barker Glasgow 1962; McKaughan 1973); and Mid-Wahgi (Chimbu-Wahgi), in which stress, pitch, and length combine to lend prominence to a given syllable (Luzbetak 1956). These differences are addressed further in chapter 4.

3.4. Rules for sandhi (phrase level)

In isolation, phrases exhibit patterns of tonal spreading, as well as surface tonal patterns not attested with lexical items in isolation. Tonal spreading, or sandhi, is the process by which a tone can associate with more than one tone-bearing unit or one tone influences another (Crystal 2008; Ladefoged & Johnson 2010). In tonal languages like Standard Chinese, sandhi can be complex (Ladefoged & Johnson 2010), but it is generally more straightforward in the languages of the New Guinea highlands (Pike 1948; Ford 1994; Tida 2006). In this section, I address sandhi across different types of noun and verb phrases, drawing on examples from adjectival, adpositional, and adverbial phrases that I elicited in isolation as well as natural data from narrative texts.

3.4.1. Updrift

<u>Tonal Rule E: Updrift</u>

$$/H/ \rightarrow [^{\uparrow}H] \ / \ H \ \#\_\_\_$$

When a high tone follows another underlying high tone[16], it becomes extra high.

When two high tones occur consecutively, the second can optionally raise to become extra high ($^{\uparrow}$H), as is the case for *níl igla* 'in the water' in Figure 16 and (99). Because of the restriction on the number of high tones per word, this rule cannot apply within a single word. This rule also applies to postlexical patterns of emphasis and likely serves to avoid violating the obligatory contour principle (Gussenhoven 2004; Crystal 2008; Hyman 2009).. Such a rule is uncommon typologically (Schuh 1978), but is also found in Kairi of the Gulf Province (Newman & Petterson 1990).

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[16] This must occur across word boundaries, because of the bar on multiple underlying high tones in a word.

(99) /nil   igla/   →   [ˈníl ˌ↑í.gla]

     H   HL   H ↑H L

     water   in

     'in the water'

UR	/níl ígla/
Updrift	H ↑H L
Tone assignment	H ↑H L | | | ˈnil ˌi.gla
SR	[níl ↑ígla]

FIGURE 16: PITCH TRACK FOR *NIL IGLA* 'IN THE WATER'

117
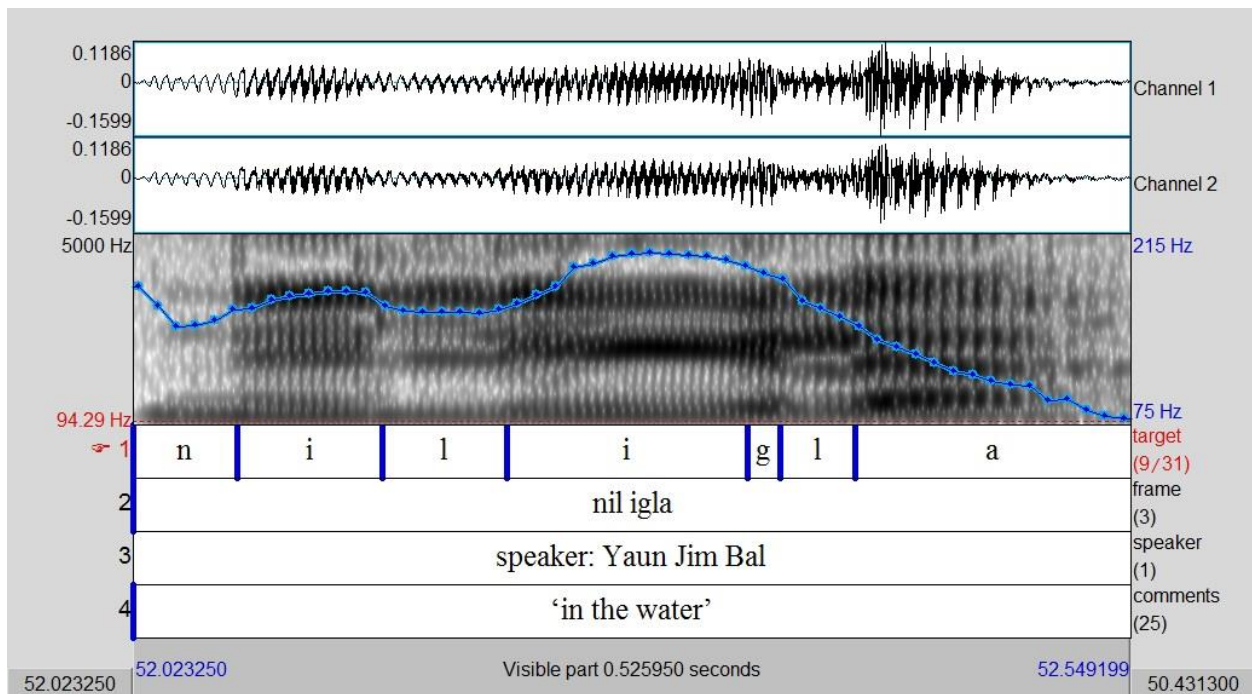
(100) /kagɛ ta-i/ → [ˈka.ɣɛ ˌtá⁺.í⁺]

LH   H   LH   ⁺H
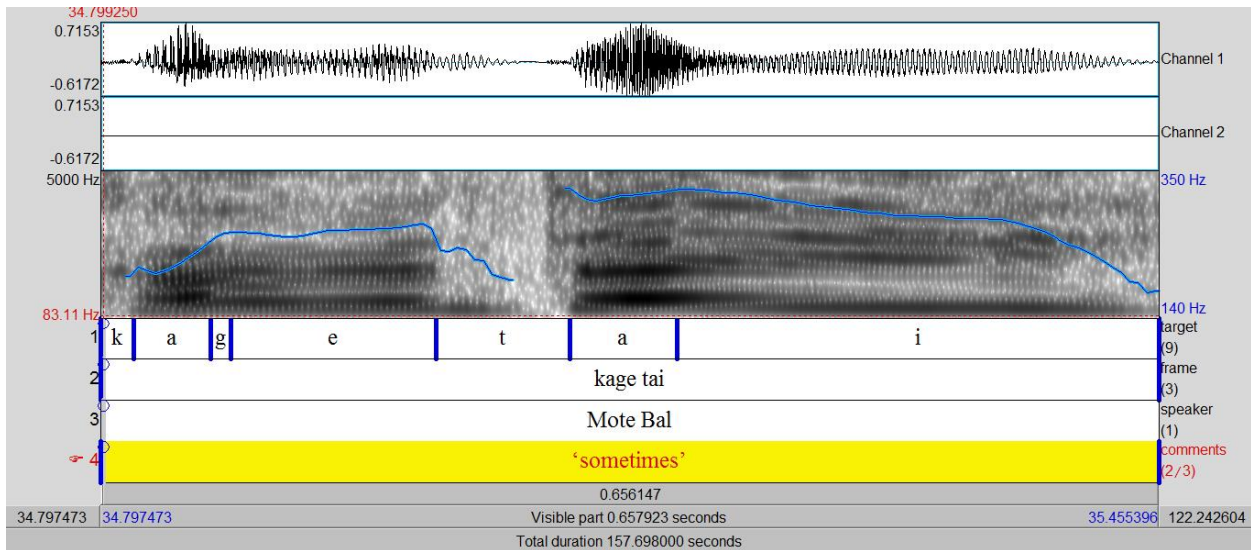
time INDEF-DET

'sometimes'

UR   /kagɛ ta-i/

Updrift   LH ⁺H

                                      LH   ⁺H
Tone assignment | | |
                                      ˈka.ɣɛ ˌta.í

                                      LH   ⁺H
Tonal spreading | | |\
                                      ˈka.ɣɛ ˌta.í

SR   [ˈka.ɣɛ ˌtá⁺.í⁺]

FIGURE 17: PITCH TRACK FOR *KAGE TAI* 'SOMETIMES'

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3.4.2. Low deletion

<u>Tonal Rule F: Low deletion</u>

Between high tones, a low tone is deleted.

[-High tone] → Ø / [+High tone] ___ [+High tone]

In phrases, a low tone is deleted between high tones. This must apply after updrift and before perseverative tonal spreading, as seen in (101). In this example, if low deletion occurred after tonal spreading, the first syllable of /gɔlɛ/ 'old' would not be associated with a tone, which would violate the association convention (Odden 1995; Gussenhoven 2004). This rule is slightly odd, as rules which disrupt tonal contours are uncommon and dispreferred by an autosegmental-metrical approach (Odden 1995; Gussenhoven 2004). However, this is remedied by the following rule, Tone simplification. In (102) below, I have provided an example which demonstrates both of these rules, along with an incorrect derivation in (103) if their ordering was switched. While (103) does lead to the correct surface form, it does not conform to the obligatory contour principle of an autosegmental-metrical approach (Odden 1995; Gussenhoven 2004).

(101) LH   LH

    igé   +   golé

    house +   old

    'old house'

UR	LH LH /igɛ gɔlɛ/
Low deletion	LH H igɛ gɔlɛ
Tone simplification	LH igɛ gɔlɛ
Perseverative spreading	L H | / | \\ ˈi.gé ˌgɔ́.lé
SR	[ˈi.gé ˌgɔ́.lé]

(102) H   LH

 níl + mare

 water   near

 'near the water'

UR	H LH /nil maɾɛ/
Low deletion	H H ˈnɪl ˌma.ɾɛ
Tone simplification	H ˈnɪl ˌma.ɾɛ
Perseverative spreading	H | \ \ ˈnɪl ˌma.ɾɛ
SR	[ˈníl ˌmá.ɾɛ́]

(103) H   LH

    níl   +   mare

    water   near

    'near the water'

	H LH
UR	/ˈnil ˌma.ɾɛ/
Tone simplification	-
Low deletion	H H* ˈnɪl ˌma.ɾɛ
Perseverative spreading	H H* | ╲ ˈnɪl ˌma.ɾɛ
SR	[ˈníl ˌmá.ɾɛ́]

3.4.3. Tone simplification

<u>Tonal Rule G: Tone simplification</u>

A tone is deleted when it follows an identical adjacent tone.

[α High tone] → Ø / [α High tone] ___

A tone is deleted when it follows an identical tone. This is predicted by the obligatory

contour principle of the autosegmental-metrical approach, which requires that adjacent tones be

different (Odden 1995; Gussenhoven 2004). After this rule, tone spreading occurs, so that the

surface form does not change. As this rule is motivated by the theoretical framework, and not the

surface form, it is not ideal (Yip 2002; Gussenhoven 2004) and is therefore addressed in 4.4.2.

An example in which this rule applies is provided below. Additionally, in order to avoid violating the obligatory contour principle, high tones can instead be subject to updrift and become extra-high (this is discussed in 3.4.1.). Updrift also feeds Tonal Rule F: Low deletion, which creates sequences of tones which are subject to tone simplification.

(104) L L   L
  /bɔl almɛ/   → [ˈbɔl ˌal.mɛ]
  bed under
  'under a bed'

	L L
UR	/bɔl almɛ/
	L L
	| | \
Tone assignment	ˈbɔl ˌal.mɛ
	-
Low deletion	
Tone simplification	L
	L
	/ | \
Perseverative spreading	ˈbɔl ˌal.mɛ
SR	[ˈbɔl ˌal.mɛ]

In (105), it is also clear that tone simplification occurs in noun phrases and occurs after the low deletion rule. In this example, there are two possible analyses to account for the final low tone. The first is that this is a postlexical tone which associates with the final tone-bearing unit. Alternatively, the tonal pattern for *one* 'very' is LHL, but at the surface level this is realized as LH due to the contour leveling rule. The first analysis is preferable, as it requires fewer rules

which are theory-driven, rather than data-driven, and is therefore used in this example, but either is plausible (Odden 1995; Yip 2002; Gussenhoven 2004). The example below also demonstrates that tonal re-assignment can occur after underlying tones have been deleted.

(105) LH   L   LH   LH   L   HL
     | | | | | | | | | |
     /igɛ kwi   ɔnɛ/   →   [ˈi.ɣɛ́ ˌkwi ˌɔ́.nɛ]
     house new   very
     'very new house'

	/igɛ kwi ɔnɛ /
UR	
	LH L LH
Stress assignment	ˈi.gɛ ˌkwi ˌɔ.nɛ
Plosive lenition	ˈi.ɣɛ ˌkwi ˌɔ.nɛ
Tone assignment	LH L LH / / | \ \ ˈi.ɣɛ ˌkwi ˌɔ.nɛ
Low deletion	-
Tone simplification	LHLH
Postlexical tone	LHLH L%
Tonal re-association	L H L H L% / / | | | ˈi.ɣɛ ˌkwi ˌɔ.nɛ
SR	[ˈi.ɣɛ́ˌkwiˌɔ́.nɛ]

### 3.4.4. Morphotonemics within clauses

While typical association and perseverative spreading occur within clauses, there is however, also one pattern which is unique to noun phrases. In nominal compounds (3.4.4.2), there is a rule which is found in both Kuman and Kere which deletes the tonal pattern of either the first or second word in the compound. After this, either perseverative or anticipatory spreading can occur. In verbal phrases and sequential verbs no such deletion takes place and tones can spread to the remainder of the phonological phrase, regardless of syntactic boundaries (see Tonal Rule H).

3.4.4.1. Verb phrases and sequential verbs

In verbal phrases, there are no unusual patterns of sandhi. Verb stems typically have all low tone in this language, as discussed in 3.3.6. Approximately 2% of verbs I collected occur with a high lexical tone, and environments in which tone can spread from a verb to other words or affixes are therefore uncommon (see 3.3.6.). In (106) and Figure 18 below (elicited from a younger female speaker), the sequential suffix *–re* occurs with the verb stems *p* 'walk', and *ne* 'eat'. When this occurs, the final tone of each stem can associate with the vowel of the suffix *–re*, resulting in a L pattern for *pre* and a LH pattern for *nere*. Spreading within a word such as this is common across languages (Schuh 1978).

(106) no   kon   p-re   komna   ne-ré   ulpa-bná[17]

     L   L   L   L   L   L   H   L   L   H

     1SG   around   walk-SEQ   food   eat-SEQ   sleep-1SG.NFUT

     'I will walk around, eat, then sleep'

FIGURE 18: PITCH TRACK FOR *NO KON PRE KOMNA NERE ULPABNA* 'I WILL WALK AROUND, EAT, THEN SLEEP'
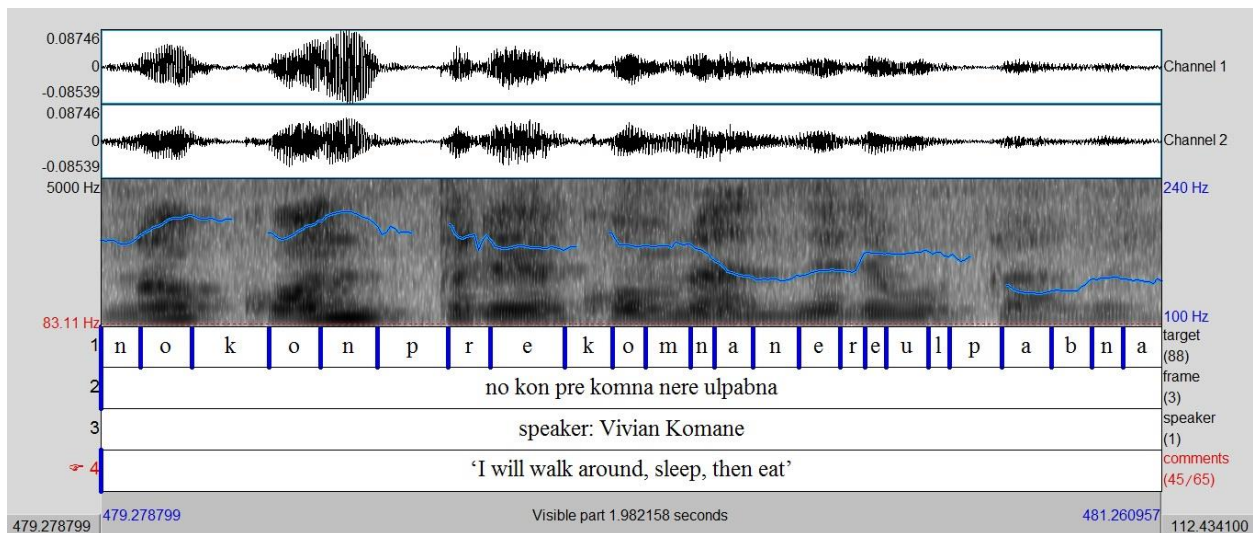
3.4.4.2. Noun phrases and compounds

Turning to noun phrases, there is one additional pattern of tonal deletion found in compounds. The pattern which emerges in nominal compounds is identical to a tonal deletion rule with compounds in Kuman (Hardie 2003) and necessitates the following rule in Kere.

[17] There are postlexical tones in this phrase on *no* and *kon*, which accounts for the discrepencies between this gloss and the pitch track.

Tonal Rule H(a): Deletion in compounds

In a nominal compound, the tonal pattern of the first or second word is deleted.

Which tonal pattern is deleted is not predictable.

Tonal Rule H(b): Anticipatory spreading

If the tonal pattern of the first word is deleted, anticipatory tonal spreading occurs.

In compounds like (107), after tonal association, the tonal pattern of either the first or second word deletes and then either perseverative or anticipatory spreading can take place. This is exactly what Hardie (2003:77-80) reports to be the case in Kuman. Thus, in (107) the surface tonal patterns of the words *ere* 'tree' and *arí* 'leaf' in isolation are L and LH, respectively. When combined to create the compound *ereari* 'leaf', the second vowel of *ere* is deleted, and the tonal pattern of the first word is deleted. Then, the low tone of the second word spreads leftward to the remaining syllable of the first word, resulting in a LLH surface pattern.

There are some issues with this analysis, however. It is possible to also analyze this as simply combining the L and LH patterns of the individual words when they form a compound, which is a simpler explanation. However, my analysis here is consistent with an autosegmental-metrical approach (Odden 1995; Gussenhoven 2004) and examples like (105) show additional rules like contour leveling are necessary to account for all of the data. In (108) and Figure 19, only deletion of a low tone followed by spreading of the high tone can account for the surface pattern. If the underlying tones for each word were permitted to link to each syllable from left to

right, the surface pattern for *yalkane* 'people', would be LLH *[jalkanɛ́]. Instead, the surface

tonal pattern is LHH, [jalkánɛ́], which is consistent with what this tonal deletion rule predicts.

(107) L   L H   L H
   |\ | | |\ \
   /ɛɾɛ aɾi/   →   [ˈɛ.ɾa.ˌɾí]
   LL LH   LLH
   tree leaf
   'leaf'

	/ɛɾɛaɾí/
UR	L LH
Stress assignment	ˈɛ.ɾɛˌa.ɾi
Vowel syncope & re-footing	ˈɛ.ɾaˌɾi
Tone assignment	LLH | | | ˈɛ.ɾaˌɾi
Deletion in compounds	LH | | ˈɛ.ɾaˌɾi
Anticipatory spreading	LH /| | ˈɛ.ɾaˌɾi
SR	[ˈɛ.ɾaˌɾí]

(108) L   LH   L   H

                                  | | \

    /jal   kanɛ/   →   [ˈjalˌká.nɛ́]

    L   LH   LHH

    man people

    'people'

		/ jalkanɛ́ /
UR		L LH
Stress assignment		ˈjalˌka.nɛ
Tone assignment		L L H | | | ˈjalˌka.nɛ
Deletion in Compounds		LH
Tone re-assignment		LH | \\ ˈjalˌka.nɛ
Perseverative spreading		L H | | \\ ˈjalˌka.nɛ
SR		[ˈjalˌká.nɛ́]

FIGURE 19: PITCH TRACK FOR *YAL KANE* 'PEOPLE'
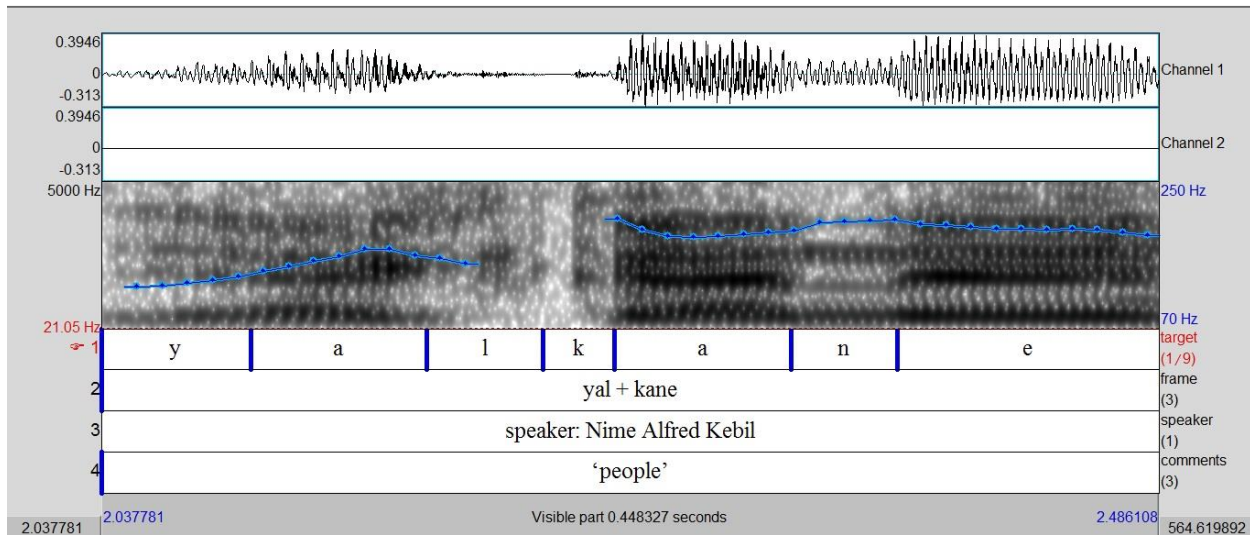
3.4.5. Perseverative spreading

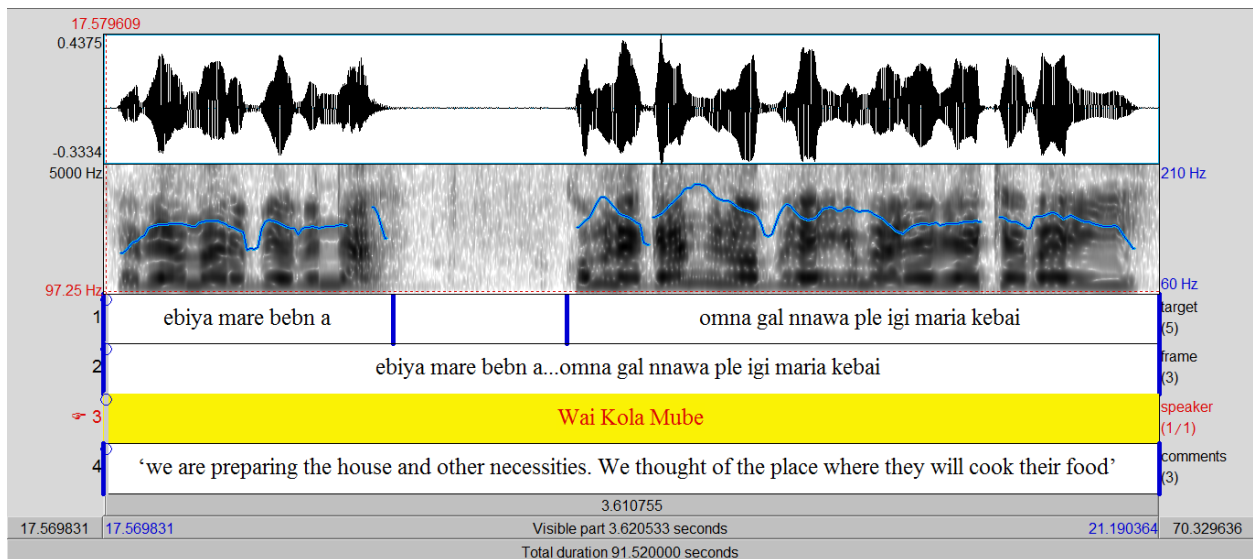### **Tonal Rule I: Tone spreading**

A final tone spreads from left to right across all remaining syllables

within the phonological phrase.

Tones spread across morpheme and word boundaries.

In Kere, sandhi is perseverative, as tone spread from left to right. This type of spreading is much more common typologically than its opposite, anticipatory spreading (Ladefoged & Johnson 2010; Yip 2002), and is seen throughout the data. In this language, perseverative spreading can occur across word boundaries, as in (109) which has specified Low tone with the first word *bo* 'sugarcane' and no specified tone for *wagai* 'good'. This is similar to Kuman (Hardie 2003). In Kuman, tone spreading is also perseverative and can occur across morpheme
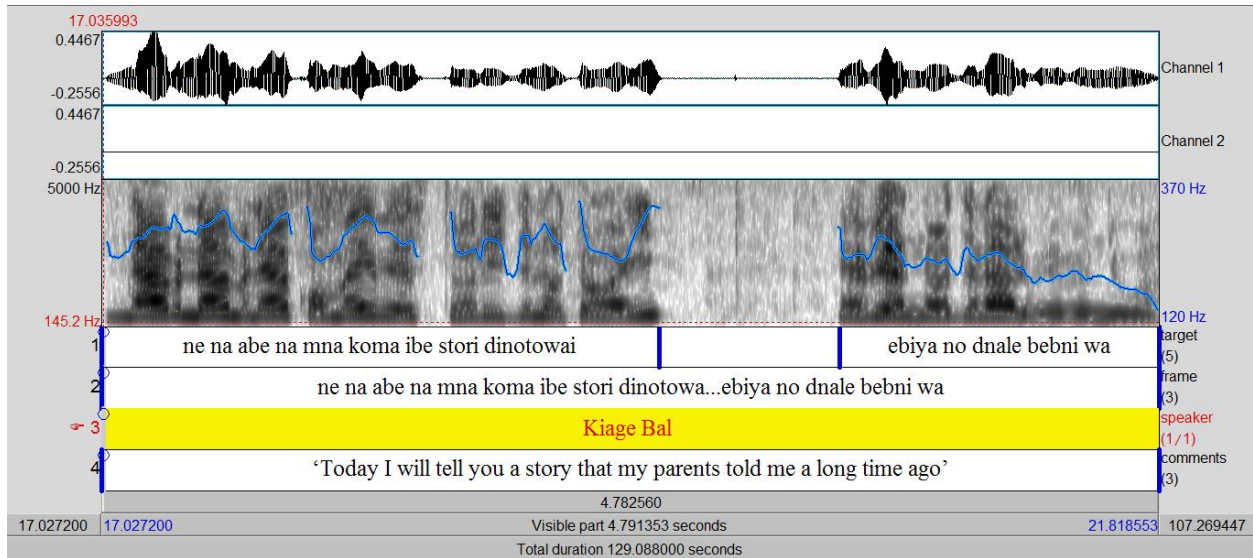
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boundaries and word boundaries. In compounds this spreading can also be anticipatory (Hardie 2003), as it is in Kere, as discussed above.

(109) L
    | \ \\
   bo wagai
   'good sugarcane'

(110) (REPRODUCED FROM 3.4.3) LH   LH
                              igé   +   golé
                              house +   old
                              'old house'

UR	LH LH /igɛ gɔlɛ/
Low deletion	LH H ˈi.gɛ ˌgɔ.lɛ
Tone simplification	LH ˈi.gɛ ˌgɔ.lɛ
Perseverative spreading	L H | / | \\ ˈi.gé ˌgɔ́.lɛ́
SR	[ˈi.gé ˌgɔ́.lɛ́]

3.4.6. Sandhi across phrasal and clausal boundaries

In Kere, tone spreading is sensitive to the boundary of a phonological phrase. Therefore, it is possible for tone to spread across syntactic phrases and clauses, as long as they are in the

same phonological phrase. In this language, the phonological phrase is a word or group of words that are pronounced within a single breath and as if they were a single word. Such phrases are also characterized by (1) the ability of tones to spread and segmental phonological rules to apply across word boundaries within the phonological phrase; and (2) the resetting of postlexical tone and amplitude at the beginning of a new phonological phrase, regardless of syntactic boundaries (i.e. "edgemost phrasal prominence" (Truckenbrodt 1995: 3)). This is common across languages (Pierrehumbert & Beckman 1988) and can been seen in the figures below. These examples came from naturalistic narrative data.

FIGURE 20: PITCH RESETTING ACROSS TWO PHONOLOGICAL PHRASES, MALE SPEAKER

(https://elar.soas.ac.uk/Collection/MPI971073; kere010-002)

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FIGURE 21: PITCH RESETTING ACROSS TWO PHONOLOGICAL PHRASES, FEMALE SPEAKER

17.035993
0.4467
-0.2556 Channel 1
0.4467 Channel 2
-0.2556
5000 Hz 370 Hz
145.2 Hz 120 Hz

1 | ne na abe na mna koma ibe stori dinotowai | ebiya no dnale bebni wa | target (5)
2 | ne na abe na mna koma ibe stori dinotowa...ebiya no dnale bebni wa | frame (3)
3 | Kiage Bal | speaker (1/1)
4 | 'Today I will tell you a story that my parents told me a long time ago' | comments (3)

4.782560
17.027200 | 17.027200 | Visible part 4.791353 seconds | 21.818553 | 107.269447
Total duration 129.088000 seconds

(https://elar.soas.ac.uk/Collection/MPI971073; kere005-001)

3.4.7. The tonological rules of Kuman

While my analysis in this section includes several tonological rules in Kere, I now turn to comparing these rules with those of Kuman. Due to his focus on monosyllables and disyllables, Hardie (2003) reports only a handful of tonological rules in Kuman. In this section, I briefly compare Hardie's (2003) findings for Kuman and what I have provided for Kere above. In Hardie's (2003) analysis of Kuman one tone is associated to one TBU from left to right, and then the last tone spreads to any remaining syllables. In the small sentences examined, Hardie (2003) found that across word boundaries, the final tone of the first word can spread to the first syllable of the second word. In compounds, there is also a rule which deletes the tone of the first or second word in a compound. This occurs before tone spreading, and in cases where the tones have been deleted from the first word, anticipatory spreading takes place (Hardie 2003). These

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rules and their orderings are summarized in Figure 22 below and are consistent with what I have found in Kere.
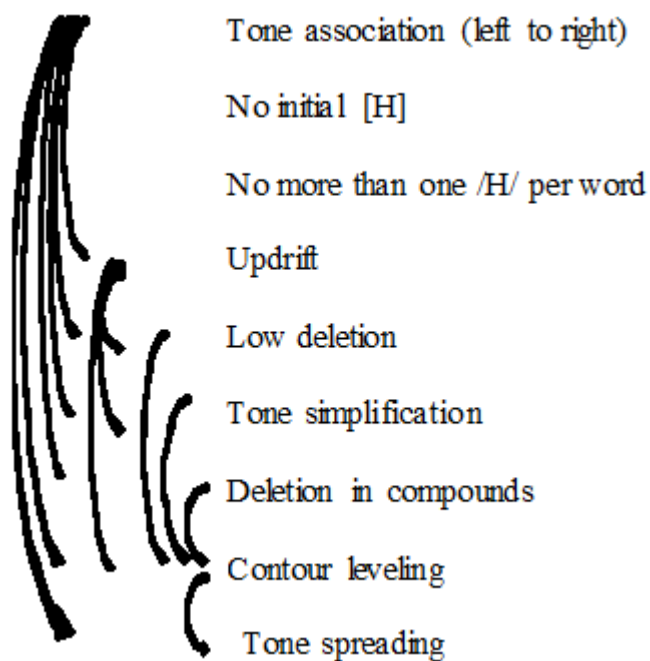
FIGURE 22. KUMAN TONAL RULES AND THEIR CRITICAL ORDERINGS

Kuman tonal rule 1: Association (left to right)

Kuman tonal rule 2: Tone deletion (in compounds)

Kuman tonal rule 3: Tone spreading (adjacent tones spread to vacant TBUs)
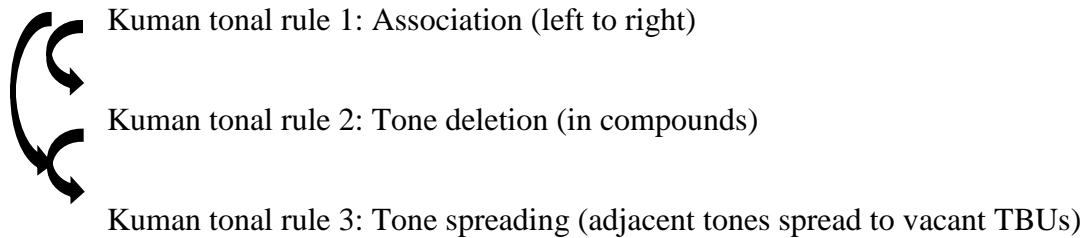
(Adapted from Hardie (2003))

As this dissertation focuses on words of all lengths, I have found more lexical tonological rules (see Figure 23) than those that Hardie (2003) reports for Kuman, including a restriction on initial high tone, a limit on the number of high tones in a word, and a rule which levels contours. Like Kuman, tones are associated from left to right in Kere. There is also the same tone deletion in compounds, which occurs before tonal spreading and after tonal association (3.4.4.2). Since the rules reported by Hardie 2003 are limited, a comparison of this aspect of the two tonal systems is also quite limited and contributes little typologically. A more detailed comparison of structural qualities of the two systems is provided in 4.2 and has more significant implications for tonal typology.

FIGURE 23. KERE LEXICAL TONAL RULES AND THEIR CRITICAL ORDERINGS

Tone association (left to right)

No initial [H]

No more than one /H/ per word

Updrift

Low deletion

Tone simplification

Deletion in compounds

Contour leveling

Tone spreading

3.5. Tone differences across Sinasina

As mentioned in the language background section (1.1), Kere and Tabare are two closely related varieties with extensive contact between speakers. While McVinney and Luzbetak (1954) mention that Tabare has tone, they do not describe the system. In my own research, I have found that speakers of both Kere and Tabare often claim that mutual intelligibility between the two is high and that all *tok ples*[18] varieties of Sinasina primarily differ in lexical patterns of "tone" or "tune". This claim is often accompanied by a manual gesture which represents high pitch and the

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[18] *Tok ples* is a Tok Pisin phrase which refers to a variety or vernacular spoken in a particular village or place.

same handful of words, such as *malda* (NEG)[19] which has different tonal patterns in these varieties. In this section, I address these claims, arguing that there are many cognates between Kere and Tabare and that both sound changes and tonal changes are common in these cognates. The implications of this for understanding the nature of the relationship between Kere, Tabare, and other varieties is discussed further in 4.5 in the following chapter.

My methods to understand the relationships between these varieties were threefold (and are described in more detail in 1.4.3). First, I interviewed Tabare and Kere people about these varieties both in town and in their respective villages, as Kere was reported by speakers to be most similar to Tabare. The results were as described in the preceding paragraph. Next, I collected a 200-item Swadesh list (Swadesh 1971) for each variety and compared similar forms in the data. Lastly, I began asking speakers to rate their own understanding of various clips from these varieties. This approach was abandoned, however, because of the results of the interviews, in which speakers consistently claimed that they were speakers of different *tok ples* 'vernaculars' (see 4.5 for preliminary analysis and appendix B for raw data). Figure 24 below provides a summary of the results of the Swadesh comparisons. Twenty-five tokens were thrown out due to incomplete data or slight differences in definitions, forty-one were not cognates, thirty-seven had no changes, forty-six had differences in pitch, and sixty-seven had differences in segments (Figure 24). It is also important to note that sixteen tokens demonstrated differences in both pitch and segments and are therefore included in both counts.

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[19] Oftentimes, this example is provided with a different manual gesture which represents negation, as opposed to a gesture indicating high pitch. These gestures are fairly standard throughout the area and are related to a village sign language (Asonye & Rarrick 2017).
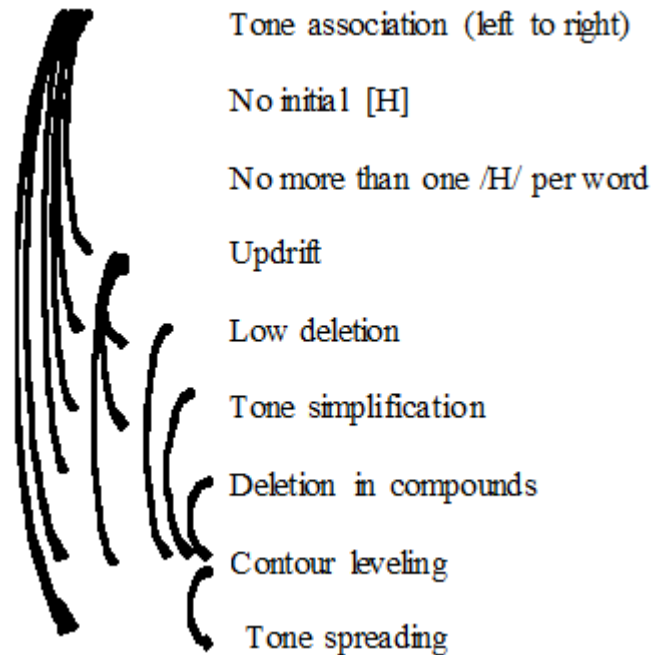
FIGURE 24. COMPARISON OF SWADESH DATA FROM KERE AND TABARE[20]

FIGURE 24. COMPARISON OF SWADESH DATA FROM KERE AND TABARE[20]

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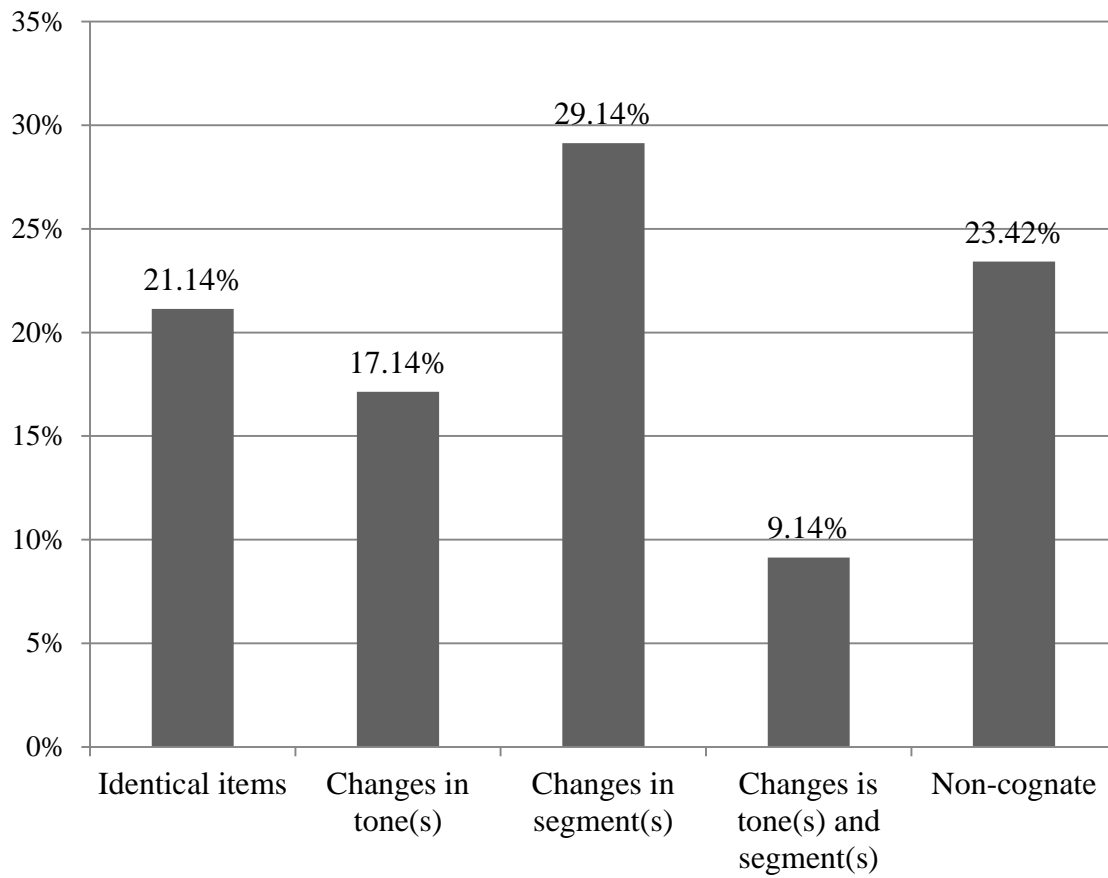
[20] See Appendix A for lexical and tonal comparisons for Kuman (Hardie 2003), Kere, and Tabare.

3.6. Summary

FIGURE 23. KERE LEXICAL TONAL RULES AND THEIR CRITICAL ORDERINGS

Tone association (left to right)

No initial [H]

No more than one /H/ per word

Updrift

Low deletion

Tone simplification

Deletion in compounds

Contour leveling

Tone spreading

The tonal rules of Kere and their orderings are summarized above. In Kere, the syllable is the tone-bearing unit, and tone can occur with any syllable nucleus, including syllabic consonants. There are two lexical tones: high and low. While high tone is marked with a higher F_0, low tone is not marked by a change in pitch relative to nearby syllables. In this language, like Kuman and many others, tone spreading is perseverative, apart from certain compounds. The implications of the features of this system for classification, a comparison with the system of Kuman (Hardie 2003), and a discussion of the theoretical implications of these findings are provided in the next chapter. Many of the features of this tonal system are also not prototypical behavior for either a purely pitch accent language or a language with dense lexical tone, which further suggests that a dichotomous approach to tonal typology is insufficient (as addressed in the next chapter).

CHAPTER 4
DISCUSSION

According to Wurm, (1961:116), "[a]ll the languages belonging to the [East New Guinea Highlands] Stock are tonal to some extent…"; so it is not surprising to find some of the tonal patterns of Kere I have described in chapter 3. Here, I attempt to classify the tonal system of Kere (4.1) based on these patterns and compare it to the system Hardie (2003) presents for Kuman (4.2). I also look at this system typologically, comparing it to tonal systems found in Asia and in Africa, and to that of Cherokee (4.3). In 4.4, I discuss some of the theoretical implications of the existence of such a system, arguing that a feature-based approach to tonal typology is best and that an autosegmental-metrical approach to tonal description is sufficient to account for these data. Finally, in 4.5, I discuss best practices for labeling the varieties of Sinasina, given their relationship to one another and the role of tone in this relationship.

4.1. Tone in Kere

Typologically, there are some unusual features of Kere's tonal system. While it behaves in some ways like a lexical pitch-accent system, in others it is more like a language with lexical tone (see 3.1). Here, I summarize my findings from the preceding chapter and argue that Kere's system does not behave exactly like either system, but the function of tone is this language is more like that of a language with lexical tone than a pitch-accent language. Therefore, it is best considered a sparse lexical tonal system, which is a tonal system in which tone is underlyingly part of lexical items, but not all lexical items.

As a reminder, the tonological rules of Kere are summarized in the figure below. Many of these rules, such as tone simplification, are common typologically and are predicted by the autosegmental-metrical approach (Odden 1996; Gussenhoven 2004). Others, however, such as the restriction which prevents more than one low tone (underlyingly) per word and the bar on initial high tone in words with more than one syllable, are less common in languages with lexical tone (McCawley 1978; Hardie 2003). The rule which levels contour tones is also less common in languages with lexical tone, but it is not unique to Kere (Gordon 2002).

Despite this, there are also several minimal pairs for tone in Kere, which are provided throughout this dissertation (see 3.2, 3.3). These minimal pairs suggest that the primary function of word-level tone in Kere is to distinguish lexical items. Hulst & Smith (1988) argue that tonal systems should be classified based on the primary purpose of tone in a language, especially with respect to whether or not it is used to distinguish lexical items. Following such an approach, the tonal system of Kere is more like a lexical tonal system than a pitch-accent system because of these minimal pairs. This is true of both Kuman (Hardie 2003) and Dom (Tida 2006) as well, which both also feature minimal pairs for tone. However, this type of classification fails to account for several major structural differences between these tonal systems. Therefore, in order to capture the unique features of these systems, a feature-based approach to tonal typology is best for capturing the diversity of tonal behaviors across languages, as I argue further in 4.4.1.

4.2. Comparing Kere & Kuman

In his 2003 thesis, Hardie provides a description and analysis of the tonal system of Kuman, a language closely related to Kere. In this work, Hardie focuses on the tonal patterns

found on monosyllables and disyllables, with some discussion of compounding. Based on the patterns he finds in these types of words, he concludes that Kuman behaves in some ways like a "true" (dense lexical) tonal language, and in others like a pitch-accent language. In this section, I summarize the features Hardie (2003) reports for Kuman and compare them to those of Kere. I also look at both systems typologically, concluding that both of these languages seem to exhibit some tonal behaviors found in prototypical dense lexical tonal systems and others found in pitch accent systems. Even these very closely-related languages do not have an identical array of tonal features, so it would be misleading to use a simple dichotomous classification to describe them. A more faithful approach is to instead describe languages in terms of their collection of tonal features (Donohue 2005; Hyman 2009). This conclusion is also discussed further in 5.2 and 5.4.

4.2.1 Hardie's 2003 analysis of Kuman

Focusing on monosyllabic and disyllabic words, Hardie 2003 outlines many of the major and minor characteristics of tone in Kuman. In this thesis, Hardie provides evidence for two tones which are best described as +falling and –falling, as the first toneme is a falling pitch and the second has two allotones, slightly rising and level. Monosyllabic, monomorphemic words tend to occur with the –falling allotone. Since the pitch patterns found on monosyllables and disyllables coincide with the word and not the syllable, and pitch patterns are associated with changes to the morphemic composition (i.e. compounding), Hardie argues that the morpheme is the underlying unit of lexical pitch in this language. This is closest to Donohue's (1997) word-level tones. These tones are analyzed as being an underlying part of the morpheme with a rule which associates tones and tone-bearing units (syllables in this case) from left-to-right. A second

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rule also spreads the final tone on to any remaining syllables. With two-syllable compounds, there is also an intermediate rule which deletes tones on the first word in the compound.

Some of Kuman's tonal features, such as contrastive lexical pitch and surface contour pitches are found both in dense lexical tone systems and in pitch accent systems. However, according to Hardie (2003), Kuman only allows high tone on certain syllables of a word and has only a two-way contrast on monomorphemic words (regardless of the number of syllables), which is not typical of either pitch accent or dense lexical tonal systems (Hardie 2003). The tone-bearing unit in this language is also reported to be the morpheme. This is unusual for both pitch accent languages like Standard Japanese, and for lexical tone languages like Mandarin; in both of these languages, the tone-bearing unit is the syllable (McCawley 1978). Unlike many dense lexical tone systems, Kuman also 1) allows tone spreading across word boundaries, 2) does not have a balanced tonal inventory and 3) has a strong correlation with tone quality and vowel height (in monosyllables non-falling tone only co-occurs with high vowels.) Overall, Kuman seems to share features of both tonal and pitch accent systems and cannot conclusively be labeled as either (Hardie 2003).

4.2.2 Comparing Kere and Kuman

In this subsection, I compare the tonal systems of Kere and Kuman, based on the Kere analysis I provide in chapter 3 and Hardie's 2003 analysis of Kuman. I address both minor characteristics (4.2.2.1), like the levels of tone and basic melody of each language, as well as major characteristics (4.2.2.2). These major characteristics come from Hardie's typological analysis of Kuman (Hardie 2003: 81-90), and are thus the focus here. These features were gathered from Standard Japanese and Mandarin Chinese, as they "have often been taken as

prototypical models (though not sole models) of pitch accent and true tone languages" (Hardie 2003: 82). Other typological features used in continuum-based or feature-based approaches are discussed in 4.4.1.

4.2.2.1. Minor Characteristics

There are some similarities and differences in minor features of the tonal systems of Kere and Kuman which are worth noting. Firstly, while Kere has a [+High ,-Low] versus [-High, +Low] distinction, Kuman relies on [+Falling] versus [-Falling] (Hardie 2003). Typologically, the contrast found in Kere is more common, and the contrast found in Kuman is rather unusual (Hardie 2003). The basic melodies of these languages are also different. In Kuman, most words occur with the rising allotone of the –Falling toneme. Thus, LH is considered by Hardie to be the basic melody (Hardie 2003: 72). In Kere, however, it seems to be L, which may contribute to the difficulty of detecting lexical tone at the surface level of this language initially. In both languages, tonal spreading is from left to right[21]. However, in Kuman a single tonal contour is assigned to each morpheme and any remaining tones are assigned to the final syllables of the last morpheme (Hardie 2003: 74). Tonal assignment in Kere is similar, although contour tones are then subject to leveling. While these minor characteristics are not crucial to our understanding of the tone systems of these two languages, they do lend further insight into how these systems should be classified, as this is one of several notable differences in both their major and minor characteristics.

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[21] Except in certain compounds where the tone of the first word is deleted.

4.2.2.2. Contrastive lexical tone

There are several monosyllabic and disyllabic minimal pairs for tone in Kere. Examples are provided throughout 3.3 and reproduced below. Apart from tone, there are no differences between the members of these pairs; they have identical segments and stress patterns. Speakers of Kere consistently produce these words with the same pitch patterns, and are able to identify the correct meaning in isolation, which suggests they are truly minimal pairs and not simply homophones, as seen in the Kere examples below, (111) and (112). Kere, therefore, is best analyzed as having contrastive lexical tone. This is a feature of both languages with lexical tone and pitch-accent systems and is also found in Kuman.

(111) (REPRODUCED FROM 3.2.)   kwi
L
'and then' (CONJ)

kwí
H
'wing'

(112) (REPRODUCED FROM 3.3.2) are
'people'
L

aré
'sun'
LH

4.2.2.3. Surface contour tone

Unlike Kuman (Hardie 2003) and Dom (Tida 2006), Kere does not have surface contour tone on syllables. Only low, high, and extra high level tones occur on the surface level. In cases of vowel deletion and syncope, the autosegmental-metrical approach predicts surface contour tones in some words, but they do not occur. I have posited a tone leveling rule to account for this, and I address it further in 4.4.2. While languages with lexical tone tend to have surface contour tones, some pitch accent languages do and others do not (Hardie 2003). Kuman has surface contour tones in monosyllables. This is predicted by the autosegmental-metrical approach. These tones are not leveled by any subsequent rules (Hardie 2003).

4.2.2.4. Domain of tone

The tone-bearing unit in Kere is the syllable, as demonstrated in 3.2.2. This is different from Kuman, in which it is the morpheme (Hardie 2003), and Dom, in which it is the mora (Tida 2006). According to Donohue 2005, many languages of this area have word-tone systems, but the phenomena found in Kere, Kuman, and Dom suggest that there is diversity in the tonal systems of these languages. Pike 1964, however, suggests that Trans New Guinea languages tend to assign tone to the syllable, which is consistent with what I find in Kere (3.2.2).

4.2.2.5. Tone spreading

Like Kuman, Kere has tone spreading across word boundaries and within the phonological word, as seen in (113) below. This is somewhat unusual, as languages with lexical tone usually allow spreading within the word, but not across word boundaries, and the reverse is true of lexical pitch-accent languages (Hardie 2003). It is tonal features like these which suggest

that a feature-based approach to tonal typology is best, as opposed to a binary pitch-accent versus

lexical tone approach (Donohue 2005; Hyman 2009a), as discussed in 4.4.2.

(113) (REPRODUCED FROM 3.4.3) LH   LH
                                igé   +   golé
                                house +   old
                                'old house'

UR	LH LH	
	/igɛ gɔlɛ/	
Low deletion	LH H	
	ˈi.gɛ ˌgɔ.lɛ	
Tone simplification	LH	
	ˈi.gɛ ˌgɔ.lɛ	
Perseverative spreading	L H	
	| / | \	
	ˈi.gɛ ˌgɔ.lɛ	
SR	[ˈi.gé ˌgɔ́.lɛ́]	

4.2.2.6. Restrictions on high tone

Both lexical tone languages and lexical pitch-accent languages may allow high tone to

occur on any syllable in a word. However, this is not the case in Kere or Kuman (Hardie 2003).

In Kuman, high tone is part of the rising ([-Falling]) or falling ([+Falling]) pattern which is

assigned to the morpheme and therefore has only a two-way distinction on monomorphemic

words. High tone is restricted to certain syllables based on the length of a word, rather than a

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syllable's position in the word (Hardie 2003). In Kere, high tone can occur on an initial syllable only in monosyllables. Longer words can occur with initial high tone only in phrases where they are preceded by another word, especially one which ends in high tone and perseverative spreading spreads the tone across the word boundary. This is seen in the example below. Additionally, in Kere, a word can have no more than one high tone underlyingly, but this high tone can spread to other syllables in a word.

(114) /níl + marɛ/ → [ˈníl ˌmá.rɛ]

    H   LH   HHL%

water + near

'near the water/river'

UR	H LH /nil marɛ/
Tone Association	H LH | | \\ ˈnil ˌma.rɛ
Low deletion	H H
Tone simplification	H
Postlexical tone	H L%[22]
Perseverative spreading	H L% | \\ | ˈnil ˌma.rɛ
SR	[ˈníl ˌmá.rɛ]

---

[22] This postlexical tone marks the end of this utterance, which is a declarative statement.

4.2.2.7. Monomorphemic words

According to Hardie 2003, there is only a two-way tonal contrast in monomorphemic words in Kuman, ±Falling. This is unusual for languages with lexical tone and with pitch-accent, and is a unique feature of Kuman. This is not the case in Kere, however. Examples showing the attested tonal patterns in monomorphemic words are shown below.

(115) bo
    L
    'sugarcane'

(116) púl
    H
    'knife'

(117) are
    L
    'sun'

(118) aré
    LH
    'people'

(119) yoblágé
    LH
    'bone'

(120) orgíble

   LHL

   'very big'

(121) kamṇkawa

   L

   'cloud'

(122) nigédoa

   LHL

   'bad'

4.2.2.8. Tonal inventory

The tonal inventory of Kuman is not balanced, meaning that of the possible surface tonal patterns, few are realized (Hardie 2003). This is unusual for languages with lexical tone, like standard Chinese, but is common in pitch-accent languages, like Japanese. In Kere, approximately half of the possible surface tonal patterns are attested, which is more than in Kuman and Japanese but fewer than Chinese (Kubozono 1994). While this feature has been used to distinguish pitch accent from lexical tonal languages, there are tonal languages which have a low number of lexically contrastive tones, including Bantu languages (Lojenga 1994). The tonal inventory of Kere is most similar to these languages.

In monosyllables, both possible patterns are realized in Kere. In disyllables and trisyllables, all patterns with initial low tone are found. However, in words with four or more syllables, only two of the possible patterns emerge: LLLL and LHLL at the surface form, respectively. This low number of possible patterns is likely related to the relatively low number

of monomorphemic words with more than three syllables in Kere, as well as restrictions on the number of high tones in a word (Tonal Rule 3) and a restriction which bars initial high tone (Tonal Rule 2).

(123) kamṇkawa
LLLL
'cloud'

(124) nigédoa
LHLL
'bad'

4.2.2.9. All-low words

Languages with especially sparse tone tend to be classified as pitch-accent languages, rather than lexical tonal languages. Looking at a Kere Swadesh list I collected in 2014, approximately 15% of words occur with high tone on at least one TBU. These were primarily nouns; verbs tend to occur with all-low tones more frequently than other types of words. The difference between tonal patterns in nouns and verbs is discussed further in 3.3.6. This possible correlation between high tone and part of speech is unlike Kuman, which behaves more like a lexical tonal language and has few words which are unmarked for tone (Hardie 2003).

4.2.2.10. Tone and duration

In stress-accent languages, it is common for vowel duration to reinforce tone. This is the case in Kuman (Hardie 2003), but not in Kere, and it is unclear whether this is typical for languages with either lexical tone or pitch-accent systems. In Figure 25 below, I have provided two pitch tracks for them same speaker, a woman who was born in the 1960s. When she

produces the word *nigedoa* [nɪɣídowa], 'bad' slowly over 0.84 seconds, the F_0 is 44.5 Hz higher on the second vowel with high tone than the third vowel with low tone. When she produces the same word quickly over 0.66 seconds, the F_0 is 77.4 Hz higher. This does not suggest that vowel duration reinforces tone in Kere. However, this feature is not significant to linguists' understanding of tonal typology.

FIGURE 25. PITCH AND VOWEL DURATION
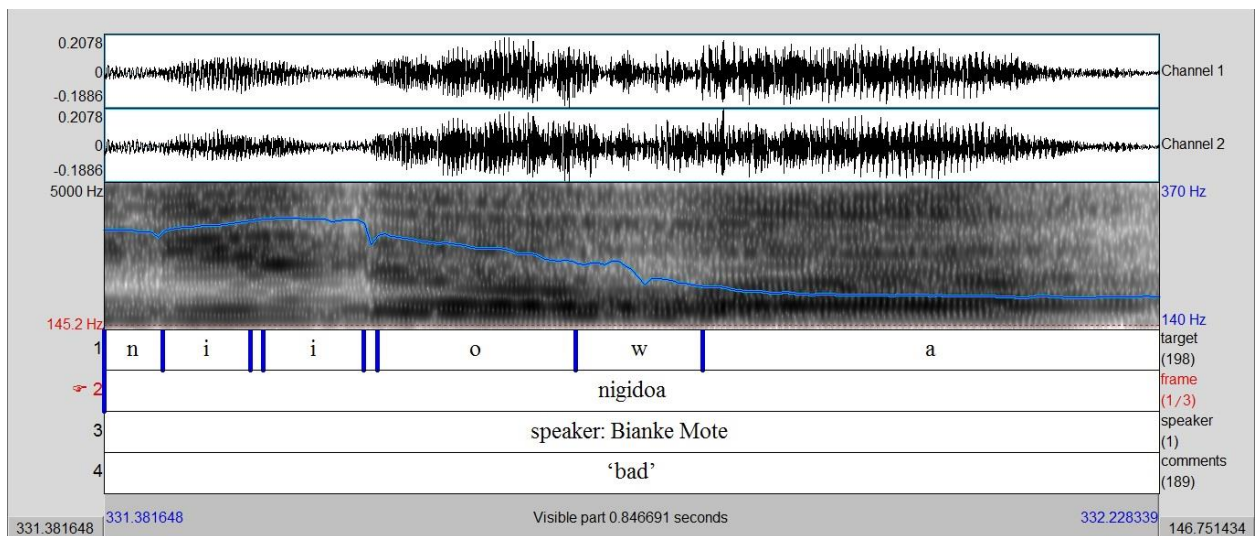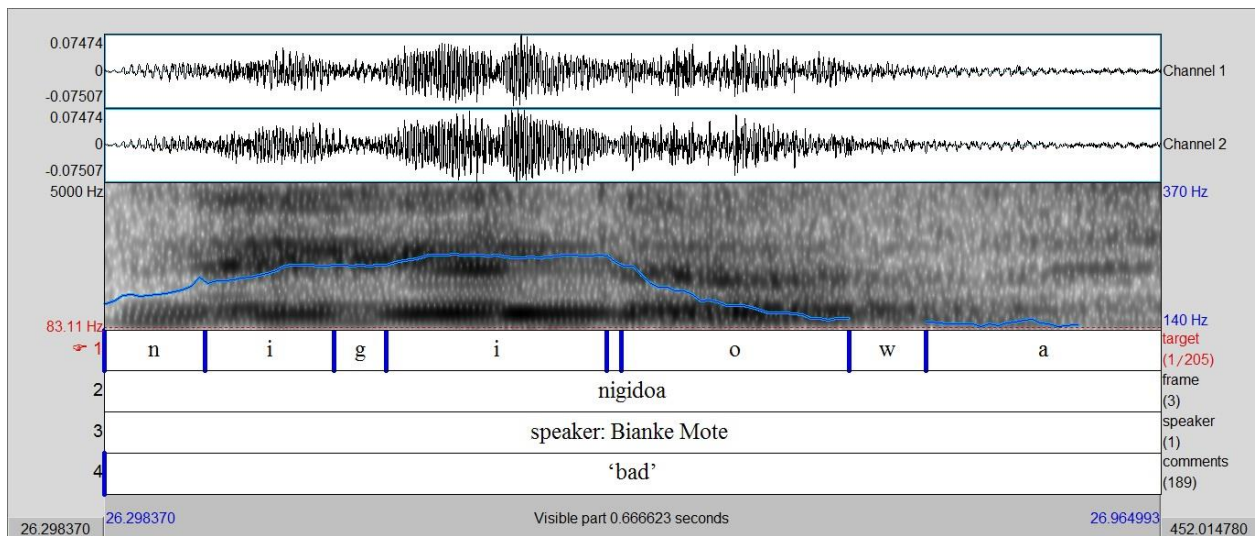
4.2.2.11. Tone and vowel features

While Schuh 1978 and Hendersen 1982 argue that it is uncommon for languages with lexical tone to truly have an intimate relationship between vowel quality and tone, Hardie 2003 demonstrates that tonal patterns in Kuman are predictable based on vowel quality. This has not been reported in languages with dense lexical tone (Schuh 1978; Hendersen 1982; Hardie 2003), but it has also been reported in the Tsuruoka dialect of Japanese (Haraguchi 1988; Hardie 2003). In Kere, there is no such tendency (3.2.1), and it is therefore not a conclusive feature for typologizing the tonal system of this language.

4.2.3. Summary

There are several minor and major differences between the tonal systems of Kere and Kuman. A summary of the major tonal characteristics of these languages is provided in Table 5 below. It is important to note some of the major differences between Kere and Kuman, which are shaded. Firstly, Kere does not have surface contour tones, which is more like a pitch-accent system and Kuman does, which may be more like a lexical tone system. In Kuman, tone is reinforced by duration (Hardie 2003), but this is not the case in Kere. Finally, in Kuman, most words are marked for tone, which is potentially more like a language with dense lexical tone, and the reverse is true of Kere (Hardie 2003). While in both Kere and Kuman, the primary function of tone is to distinguish lexical items and these systems may therefore best be considered most like lexical tonal languages, they each share different features with both pitch-accent and lexical tonal languages (Hulst & Smith 2010). Since the features that they share are different and there is no implicational relationship among these characteristics, a continuum-based approach (Hulst &

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Smith 2010) to tonal typology may not best capture this. Instead, a feature-based approach (Donohue 2005; Hyman 2009a) where features are independent of each other is best for representing the diversity of tonal phenomena which languages exhibit (see 4.4.1 for further discussion).

TABLE 5. TONAL CHARACTERISTICS OF KUMAN AND KERE

Summary of major characteristics	"True" (Lexical) tone	Pitch accent	Stress accent	Kuman	Kere
contrastive lexical tone	+	+	-	+	+
surface pitch contrasts on monosyllables	+	+/-	-	+	+
surface contour tone on syllables	+	+/-	-	+	-
pitch is a feature of the morpheme	-	-	-	+	-
tone spreading within phonological word	+	-	-	+	+
tone spreading across word boundaries	-	+	-	+	+
High tone can occur on any syllable in a word	+	+	+	-	-
only two-way contrast on monomorphemic words	-	-	-	+	-
most possible tonal patterns are attested	+	n/a	n/a	-	-
many words unmarked for tonality	-	+	-	-	+
duration reinforces tone	?	?	+	+	-
intimate relationship with vowel features	-	?	-	+	-

(columns 1-5 from Hardie 2003:87)

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4.3. Other tonal systems

Kere shares features with various tonal languages found around the world. In this section, I compare its features to those of languages which are closely-related (4.3.1), those that are unrelated but also located in Papua New Guinea (4.3.2), and other languages, including African and Asian languages and Cherokee (4.3.3). While no tonal feature is unique to Kere, none of these languages share all of the features of Kere. This provides further support for a feature-based approach to tonal typology.

4.3.1. Tone in Chimbu-Wahgi languages[23]

Donohue 1997 and Cahill 2011 attempt to classify the various tonal systems found in the languages of New Guinea. Donohue 1997 argues that tonal systems should be described and distinguished based on a range of features, as opposed to labels like "tone" or "pitch accent", but that "syllable-tone" (systems in which individual tones are assigned to syllable), "word-level tones" (systems in which tonal patterns are assigned to the word or predictable based on one tonal assignment), and pitch-accent systems are found throughout this region. However, unusual tonal phenomena have been reported throughout these languages, which further supports the proposed feature-based approach to tonal typology. For instance, Chuave, a Chimbu language, has an unusual restriction which requires each word to have at least one high tone. Monosyllabic words, therefore, do not contrast in tone, and are instead always high (Donohue 1997). Wahgi, however, appears to have a three-way distinction on monosyllabic words (high, mid, and low tones), and similar patterns on longer words (Phillips 1976; Donohue 1997). Syllable-tone systems, like Chuave and Wahgi, have considerable diversity in the number of possible contrastive tones per syllable, including variation as to whether a word must contain a high tone,

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[23] A comparison of lexical tonal patterns of Kuman (Hardie 2003), Kere, and Tabare is provided in Appendix A.

and other restrictions on certain tones (Donohue 1997). Word-level tone systems, however, are more restricted, but are also found across a larger geographic area. These languages tend to match tonal contours to an entire word with little variation. Finally, pitch-accent systems, (those in which a single syllable is designated in a simple way and determines the pitch pattern for the entire word, and these pitch patterns are rarely lexically contrastive,) are very common throughout this area, but there is also a wide range of pitch-accent languages, none of which are purely pitch-accent (Cahill 2011). There are also many languages which fall into intermediate categories, have a phonemic contrast in tone in a single place in each word, while also contrasting multiple basic tone patterns on each word (Donohue 1997).

4.3.2. Tone in other New Guinea languages

Cahill 2011 builds on Donohue 1997, providing data from languages of New Guinea, and describing their systems as having tone systems rather than pitch-accent, including various types of word-level or syllable -level tone systems. Languages with "word tone" are those which have a single tonal melody for each word. There are two subtypes of "word tone" languages: one in which a melody spreads through the word; and one in which one syllable has tone and the other tones throughout the word are phonetically predictable based on tonal processes unrelated to the given tone. While Siane (Trans-New Guinea, Gorokan) fits the patterns for this first subtype of word tone, Fasu (Trans-New Guinea, West Kutubuan), Dadibi (Trans-New Guinea, Teberan), Kairi (Trans-New Guinea, Turama-Kikorian), and Awad Bing (Austronesian, Oceanic) are of the second subtype, and Narak (Trans-New Guinea, Chimbu-Wahgi) does not clearly fit either pattern. Languages with "syllable tone" are those in which each syllable has contrastive tone independent of other syllables. These languages do, however, have phonological rules which

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change tones. Awa (Trans-New Guinea, Kainantu-Gorokan) and Mianmin (Trans-New Guinea, Ok-Okspamin) are two such languages. Overall, Cahill argues that there is a variety of lexical tonal systems in Papuan languages in addition to lexical pitch-accent and there is still a lot of work to be done on this feature of these languages, but many fit into the categories of word-tone, syllable-tone, and pitch accent (Cahill 2011), which cannot clearly be said of Kere and Kuman.

4.3.3. Other tonal systems

Compared to tonal systems around the world, Kere has sparse tone and few tonal distinctions. This is unlike Chinese languages, which often have phonemic contrasts between contour and level tones and in which most tone-bearing units are specified for tone (Yip 1995). It is similar, however, to languages like Japanese and Swedish, which are typically described as being pitch-accent languages (Abe 1998; Gårding 1998; Igarashi 2014). It also has heavy restrictions on where high tones can and cannot occur, which is unlike canonical lexical tonal systems including Chinese languages (Hyman 2009) and Cherokee (Uchihara 2016). However, Kere also shows tonal spreading throughout words and phonological phrases, which is more similar to languages described as being tonal, such as those of languages spoken west of Ethiopia and south of the Sahara, or in southwestern Mexico, and languages indigenous to the United States (Pike 1948). Overall, Kere shares features with tonal systems around the world, but does not seem to be identical to any of these, which is similar to what Uchihara (2016) reports for Cherokee and Hardie (2003) reports for Kuman.

4.3.4. Conclusions

According to Hardie 2003, "overall tone versus pitch [accent] has to do with whether pitch/tone is part of the underlying phonological representation of lexical morphemes (p.83)."

Based on my analysis above, it seems to be the case that tone is part of the underlying phonological representation of lexical morphemes, and this language is thus best described as having sparse lexical tone. More importantly, tones in both Kere and lexical tonal languages are not predictable (Cahill 2011; Uchihara 2016). This is also the case in Kuman, but Kere and Kuman additionally share features with languages labeled as "pitch-accent" in the literature. Despite the fact that Kere and Kuman are closely-related, they do not have identical tonal features, as summarized in Table 5. Because of this, I recommend a feature-based approach to tonal typology, as discussed in 4.4.1, as opposed to continuum-based or dichotomous approaches.

4.4. Theoretical implications

There are several theoretical implications of my analysis of Kere's tonal system, which I discuss in this section. Firstly, these data support a feature-based approach to tonal typology (Donohue 2005; Hyman 2009a). Secondly, this tonal system lends support to an autosegmental-metrical approach in several ways, but the lack of surface contour tones requires an additional contour-leveling rule. Thirdly, the features of this system generally conform to proposed universals for tonal systems, although words with all low tones are not generally dispreferred, as proposed by Cahill 2007.

4.4.1. A feature-based approach to tonal typology

Like Kuman, the tonal system of Kere does not have all the features of either a dense lexical tonal system or a pitch-accent system. The features of these systems suggest that the best approach to tonal typology is not a dichotomy, as there is tonal behavior between the two

systems in these and other languages. While both continuum-based (Hulst & Smith 2010) and feature-based (Donohue 2005; Hyman 2009a) accounts have been proposed, the differences between the systems of Kere and Kuman suggest that Hyman 2009a's feature-based account is preferable. These two languages have tonal systems which are in between lexical tone and pitch accent, but they do not behave in the exactly the same ways. Kuman, for instance, uses duration to reinforce tone, which is a feature of languages with stress accent, while Kere does not. Kere also has many words which are unmarked for tonality, common to pitch-accent languages, while Kuman does not (Hardie 2003). Such differences are best addressed by a feature-based approach to tonal typology.

Hulst & Smith (2010) propose a continuum-based approach to tonal typology, arguing that there is growing evidence that non-intonational tone systems make up a continuum, rather than falling clearly into one of two separate categories: pitch accent languages or tonal languages. They argue that the typology of tonal systems should feature classification based on whether underlying tones can spread to the entire word, whether underlying tone occurs in a fixed position within a word, and how stress and tone interact. Comparing Kere and Kuman, both languages allow underlying tones to spread to the entire word, underlying tone does not occur in a fixed position, and in Kere, stress and tone do not interact[24]. Therefore, these systems would be classified as more like word tone systems in this approach. While these features capture the observation that there are not just two discrete tonal categories, they are insufficient to capture other major differences between the systems of Kere and Kuman, such as major constraints on where certain tones can and cannot appear, especially with respect to contour tones.

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[24] Hardie 2003 does not provide sufficient information on stress and tone in Kuman

Donohue (2005) suggests such a feature-based approach, arguing that the systems found in Papua New Guinea are best described as being part of a "multi-dimensional continuum that includes stress systems at one of its extremities (p.33)". He also states that tonal systems are related areally and not genetically, and that languages of the highlands tend to be word tone languages. Focusing on the proposed continuum, Donohue defines a prototypical pitch accent system as having a possible contrast on monosyllabic words, which is the case in Kere and Kuman. For other types of tone languages, he argues, it is more useful to discuss them not in terms of labels, but in terms of three features: pre-linking, tone spreading, and melodies. 'Pre-linking' addresses whether tones associate across the domain of their tone bearing units with automatic processes (not lexical ones) or tones can be prelinked to a particular tone bearing unit. In Kere and Kuman, tones associate with lexical processes, but then undergo automatic processes of change. 'Tone spreading' addresses whether or not tones are spread across a phonological or prosodic word, which is the case in Kere and Kuman. 'Melodies' refers to whether or not multiple tone melodies can be associated with a tone bearing unit, which is not permitted in Kere or Kuman. The differences between Kere and Kuman suggest that this feature-based approach is preferable to a two-category approach, as Kuman and Kere do not match the features of either word tone systems or pitch accent systems. However, it does not capture major differences between these systems like use of duration to reinforce tone in Kuman (Hardie 2003) and the high number of words with all low tones in Kere.

Hyman (2009a) also argues for a property-driven approach to phonological typology, similar to Donohue's 2005 approach. However, instead of labeling or classifying languages, Hyman argues that focus should instead be placed on the individual properties of languages'

features, especially with respect to tone systems. When defining 'pitch-accent language', there are four properties to consider: obligatoriness, culminativity, privativity, and metricality. However, not all languages labeled as 'pitch-accent' have the same features for these properties. Hyman concludes that there is no pitch-accent prototype; rather, any language analyzed as pitch-accent can be analyzed as being tonal, and prosodic systems should not be placed on a continuum with a single linear dimension. Instead, the questions that should be answered are as follows, "Which languages have word-level metrical structure ("stress")? What are its properties? (I.e. what do languages DO with metrical structures?) Which languages have word-level pitch features ("tone")? What are its properties? (I.e. what do languages DO with pitch features?) (Hyman 2009a:234)" The question related to word-level pitch features can lead to a better understanding of the typology of tone systems and how they are realized. This approach is not binary, nor does it arrange languages along a single continuum, and thus it may best address some of the differences between Kere and Kuman and addresses the major functions of tone within a language, while suggesting that most languages of New Guinea can be described as tonal.

4.4.2. Kere and the autosegmental-metrical approach

Hardie (2003) shows that the autosegmental-metrical approach accounts for several features of the tonal system of Kuman, much like James 1984 argues it does for Siane. My analysis of Kere also supports the use of this approach, though it does also require more additional rules in Kere than it does in Kuman. This is not ideal, but overall, an autosegmental-metrical approach accounts for several features of the tonal system of Kere.

As mentioned in 2.3 (Rule 3: Vowel Syncope), when vowels are deleted in Kere, their tones are preserved and tones can be deleted while segments are preserved (3.4, Tonal Rules F & G). This is predicted by the autosegmental-metrical approach, as the two operate on different tiers (Gussenhoven 2004; Crystal 2008). The obligatory contour principle of this approach also accounts for the occurrence of extra high tone when two tones occur consecutively (see Tonal Rule 4: Updrift) and predicts tone simplification (Tonal Rule 6) which deletes identical adjacent tones. Several tonological rules of Kere are predicted by the autosegmental-metrical approach and this tonal system therefore lends support to the use of such an approach, despite some issues with theoretically-driven rules, rather than data-driven rules.

While the Kere data do generally lend support to the autosegmental-metrical approach, there are some issues with the approach's requirement of a contour-leveling rule and this system does not support the approach as clearly as Hardie's 2003 analysis of Kuman does. The biggest issue is with the lack of contour tones in Kere, even in situations where their occurrence is predicted by this approach. In order to account for this, I propose a rule which levels contour tones which is not ideal (McCarthy 2007). However, contour tone restrictions are not uncommon across languages. In Gordon's (2002) examination of 102 languages with tone or pitch-accent systems, 12 completely disallowed contour tones, as Kere does. The language families in which this complete restriction occurs also span the globe, including Afro-Asiatic, Indo- European, Na Dene, Panoan, Sino-Tibetan, and Uto-Aztecan languages. Therefore, while this feature necessitates extra rules within this framework, it is not typologically rare and does not provide serious evidence against the use of an autosegmental-metrical approach.

4.4.3. Kere and tonal universals

Several tonal universals have been proposed by various authors. Here, I address those proposed by Hyman & Schuh 1974, Maddieson 1978, and Cahill 2007 and discuss how the Kere data fit with these proposed universals. Hyman & Schuh 1974 and Maddieson 1978 propose the following universals:

a) A larger number of tone levels occupy a larger pitch range than a smaller number (absolute universal);

b) Systems in which high tones are marked are more frequent than systems in which low tones are marked (tendency);

c) If a language has contour tones, it also has level tones (implicature);

d) A language with complex contours also has simple contours (implicature);

e) Rules raising tones are more common than rules lowering them (tendency);

f) Perseverative rules are more common than anticipatory ones (tendency);

g) Tonal polarity, the assignment of a tone opposite to an adjacent tone, is more common than polarity with other (i.e. segmental) features (tendency);

h) Lower vowels tend to have lower tone (tendency);

i) Low-toned vowels tend to be longer than high-toned ones (tendency);

j) Vowels with rising tone tend to be longer than vowels with falling tone (tendency).

Cahill 2007 proposes three new potential universals based on findings from Papuan languages. These are: k) floating tones migrate rightward (found in Usarufa, among other languages); l) words with all-Low tones are dispreferred (found in Narak, Kairi, Kanite, Awad Bing, among others); and m) a HLH sequence is dispreferred (found in Mianmin, Kairi, and Usarufa, among

others). Cahill (2007) argues that these proposed 'universals' are widespread both areally and genetically, but are not true universals. These proposed universals and how they apply to Kere are summarized in Table 6 below. My analysis of Kere throughout this dissertation lends support to nearly all of Cahill's suggestions.

In Kere, most words, especially verbs, have all low tones. This is contrary to the universal proposed by Cahill (2011) that words with all low tones are dispreferred. Looking back at the Swadesh ratios discussed in 4.2.2.9, approximately 85% of words in isolation occur with all low tone in Kere. This universal is clearly not supported by this language and may suggest that the ratio of words with all low tones to other words should be a feature in a feature-based approach to tonal typology.

TABLE 6. SUMMARY OF KERE AND PROPOSED TONAL UNIVERSALS

Proposed Universals	Kere
A- A larger number of tone levels occupy a larger range than a smaller number	+
B- Systems in which high tones are marked are more frequent than systems in which low tones are marked	+
C- If a language has contour tones, it also has level tones	n/a
D- A language with complex contours also has simple contours	n/a
E- Rules raising tones are more common than rules lowering them	+
F- Perseverative rules are more common than anticipatory ones	+
G- Tonal polarity is more common than polarity with other features	n/a
H- Lower vowels tend to have a lower tone	+
I- Low-toned vowels tend to be longer than high-toned ones	+
J- Vowels with rising tone tend to be longer than vowels with falling tone	n/a
K- Floating tones migrate rightward	n/a
L- Words with all low tones are dispreferred	-
M- A HLH sequence is dispreferred	+

4.5. What is 'Sinasina'?

Originally, speakers of Kere claimed that the difference between Kere and Tabare was limited to tone. My investigation of this issue has revealed that there are also lexical differences and speakers consider themselves to speak different *tok ples,* 'vernaculars'. This suggests that this issue is significantly more complex than just one related to tone. Understanding these issues is therefore outside of the scope of this dissertation, but my preliminary investigation of the effect of tone on mutual intelligibility has implications for language documentation, and description in Sinasina and other regions in New Guinea. In this section, I explore my preliminary findings on the interactions between tone, dialects, varieties, and language labeling in Sinasina.

Sinasina, also known as 'Sinesine', is a river valley within the Sinesine-Yongomugl political district in Chimbu Province (Hide et al. 1979). This term has also been used throughout the literature, since as early as 1948 to refer to the language of this district (Capell 1948, Capell 1949a, McVinney & Luzbetak 1954; Wurm 1961, McElhanon 1971). McVinney & Luzbetak (1954) report two varieties of 'Sinasina': 'Tabare' and 'Guna'. To the people of Sinasina, 'Sinasina' is a political district, not a language. They are very aware of the existence of several varieties spoken in this political district, apart from what they refer to as 'Tabare' and 'Gunangi'. In this section, I address the best ways to label the varieties of this area, drawing primarily on speakers' clan identities, preliminary measurements of speakers' abilities to identify these varieties out of context, and speakers' self-reported understanding of brief audio clips (Chambers & Trudgill 1980). I argue that documentation and description in this region can and should build on existing literature while addressing what speakers know to be true about their languages by

including both larger academic labels like 'Sinasina' sparingly and for classificatory purposes and primarily relying on *tok ples* names as much as possible in the actual description. I also argue that the individual varieties do not necessarily belong to a language, as the extent to which they are mutually intelligible can vary. In order to increase interoperability, however, they should be considered the varieties of a place, such as 'Sinasina'. Understanding the nature of the relationship of the varieties of Sinasina is important for fine-tuning best practices for language documentation and description in this region. Speakers also report that tone is a major difference among the varieties, but this does not seem to be the case (see 3.5).

Looking at the map provided in Figure 5, it is clear that there are several cultural and linguistic boundaries within Sinasina which overlap with both labels for social groups and traditional clan names. Hide et al (1979:4) report that these areas reflect the "seven large social and territorial groups" of Sinasina district, while speakers of Kere report that Kere is also the name of their language and of their tribe. Mutual intelligibility is reported by speakers to be fairly high between speakers of Kere and Tabare, which was supported by preliminary self-reported comprehension ratings data I collected for speakers of Kere and Tabare, presented below. My preliminary findings suggest high levels of comprehension across many varieties and a relationship between self-reported intelligibility ratings and geographical distance, which suggests an intricate network of varieties which are closely-related to varying degrees.

However, in addition to the issues of self-reporting (Turkkan 2000), because multilingualism is high in this area (Tida 2006), it is difficult to determine whether this high mutual intelligibility is a feature of these varieties or a result of their speakers' multilingualism. It is important to note that I abandoned this research avenue early on, due to the results of several

interviews. Kere and Tabare people consistently insisted that they consider themselves to be speakers of different *tok ples, '*vernaculars'. They also strongly feel that the *tok ples* and tribal labels are most appropriate for their varieties, as opposed to larger place names like 'Sinasina'.

In order to test comprehension across varieties, I collected narratives from approximately ten speakers of Kere and ten speakers of Tabare. I then clipped the recordings into shorter files between fifteen and thirty seconds. Next, I collected narratives from three speakers of Kondo and Gunangi, which are also varieties Sinasina but are spoken in slightly more remote areas. I clipped these files as well, and mixed all of the clipped files into two random orders with additional clips from two languages outside of Sinasina. Finally, I asked three Kere speakers and five Tabare speakers to listen to the files (in one of the random orders), rate their approximate level of understanding on a five-point Likert scale with 1 as the lowest and 5 as the highest (Carifio & Perla 2007), and to identify the "language" or "*tok ples*".

The three speakers of Kere accurately identified the variety spoken an average of 89% of the time, while the speakers of Tabare accurately identified the variety spoken an average of 85% of the time. Generally, speakers of Kere self-reported that they understood the Kere clips best, followed closely by those of Tabare, with their Kondo and Gunangi ratings averaging about one point lower. Tabare speakers reported that they understood the Tabare clips best, with very slightly lower ratings for the other varieties. These average understanding ratings of the Kere and Tabare speakers are provided in the chart below.
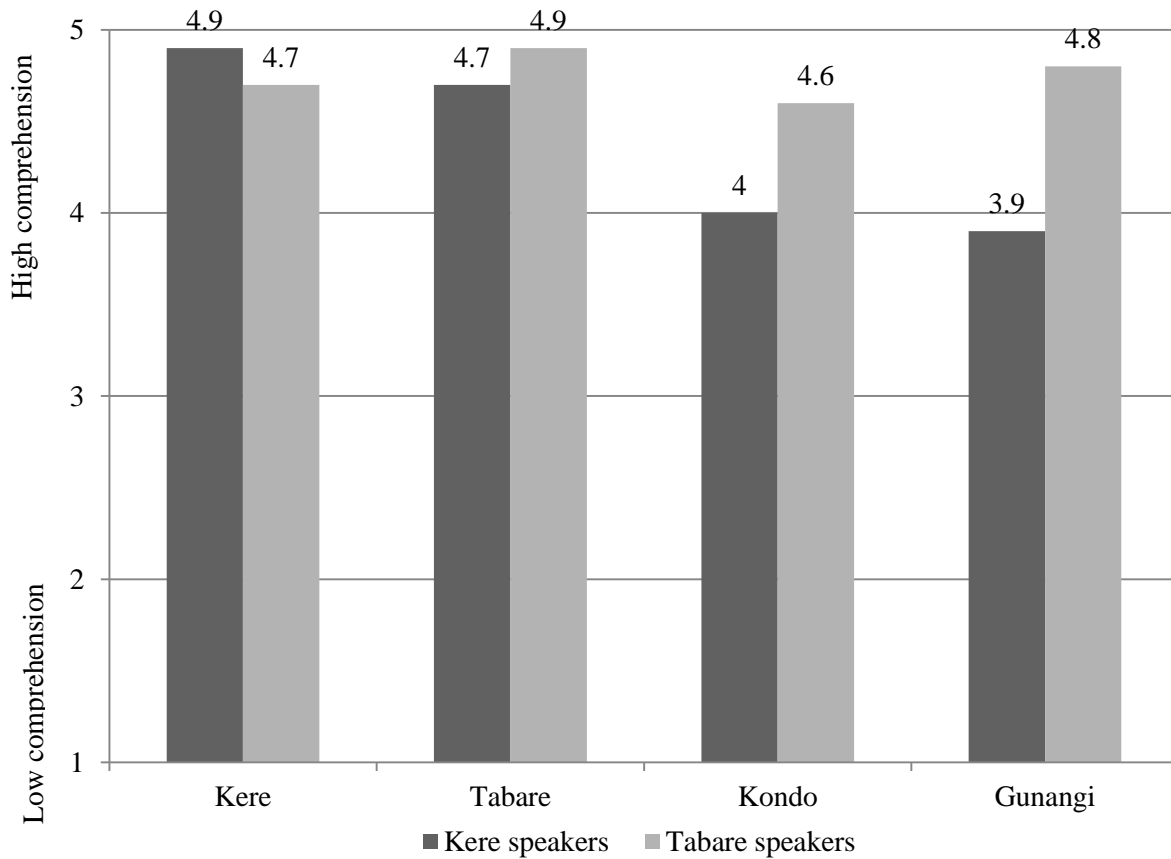
Further investigations could reveal a significant difference between Tabare people's and Kere people's purported comprehension of the Kondo and Gunangi stories. Most notable are the issues with self-reporting and sample size (Turkkan 2000) and the fact that the area in which Kere is spoken is more remote than that of Tabare. Therefore, speakers of other varieties often come to live in Tabare villages which are closer to Kundiawa town (see the map in chapter 1), and speakers of Kere have less contact with speakers of Gunangi and Kondo than do speakers of Tabare. It is also important to note that speakers of Kere and Tabare each rated their understanding of their own varieties highest, followed closely by the other variety. This is

consistent with speakers' claims about their understandings of the varieties and the relationship between the two.

When speakers' attitudes toward their varieties are taken into account, there are more than two varieties in Sinasina. Instead, there are at least seven, including Kere, Tabare, Nimai, Dinga, Kondo, Kebai, and Gunangi, as well as some speakers of Dom (Kagul), as noted on the map above. These labels overlap with the "social and territorial groups (Hide et al. 1979:4)" and tribe names. Speakers of the varieties of Sinasina report that while they can understand one another to various degrees and historically descended from the same group, they currently belong to several distinct groups of people who speak one of the seven *tok ples*, 'vernaculars' listed above. This suggests that these variety labels are useful and important to speakers and should therefore be an important part of the description of the varieties here.

FIGURE 5. MAP OF SINASINA VARIETIES & TRIBAL BOUNDARIES
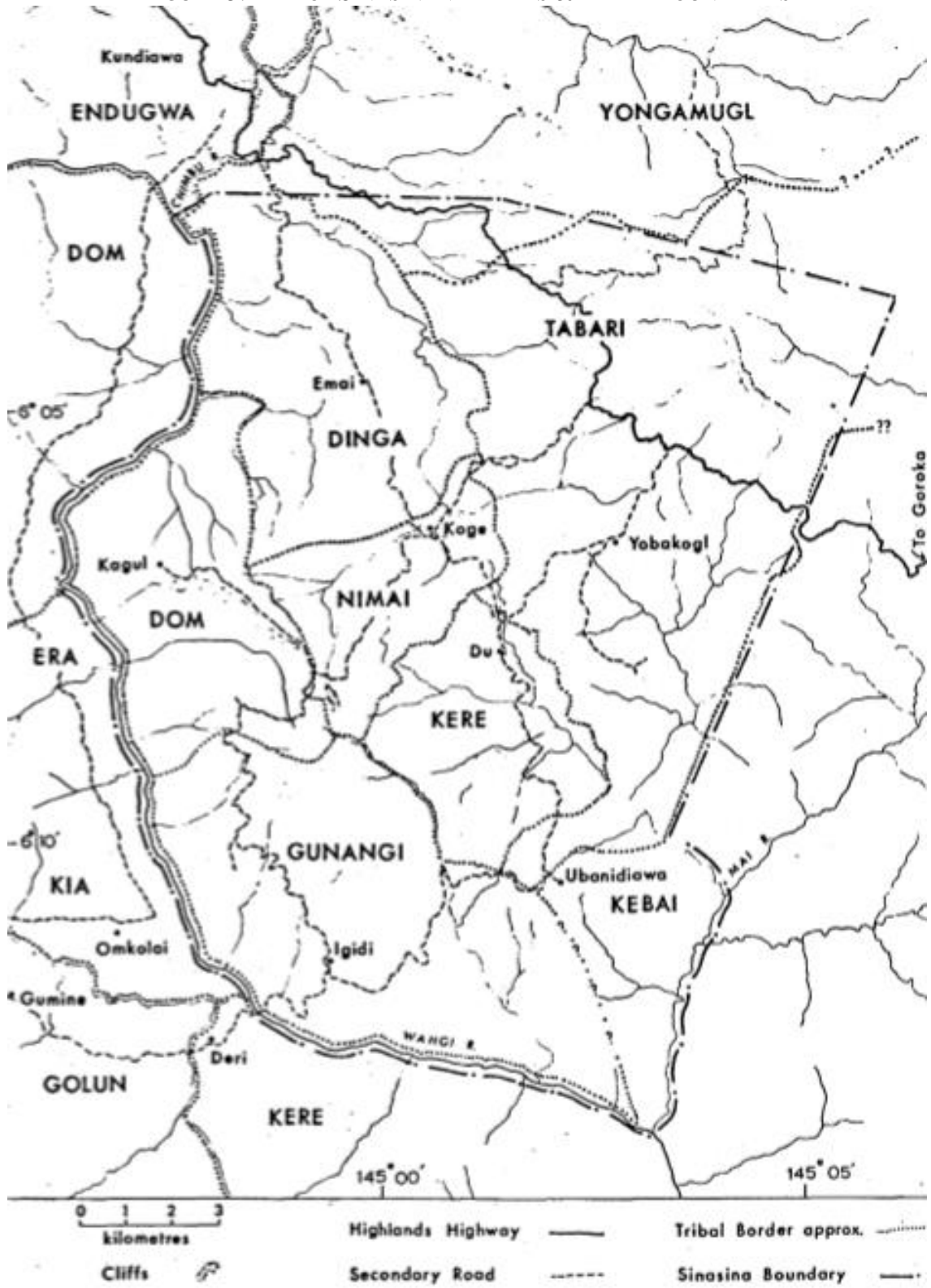
(Hide et al. 1979: 1)

FIGURE 24. COMPARISON OF SWADESH DATA FROM KERE AND TABARE
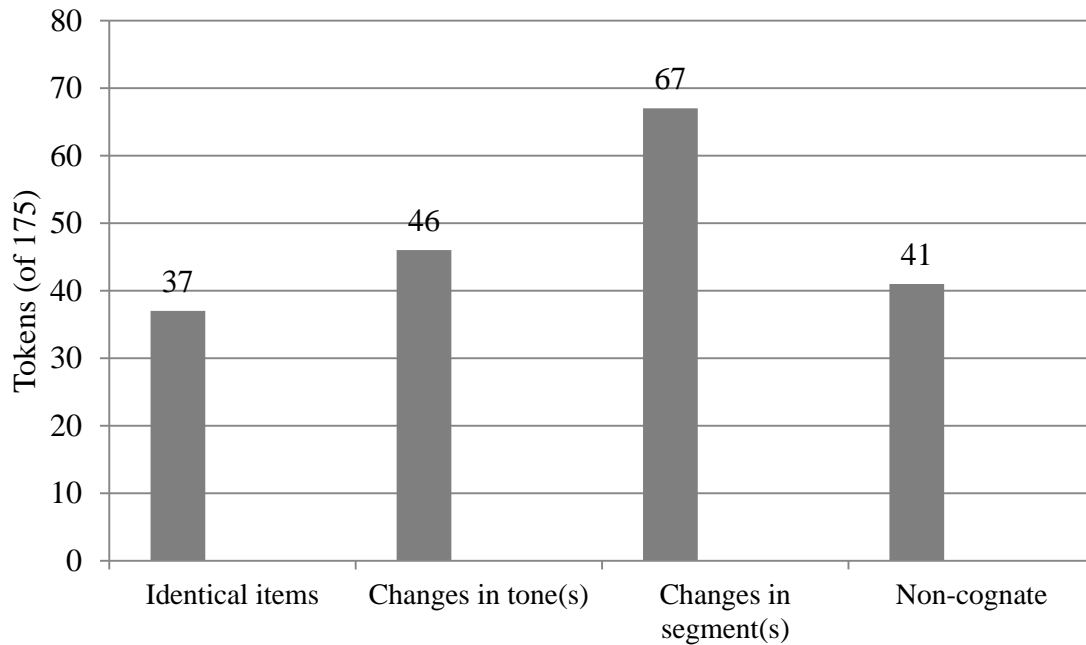
While people of Sinasina talk about these varieties as being "dialects", they do not have a term for the language of which they are dialects. They do not believe that 'Sinasina', which has been used in the past (Capell 1948, Capell 1949a, Wurm 1961, McElhanon 1971) is an appropriate language name. Speakers also report that they are able to switch between varieties when necessary in a conversation. Taking into account this evidence, I believe speakers' usage of the term "dialect" is a relic of its usage as a term for unwritten languages (Chambers &Trudgill 1980; Pringle 1986; Wurm & Laycock1961:128) and is likely distinct from a marker of relative mutual intelligibility or issues of identity.

This issue is further complicated by the fact that boundaries between varieties are not strict and instead feature some amount of overlap. In many areas, there are small *hauslain* 'villages, hamlets' in which speakers of different varieties live in close proximity. One such example is Milmil. This small area is situated between Kondo land to the Northeast and Tabare

land to the Southwest. Here, speakers of Kondo and Tabare live in adjacent houses. Speakers report that oftentimes conversations between members of the two groups are either in Tok Pisin or involve individuals speaking their own variety with few accommodations, and their interlocutors ask questions when they do not fully understand. There have also been reports from speakers of children growing up in these areas 'mixing' Kondo and Tabare to facilitate conversations with their peers and that they tend to blend features from each in their speech. Because there are currently very few child speakers of either Kondo or Tabare, this cannot currently be confirmed, but it does further suggest that the differences between these are bigger than just tone.

Taking into account the three factors of (1) mutual intelligibility, (2) community attitudes, and (3) identity discussed above, it is most appropriate to consider the 'languages' of Sinasina to be a chain of closely-related varieties. The term 'variety' is neutral with respect to both mutual intelligibility and identity (Chambers & Trudgill 1980), which in this case seem to conflict to an extent. Since people from Sinasina also do not understand the term 'Sinasina' apart from its usage as a political district, I suggest that it no longer be used in description as a language name. Instead, when referencing individual varieties, the variety or *tok ples* 'vernacular' name should be used as much as possible, along with the fact that it is part of the network of varieties spoken in Sinasina. In order to increase interoperability and build on existing literature, 'Sinasina' should be used early in the background section of a piece, but the body of a work should rely on the *tok ples* name, as this is what is actually being described, not all of the varieties of region. If mutual intelligibility with another variety is well-understood, then

it should be noted in order to continue shaping our understanding of the nature of the relationships among these varieties.

Similar issues have been reported by speakers in Chuave (see 5.3) and other districts in the New Guinea highlands. If this is the case, similar labeling procedures should be followed. These practices will best reflect communities' knowledge of their languages and will make data more accessible and useful to future researchers. The relationships between the varieties of Sinasina and their tonal systems are unlikely to be unique in Papua New Guinea. In 5.5, I suggest some best practices for documenting and describing similar situations.

4.6. Summary

Kere's tonal system shares features with tonal systems found around the world, but it is not identical to any of these, including Kuman, which is a closely-related language. Because of Kere's lack of contour tones and the high number of words which occur without high tone, in addition to other the features it and Kuman share with pitch-accent and tonal languages, I propose that a feature-based approach to tonal typology is best. Such an approach should focus on the overall function of tone within a language as well as tonal density (Cahill 2007) in order to best capture the differences I lay out between Kere, Kuman, and other languages.

Tone in this language has additional theoretical implications for an autosegmental-metrical approach, tonal universals, and directions for future research in this region. This language has shown that an autosegmental-metrical approach can account for this system, but it does require an additional contour levelling rule. This system also conforms to all tonal universals proposed by Hyman & Shuh 1974, Maddieson 1978, and Cahill 2007, apart from

Cahill's proposed dispreference for words with all low tone. This universal may instead be best used as a feature within a feature-based approach to tonal typology. Finally, as tone plays a small, (but perhaps salient to speakers) role, in distinguishing the varieties of Sinasina, this should be investigated further in neighboring regions. Researchers in this area in the future should also refer to the varieties they encounter with the *tok ples* 'vernacular' names used by the speakers in order to capture both identity and mutual intelligibility while mentioning where they are spoken and the traditional academic language names. We should also document notable differences among the varieties, especially with respect to tone.

CHAPTER 5
CONCLUSIONS

This dissertation aims to answer the following questions:

- What are the phonological rules of tone in this language?

- Is Kere a pitch-accent or tonal language, or something in between, like Kuman?

- How can a model of related varieties with differences in tone apply to other situations in New Guinea?

- What does this system tell us typologically?

In the preceding chapters, I have described the segmental phonology and tonal system of Kere (chapters 2 and 3), and compared these rules to those of other languages of the region and around the world. I argue that the segmental phonological rules found in Kere are not typologically unusual and are generally similar to those found in related languages. I have also provided an analysis of the tonal system of this language, arguing that it is does not behave like a prototypical pitch-accent or dense lexical tonal language. This is similar to Kuman, which also does not behave exactly like either type of language. However, several major and minor tonal features of Kere are different from those of Kuman (chapter 4). Here, I summarize my findings (5.1 & 5.2), address the issue of the chain of varieties of Sinasina (5.3), and discuss what the system I describe tells us about tone typologically (5.4), arguing that typology should be feature-based. I

also provide suggestions for directions for future research on the languages of this area (5.6) and concluding remarks (5.7).

5.1. Summary: What are the phonological rules of tone in this language?

Like many Papuan languages, the segmental phonology of Kere is fairly simple, but its tonal system is more complex (Zanet & Dol 2010). Below, I summarize thirteen segmental phonological rules (Figure 10, reproduced below) and ten phonological rules of tone in this language (Figure 23, reproduced below) as discussed in chapters 2 and 3, respectively. At the surface level, Kere does not initially seem to be a tonal language. This is partially because approximately 85% of words in Kere occur with all low tones (4.4.3.), which implies that this system is best analyzed as a sparse lexical tonal system.

Consonant voicing

Plosive lenition

Vowel syncope

Glide Insertion

Vowel deletion

Sonorant syllabification

Nasal assimilation

Plosive deletion

Vowel reduction

Vowel assimilation

Flap trilling

Flap deletion

Identical vowel deletion

FIGURE 23. KERE LEXICAL TONAL RULES AND THEIR CRITICAL ORDERINGS

Tone association (left to right)

No initial [H]

No more than one /H/ per word

Updrift

Low deletion

Tone simplification

Deletion in compounds

Contour leveling

Tone spreading
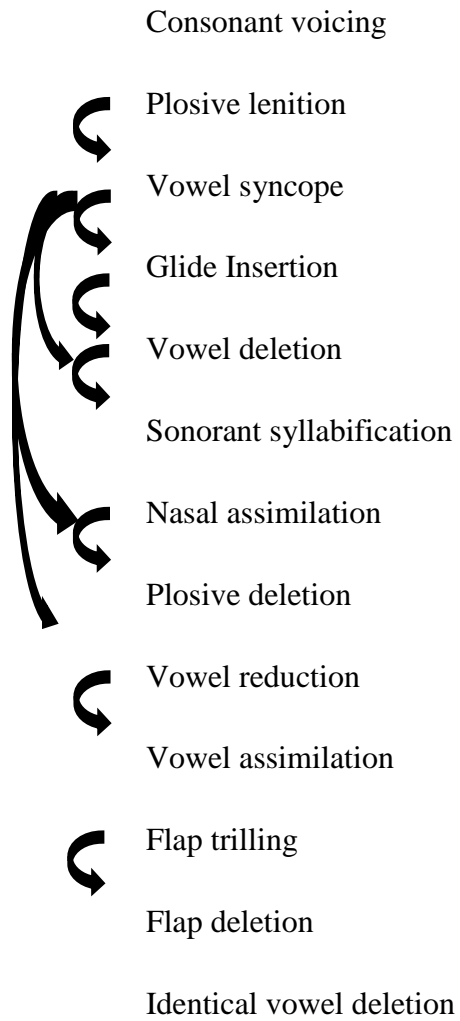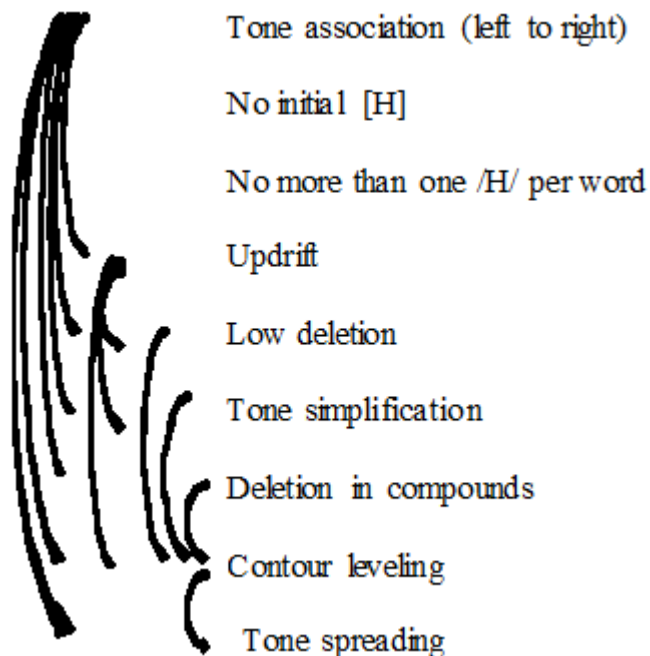
5.2. Summary: Is Kere a pitch-accent or tonal language, or something in between?

According to Hulst & Smith 2010, systems that do not behave exactly like pitch accent or lexical tonal languages can typically still best be described by one of these categories. In accordance with this, Hardie 2003 concludes that Kuman is more like a language with lexical tone than pitch accent, based on the fact that tone is underlyingly part of the word. This is also true of Kere. However, the features of these languages show that their behavior is truly similar to both categories. Moreover, the tonal features of Kere and Kuman are not identical, but they share approximately the same number of features with each system, as seen in Table 5, reproduced below. Therefore, this dichotomy and continuum-based approaches are insufficient and a feature-based approach to tonal typology is best (see 5.4).

Table 5 (REPRODUCED FROM P.154): Tonal characteristics of Kuman and Kere

Summary of major characteristics	"True" (Lexical) tone	Pitch accent	Stress accent	Kuman	Kere
contrastive lexical tone	+	+	-	+	+
surface pitch contrasts on monosyllables	+	+/-	-	+	+
surface contour tone on syllables	+	+/-	-	+	-
pitch is a feature of the morpheme	-	-	-	+	-
tone spreading within phonological word	+	-	-	+	+
tone spreading across word boundaries	-	+	-	+	+
High tone can occur on any syllable in a word	+	+	+	-	-
only two-way contrast on monomorphemic words	-	-	-	+	-
most possible tonal patterns are attested	+	n/a	n/a	-	-
many words unmarked for tonality	-	+	-	-	+
duration reinforces tone	?	?	+	+	-
intimate relationship with vowel features	-	?	-	+	-

(Columns 1-5 from Hardie 2003:87)

5.3. Summary: How can a model of related varieties apply to other situations in New Guinea?

The model of closely related varieties found in Sinasina is not unique. Similar situations are found in neighboring districts, including Chuave, which is discussed below. The conclusions I provide here for Sinasina can also apply to those instances. As argued below, using a labeling procedure which relies on *tok ples* names is most appropriate for this region, and the term 'variety', as opposed to 'language' or 'dialect', can be neutral to issues of mutual intelligibility and identity (Chambers & Trudgill 1980), which can conflict in linguistic situations in New Guinea. It is also important to reference traditional academic language names, even if they are place names, in order to increase interoperability across fields and with existing literature.

In the description of a variety of Sinasina, 'Sinasina' and other place names should no longer be used as language names, as there are several varieties spoken by several different groups in this area (4.5). Instead, each variety should be referred to by the name used by its speakers, with a note on the traditional academic language name 'Sinasina'. In Sinasina there are seven such *tok ples* names: Kere, Tabare, Gunangi, Nimai, Dinga, Kondo, and Kebai. These should be considered members of a closely-related network of varieties. While these varieties have some differences in tone, of which speakers are aware and consistently relate, they also have notable lexical differences. Since mutual intelligibility is seemingly high and suggests that these are dialects and shared core vocabulary suggests that these are separate languages, it is best to default to the speakers' intuitions and self-identity in these cases. Here, however, speakers also seem to conflict. They consider themselves to be distinct groups of people, and yet use the English word 'dialects' to discuss the relationship between their languages. For this reason, they

should instead be considered a network of 'varieties' which is neutral to this question and conforms to modern sociolinguistic practices (Chambers & Trudgill 1980). In order to reflect this, linguists should include the appropriate *tok ples* name provided by the speakers in their documentation and description in addition to long-standing labels used in the literature.

According to community members, this situation is not unique to Kere or Sinasina and thus provides directions for future research. In Chuave district, traditionally the label 'Chuave' has been used for the language of this region (Capell 1949a; Wurm 1961; Donohue 1997). However, during a meeting with a group of 12 male members of the Mainda and Mado communities of Chuave, these men claimed that there are actually at least four different varieties spoken and that 'Chuave' is not an acceptable language name. Rather, they believe that the *tok ples* labels used by the communities are more appropriate. These *tok ples* names within Chuave include: Mainda, Baida, Mada, and Mado. According to these community members, these varieties differ phonologically and lexically and are not mutually intelligible. These claims were supported by a female member of the Mainda community who lives in a Kere-speaking village and was not present at that meeting. These claims need to be researched further, but could reveal that there is significantly more documentation and description needed in the highlands of Papua New Guinea than previously thought, as there could me more variation than previously thought.

Larger labels of groups of varieties, especially those which are primarily geographic, such as 'Sinasina' or 'Chuave', can be useful in initial documentation and description, as they can reflect the fact that many of these varieties are closely-related. Further research, however, should investigate the relationships between *tok ples*. This both includes speakers' knowledge in description and works toward updating the standards for categorizing and labeling the world's languages, namely the ISO standard in order to best reflect the reality of the linguistic situation.

With respect to Kere, I recommend that the current ISO listing for Sinasina (sst) be updated to include the varieties I have listed in this dissertation which are also tribal names used in the region (Hide et al. 1979): Kere, Tabare, Gunangi, Nimai, Dinga, Kondo, and Kebai.

5.4. Summary: What does this system tell us typologically?

There are three main typological implications of the analysis I present throughout this dissertation. Firstly, a feature-based approach to tonal typology is supported. As Kuman and Kere both share many features with both pitch-accent and lexical tonal languages but do not have identical features, neither a continuum nor dichotomy can capture the major tonal features of these systems. This argument is further supported by a growing body of literature on tone in underdescribed languages which do not meet previous typological expectations (Donohue 2005; Hyman 2009a), including Uchihara's (2016) analysis of Cherokee which suggests that the language has two separate tonal patterns, one of which is predictable, like pitch-accent, and the second of which is not, like lexical tone. Secondly, an autosegmental-metrical approach works well for these data and accurately predicts tonal associations and spreading. However, it also requires an additional contour-leveling rule which another approach might not require, in order to account for the lack of surface contour tones in Kere. Lastly, the tonal system of Kere behaves in accordance with most proposed tonal universals (Hyman & Shuh 1974; Maddieson 1978; Cahill 2011), but clearly prefers words with all low tone, which is the opposite of what Cahill (2011) proposes as a tendency.

5.5. Documentation and description of tone in the highlands of New Guinea

Previous researchers have made several recommendations for studying a tonal language. Here, I summarize some of the previous recommendations and provide additional recommendations for documenting and describing tonal systems in the highlands of New Guinea based on my findings and the unusual tonal system of Kere. My core arguments here are that tonal systems in the New Guinea highlands are not well-understood and there is more work to be done in this area that can contribute significantly to our understanding of tonal typology. Fieldworkers who come across such systems and do not have research interests in tone should note their findings and provide examples which are time-aligned and archived in order to facilitate future research. Finally, many of the suggestions made in previous literature (Himmelmann & Ladd 2008; Hyman 2010; Zanten & Dol 2010) worked well in my research, but should be supplemented with the collection of as much naturalistic data as possible.

Himmelmann & Ladd 2008 aims to provide basic guidance for non-specialist fieldworkers in describing and analyzing tone systems of understudied languages, offering basic information about various prosodic features like tone and stress. This article also notes that when doing fieldwork, because there is substantial variation across languages, it is important to establish the probable lexical prosodic features of the language early on. Reading literature on neighboring languages and listening to speakers' corrections can be useful. In order to distinguish lexical prosodic features from intonational prosodic features, target words should be elicited in different contexts, including phrase-initial, -medial, and -final conditions. List intonation can be useful early on, because it is easy to elicit in early stages and tends to have a fairly simple distinction between final and non-final members. To fully understand the patterns of a language, it is important to supplement natural conversation or texts with elicited data from

multiple speakers. Perceptual data can also be useful, and experiments and analysis can be greatly aided by the use of programs like Praat, Amu, Wave Surfer, and Speech Analyzer. Himmelmann & Ladd (2008) conclude by stating that understanding prosodic variations across languages is essential for fieldwork. My work with Kere followed many of Himmelmann's recommendations and found them to be useful for studying tonal systems in New Guinea, especially combined with my use of Toney (Bird & Lee 2014) which helped me learn to hear pitch patterns early on.

Hyman (2010) suggests that in order to start studying a tone language, a researcher should take up three stages of tasks. First, the surface tonal contrasts need to be determined by looking at words in isolation. Second, tonal alternations should be elicited through paradigms or short phrases, as word-level and phrase-level alternations may differ. Third, tonal analysis can take place. He argues that it is important to understand surface tonal patterns before analysis takes place and analysis should take into consideration surface contrasts, distributional constraints, and alternations. This last stage, tonal analysis, is much more open to interpretation and can be heavily theory-dependent (Hyman 2010).

During my early elicitation and analysis, I also found these recommendations to be helpful to an extent. While my analysis focused on words in isolation, followed by short phrases and then larger patterns, my data collection did not. During my fieldwork, I continually collected naturalistic narratives in addition to the smaller items I elicited. This allowed me to draw examples from naturalistic data after my analysis was complete, and served to document the language, which was a primary goal of my work. With smaller endangered languages like Kere, I do not recommend eliciting small samples and building to larger phrases without also simultaneously recording larger units of naturalistic speech. When looking at complex tonal

system, it is also important to read the literature on related languages, even if it is sparse, and to compare what other researchers have found to your own findings. This can shed light on various parts of the analysis and highlight unique features of the tonal system which you are studying. Speaker intuitions about syllable prominence are also helpful in distinguishing a pitch-accent-like from a lexical tone-like system (Zanten & Dol 2010).

Finally, researchers who come across tonal features in a language, but do not have research interests in tone should note the system and provide examples. This is especially true if the language has minimal pairs for tone or some other surface indication that tone is significant in the language. Even a single example can provide direction and a point of comparison for future researchers interested in tone, which is crucial as there is still much to be done in this region.

5.6. Future directions for research

The comparison between the tonal systems of Kuman and Kere I provided throughout this dissertation demonstrates that there is measurable variation in tonal systems throughout the languages of Chimbu province. There are still many underdocumented and underdescribed languages in this region, and it may be the case that many of them have unusual tonal behaviors. With respect to labeling for languages, there is also a fair amount of work to be done on those languages which have been improperly labeled. For example, further description on the relationships between the varieties found in Chuave and their tonal behaviors, for example, is a possible future direction for research, in addition to further in-depth investigation of the tonal systems of the other Sinasina varieties. There is certainly a need for more language

documentation, description, and research on tonal typology in this province, but the threat of language endangerment throughout the area means that time for this work may be limited.

5.7. Concluding remarks

While my primary goal for this dissertation is to add to linguists' typological understanding of tonal systems, an additional goal is to add to the description of an underdocumented, underdescribed, endangered Papuan language. While it is my hope that this *tok ples* will have a place in the future of the Kere community, the low number of speakers of child-bearing age and the focus on Tok Pisin and English makes this less likely. High levels of language endangerment are found throughout the Trans New Guinea languages; so, like the majority of the world's languages, we are racing the clock to adequately document and describe these typologically unusual languages, while also providing tools for community members interested in revitalization efforts. While this dissertation does add to a growing body of literature on small Papuan languages, it also highlights the very real fact that there is so much more to be done and little time in which to do it.

APPENDIX A: KERE, TABARE, & KUMAN[25] TRANSCRIPTIONS

Gloss	Phonemic transcription (Kuman)		Phonemic transcription (Kere)		Phonemic transcription (Tabare)	
	segmental	tonal	segmental	tonal	segmental	tonal
1. long	ɔʟtɔ	HL	alɛklai	L	alɛklai	LLH
2. possum	kaᵐbʊ	HL	kabenoge	L		
3. knife	pɪʟ	LH	pul	H		
4. clothes	ᵑgaʟ	HL	gal	L		
5. vomit	mɛᵐbɪʟ	HL	mɛbil	L	mɛbil	L
6. red	ᵑgɔʟ	HL	gɔl	L	gɔl	L
7. digging stick	ɪkan	HL	suan	HL		
8. exchange	tɛ ɪᵐbɔ ja					
9. pig	ᵐbʊʟa	HL	bɔna	LH		
10. vegetable	jʊaɪ	HL	kɔmna	L		
11. mountain	mʊʟɔ	LH	kamil kul	L #H	agai kul	LL H
12. finished	ⁿdʊⁿdʊgwa					
13. my brother	aⁿgara	HL	kɛbna			
14. many	mɛrɛ kɪⁿdɛ		japsi	L	meɾiki	L
15. arrow	jɛr	HL	kml el	L#L		
16. sugarcane	ᵐbɔ	LH	bɔ	L		
17. mother-in-law	ɪmakana					
18. laugh	ᵑgaʊʟ	HL	waga	L	waga	H
19. (water) well	maʊʟ nɪʟ		mau nil	L#H		
20. bed	ᵐbɔʟ	HL	bɔl	L		
21. knot	ʊʟɔ	HL	kankɔa	LHL		
22. house	ɪᵑgʊ	LH	igɛ	LH		
23. wig	arɪʟ	HL				
24. insect	ᵑgaⁿdɛnkaᵐbʊ		milagala	L		
25. mat	kʊᵑgʊʟ	HL				
26. cold, flu	nʊ	HL	nusinabn	L		
27. snake	tɔkɪ	HL	tɔgi	L	tɔgi	L
28. belt	kʊmaʟ	HL				
29. dust off	tama	HL	bɛda	LH		
30. hair	ɪᵑgʊ	HL	jɔmɛ	L	jɔmɛ	L
31. vegetable end	ɛʟɛ	HL				
32. tapa cloth	kɔraʟɛ		igɛ maunɛ	L#L		

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[25] Kuman transcriptions and wordlist come from Hardie 2003: 96-98.; for grayed boxes no data is available.

Gloss	Phonemic transcription (Kuman)		Phonemic transcription (Kere)		Phonemic transcription (Tabare)	
	segmental	tonal	segmental	tonal	segmental	tonal
33. sleep	ʊʟ	LH	ul	L	ul	H
34. hole (in ground)	maʊʟ	HL	maul	L		
35. elbow	ᵑgɔʟkɔ	HL	ɔgna gɔmlɛgɛ	L		
36. ripe	ᵐbɔʟ	HL	bɔl	H		
37. dream	kʊᵐbʊ	LH	kuban			
38. fruit	mɔᵑgɔ	HL	ɛɾɛ mugɛ	L#L	ɛɾɛ mugɛ	L#LH
39. tree	ɛⁿdɛ	LH	ɛɾɛ	L	ɛɾɛ kan	L#L
40. bird sp.	tɪɛ	HL				
41. bird arrow	aᵑgɪr	HL	ɛl sibɛnna	L#L		
42. person's name	aᵐbanɛ		abanɛ	L	abanɛ	L
43. singsing	kʊa naⁿdɛ		igɛn bɛnabna	L#L		
44. widow	wɛɾaɪ	HL	wɛʟai	L		
45. funeral feast	kʊʟᵑgaʊʟ	HL				
46. ground	makan	HL	gaba	L		
47. seed	ɪᵐbɔ	HL	ibɛ	LH	komnɛ ibɛ	L#L
48. hitting stick	kʊᵐba	HL	kuba	L		
49. pandanus (white)	amʊʟ	HL	aml	LH		
50. water	nɪʟ	LH	nil	H	nil	L
51. inside a house	ɪᵑgʊʟ	HL	igi igla	LH#HL		
52. sneeze	taʊʟ	HL	asuri	L		
53. skirt	kaʊr	HL	galsunare	L		
54. egg	mʊʟɔ	HL	kɔɾa lɛ mugɛ	L#L#L	mlɛ	L
55. thus	jɛʟ	HL				
56. nose	ᵑgʊman	HL	guma	LH	guma	L
57. deaf	kɪnaᵑgɪ		knagi	L		
58. sore	nʊm	LH				
59. cold air	ɪr	LH				
60. cigarette	bɪɾɛ ᵑgɔʟ		usu	L		
61. bird sp.	ʊlka	HL				
62. pain	ᵑgɪʊʟ	HL	gil	L		
63. over there	ɪᵐbɔ	HL				
64. plant sp.	ᵑgʊmanɛ					
65. frog sp.	ⁿdɛm ᵐbʊᵐbʊ					

Gloss	Phonemic transcription (Kuman)		Phonemic transcription (Kere)		Phonemic transcription (Tabare)	
	segmental	tonal	segmental	tonal	segmental	tonal
66. star	kʊʟ	HL	kwilɛ mɔgma	LH#L	kwili mɔgma	L#L
67. dust	kʊᵑganɛ		kɔganɛ	L	kɔganɛ	LLH
68. right hand	wɔ	LH	ɔgɛn ɔnɛ	L#L	ɔgɛ ɔnɛ	L#L
69. copy-cat	tɪɛ	HL				
70. rice	kʊʟmɔᵑgɔ		kwa pɛgɛ	L#L		
71. shield	awaʟɛ					
72. grease	wam	HL				
73. madman	ⁿdʊⁿdʊᵑgwa		kna dudua	LH#LLH		
74. his teeth	tɪᵑgɪɛ		kina	HL		
75. moon	ᵐba	LH	kaba	L	ba	L
76. bird hairs	kʊᵐbanɛ					
77. jacket	ɪr ᵑgaʟ		galsuna ɔrɛ	LLH#L		
78. spirit	ᵑgɪʟ	LH				
79. stupid	ⁿdʊ	LH	dudua	LLH		
80. his son	wam	HL	wamɔ wai			
81. compost	mɔʟɔ	HL				
82. grass	kʊʟ	LH	kulkan	L	kul	L
83. flower sp.	aⁿdɛ ᵐba					
84. one	tʊara		tɛranta	L	tɛran	L
85. reed	kʊᵐba	HL				
86. guardian	tʊʟ	HL				
87. I hear	na pɪrɪka		pilno	L	pua	L
88. plant shoots	mʊnɔ	HL				
89. come (IMP)	wɔ	HL	wa	H	wa	L
90. friend	jɛ	LH	yenoba	LHL		
91. child	ᵑgaʟ	HL	gan	L	gage	LH
92. stay (IMP)	mɔʟɔ	HL	mɔlɔ	LH		
93. on top	ɛʟɛ	HL	kul	H		
94. east	ʊmara					
95. possum fur	kaᵐbʊ ɪᵑgʊ					
96. lake	nɪʟ nʊᵐbʊn		pɔmɛ nil	L#H	nil digan	L#L
97. child's clothes	ᵑgaʟ ᵑgaʟ		gaŋau gasuna	L#HL		
98. mother-in-law	mʊnɔ	HL				
99. my trap	na pɪrɪka					
100. weed	tʊʟ	HL				

APPENDIX B: SELF-REPORTED MUTUAL INTELLIGIBILITY DATA

Kere Speakers

Survey #	Set	Initials	Age	Gender	Tok Ples	Location	Average Rating	% Accuracy	Average Rating	% Accuracy
7	ZAa	MiM	55	M	Kere	Village- Mu	4.42	88.60%	5	93.30%
9	Z#	AN	23	M	Kere	Village- Mu	3.77	65.70%	4.2	76.70%
10	ZAa	AY	35	M	Kere	Village- Mu	3.82	88.60%	4.3	96.70%
						Average:	4	80.97%	4.5	88.90%

Initials	Average Kere Rating	% Accuracy Kere	Average Tabare Rating	% Accuracy Tabare	Average Gunagi Rating	% Accuracy Gunagi	Average Kondo Rating	% Accuracy Kondo
MiM	5	100%	5	80%	5	100%	5	100%
AN	5	100%	4.1	90%	3.6	80%	3.6	60%
AY	4.8	100%	4.9	90%	3.4	100%	3	100%
Average:	4.9	100%	4.7	87%	4	93%	3.9	87%

Tabare Speakers

Survey #	Set	Initials	Age	Gender	Tok Ples	Location	Average Rating	% Accuracy	Average Rating	% Accuracy
4	Z#	JI	48	F	Tabare	Village- Mu	4.48	82.90%	5	93.30%
12	Z#	TI	42	M	Tabare	Village- Mu	4.54	85.70%	5	93.30%
13	C#	HG	35	F	Tabare	Town- Goroka	4.4	88.60%	4.97	96.70%
14	CAa	SG	34	F	Tabare	Town- Goroka	4.29	62.90%	4.37	63.30%
15	C#	DG	28	M	Tabare	Town- Goroka	4.06	77.10%	5.57	80%
						Average:	4.34	79.44%	4.78	85.32%

Initials	Average Kere Rating	% Accuracy Kere	Average Tabare Rating	% Accuracy Tabare	Average Gunagi Rating	% Accuracy Gunagi	Average Kondo Rating	% Accuracy Kondo
JI	5	100%	5	90%	5	100%	5	100%
TI	5	90%	5	100%	5	100%	5	100%
HG	4.9	90%	5	90%	5	100%	5	100%
SG	4.1	50%	4.5	60%	4.2	60%	4.8	100%
DG	4.6	80%	4.9	80%	4	60%	4.4	100%
Average:	4.72	82%	4.88	84%	4.64	84%	4.84	100%

Kondo Speakers

Survey #	Set	Initials	Age	Gender	Tok Ples	Location	Average Rating	% Accuracy	Average Rating	% Accuracy
2	ZAa	MoM	68	M	Kondo	Village- Mu	3.91	74.30%	4.4	83.30%
3	ZAa	MaM	45	F	Kondo	Village- Mu	4.63	68.60%	4.97	80%
5	Z#	MW	48	M	Kondo	Village- Mu	4.29	82.90%	4.83	96.70%
6	ZAa	SM	40	F	Kondo	Village- Mu	4.11	71.40%	4.33	83.30%
8	Z#	MK	35	M	Kondo	Village- Mu	4.4	85.70%	4.67	100%
11	ZAa	NM	45	F	Kondo	Village- Mu	4.37	85.70%	4.83	100%
						Average:	4.285	78.10%	4.671666667	90.55%

Initials	Average Kere Rating	% Accuracy Kere	Average Tabare Rating	% Accuracy Tabare	Average Gunagi Rating	% Accuracy Gunagi	Average Kondo Rating	% Accuracy Kondo
MoM	4.2	80%	4.4	60%	4.6	100%	4.6	100%
MaM	4.9	80%	5	70%	5	80%	5	100%
MW	5	90%	5	100%	4	100%	5	100%
SM	4	90%	4.5	60%	4	100%	5	100%
MK	4.7	100%	4.7	100%	4.2	100%	5	100%
NM	5	100%	5	100%	4	100%	5	100%
Average:	4.633333333	90%	4.766666667	82%	4.3	97%	4.933333333	100%

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