Numerical Approximation Using *Some*

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Abstract. In this paper I investigate a use of the English determiner *some* with numerals, as in *twenty-some*. This kind of construction has an approximative interpretation, where it is interpreted as denoting a number within a range. *Some* cannot modify all numerals, with constraints that depend on the syntactic structure of the numeral. I draw parallels between this construction and epistemic indefinites, and provide an analysis based on existing analyses of Spanish *algún*.

Keywords: numerals, indefinites, epistemic indefinites, approximation, modification

1. Introduction

English *some* normally plays the role of a determiner, appearing before a noun phrase as in the examples in (1). But, *some* can also play a role as an approximator, as in the examples in (2). In these examples, *some* is used by the speaker to provide uncertainty about the precise number of individuals that satisfy the claim.

(1) a. Some professor was dancing on the table.
    b. Some students were eating lunch.
    c. I put some apple in the salad.

(2) a. There were twenty-some people at the party.
    b. Michigan State University has 40-some thousand students enrolled.

The uncertainty inherent in these examples with *some* modifying a numeral (what I will label *#-some* in this paper) calls up comparisons with other epistemic indefinites, indefinites which impose knowledge requirements on the speaker. Examples of these include Spanish *algún* and English *some*, which also carry the implication that the speaker is uncertain about the particular referent that makes some claim true.

In this paper, I provide an analysis of *#-some*. First, I provide a compositional syntactic and semantic analysis of the construction. Then, building off of the analysis of *algún* from Alonso-Ovalle and Menéndez-Benito (2010), I propose an analysis of the ignorance component of *#-some*, deriving the uncertainty as an implicature.

[1] I thank Marcin Morzycki, Erin Zaroukian, Ai Taniguchi, Ai Kubota, Yusuke Kubota, the Michigan State University semanticists, and the audience at *Sinn und Bedeutung 19* for their helpful comments and suggestions regarding this project. All errors are my own.

2. Data

The interpretation for the *#-some* construction has both an "at least" component, starting at the modified numeral, and an "at most" component. For the examples in (3), this is illustrated with the paraphrase below the example.

(3) a. Twenty-some people arrived.
"At least 20 and not more than 29 people arrived."
b. I could have it entirely full of small icons and fit a hundred some icons on one screen.
"Fit at least a hundred and not more than 199 icons."
c. More than half of the expenditure of eighty-some thousand dollars is for soft costs.
"At least eighty thousand dollars and not more than 89 thousand dollars."

That the *#-some* construction has its lower bound starting at the modified numeral can be shown by creating situations where the truth or falsity of a statement is judged in retrospect. For instance, suppose a speaker had uttered the sentence in (4), and then later on learned that she had only seen 19 dogs during her walk. In this case, (4) is naturally thought of as being false. However, if the speaker had been in a different world and saw 23 dogs during the walk, the utterance in (4) would be judged true in retrospect. The fact that the "19 dogs" interpretation for (4) is untruthful supports the conclusion that the *#-some* construction is bounded on the lower end by the modified numeral.

(4) I saw twenty-some dogs during my walk today.

(5) a. *Speaker learns he saw only 19 dogs:*
(4) is judged to have been false.
b. *Speaker learns he saw 23 dogs:*
(4) is judged to have been true.

However, *#-some* isn't unrestricted; the particular numeral being modified determines whether *#-some* is allowed. For instance, *ten* and *five* cannot be modified by *some* (as in (6)).

(6) a. *ten-some
b. *five-some

The explanation for this comes from the syntax of cardinal numbers. Consider a cardinal that does allow modification with *some*, such as *twenty*. *Twenty* can combine with other numerals via addition (additively), forming more complex numbers (like *twenty-two*). *Five* and *ten* do not compose additively with other numerals, as shown in (7). The relevant description of this, then, is that the *#-some* construction can only be used where two cardinals are combining additively.

(7) a. *ten-five (expected: 15)
    b. *five-one (expected: 6)

Supporting this analysis is the fact that *some* cannot modify a numeral in a position where numerals combine multiplicatively. For instance, in a cardinal number such as *five thousand*, *five* is combining with *thousand* multiplicatively — *five thousand* is five thousands. In the *#-some* construction, what *some* essentially does is bring to mind an interval of numbers that could have combined additively with the modified numeral. If *some* were able to be used multiplicatively as well, we might expect *some thousand* to allow for an interpretation of "some number in the interval of 1 to 9 multiplied by 1000." This interpretation is simply unavailable, however, suggesting that *some* can only be used additively.[2]

3. Epistemic indefinites and *#-some*

3.1. Parallels between *algún* and *#-some*

Cross-linguistically, there exists a class of indefinites known as epistemic indefinites, which enforce requirements on the speaker as to how much the speaker can know about the referent of the indefinite. Examples of epistemic indefinites include (but are not limited to) Spanish *algún* (Alonso-Ovalle and Menéndez-Benito 2010), Japanese *wh-ka* (Sudo 2010; Kaneko 2011; Alonso-Ovalle and Shimoyama 2014), German *irgendein* (Kratzer and Shimoyama 2002; Aloni and Port 2012), Romanian *vreun* (Farkas 2002; Fălăuş 2009), and importantly for this study, English singular *some* (Becker 1999; Farkas 2002).[3]

#-some is similar to many epistemic indefinites in that it also imposes knowledge requirements on the speaker — namely, that what *#-some* does is it conveys ignorance about the particular number that satisfies the assertion. For instance, *twenty-some* expresses ignorance about which number in a sequence from twenty-one to twenty-nine is true. That this ignorance is truly there can be demonstrated by trying to deny that the ignorance exists. (8) shows that a follow-up sentence where the ignorance implication is canceled is illicit.

(8) #Twenty-some people came to the party. In fact, it was exactly twenty-three people.

[2]It should be noted that an interpretation for *some thousand* is available, but it is not the same type of interpretation that *#-some* provides. An apt paraphrase of *some thousand people* might be "around a thousand people," but this differs from *#-some* in that the modified numeral doesn't provide a lower bound.

[3]See Alonso-Ovalle and Menéndez-Benito (2013b) for an overview of epistemic indefinites.

This fact parallels a similar fact with *algún* and *some*, where both also have an ignorance implicature, as demonstrated in (9) and (10). For both determiners, the speaker is forbidden from having certain knowledge about the witness that satisfies the claim.

(9) #María se casó con algún estudiante del departmento de lingüística: en concreto
María SE married with ALGUN student of.the department of linguistics: namely
con Pedro
with Pedro
'María married a linguistics student, namely Pedro.' (Spanish)

(10) Some professor is dancing on the table. #Namely, Jones.

As noted by Alonso-Ovalle and Menéndez-Benito (2010), the ignorance component of *algún* does not behave like an entailment or presupposition, but behaves like a conversational implicature. Two tests are important in determining this: that conversational implicatures disappear in downward entailing environments, and that conversational implicatures can be reinforced while semantic entailments cannot be reinforced. Based on these tests, the ignorance component of *#-some* should also be analyzed as an implicature.

To demonstrate that conversational implicatures disappear in downward entailing environments, *algún* can be embedded under negation or a verb such as *dudar* "to doubt," as in (11). Alonso-Ovalle and Menéndez-Benito argue that the ignorance implicature with *algún* disappears in these examples. The ignorance implicature also disappears in the examples with *#-some*; (12-a) expresses that it is not true that any number of people in the range of twenty-one through twenty-nine were at the party, and similarly, (12-b) expresses doubt about any number of people in that range coming to the party.

(11) a. No es verdad que Juan salga con alguna chica del departamento de
not is true that Juan date:subj3s with ALGUNA girl from.the department of
lingüística
linguistics
'Juan is not dating any girl in the linguistics department.'
(Alonso-Ovalle and Menéndez-Benito 2010, ex. 43)

b. Pedro duda que Juan salga con alguna chica del departamento de
Pedro doubts that Juan date:subj3s with ALGUNA girl from.the department of
lingüística
linguistics
'Pedro doubts that Juan is dating any girl in the linguistics department.'
(Alonso-Ovalle and Menéndez-Benito 2010, ex. 44)

(12) a. It's not true that twenty-some people were at the party.
b. I doubt that twenty-some people came to the party.

An additional argument that the ignorance component of *algún* is an implicature (and not an entailment) is that implicatures can be reinforced, while entailments cannot be. That entailments cannot be reinforced is demonstrated in (13), where in (a) the entailment from a presupposition cannot be reinforced (*there is a king of France*), and in (b) an entailment from the assertion cannot be reinforced (*Kim was kissed*).

(13) a. #The king of France is bald, and there is a king of France.
b. #Jim kissed Kim passionately, and Kim was kissed.

Alonso-Ovalle and Menéndez-Benito demonstrate that the ignorance component of *algún* can be reinforced, such as with (14). We can see that the ignorance implicit in *#-some* also can be reinforced, as in (15).

(14)

María	sale	con	algún	estudiante	del	departamento	de	lingüística, pero	no
María	goes.out	with	ALGUN	student	of.the	department	of	linguistics, but	not

sé	con	quién
know:pres1sg	with	whom.

'María is dating some student in the linguistics department, but I don't know who.'
(Alonso-Ovalle and Menéndez-Benito 2010, ex. 45d)

(15) Mary cooked twenty-some pies, but I don't know exactly how many.

The similarities between *algún* and *#-some* suggest that they should get similar treatments. I make use of the analysis of *algún* in Alonso-Ovalle and Menéndez-Benito (2010) in building an analysis of *#-some*. The intuition behind this approach will be that *#-some* is a signal that the speaker cannot identify the particular number that satisfies an existential claim. In the next section, I discuss Alonso-Ovalle and Menéndez-Benito's analysis of *algún*.

4. About *algún*

Spanish *algún* is used when the speaker cannot identify the witness that satisfies some existential claim. Alonso-Ovalle and Menéndez-Benito (2010) model the epistemic properties of *algún* in the following way. First, as a quantifier, *algún* combines with a subset selection function, which models contextual domain restrictions. Second, *algún* lexically encodes a presupposition that this subset selection function yields a non-singleton subset; when the subset selection function combines with the restrictor of *algún* (the NP that *algún* combines with), it must not return a singleton subset. This is formalized in (16). The effect of this is that *algún* competes pragmatically with the determiner *un*, which does not encode the anti-singleton presupposition. Based on the competition with *un*, the hearer can draw certain inferences.

(16) $[\![\textit{algún}]\!] = \lambda f_{\langle et,et\rangle}\lambda P\lambda Q : \textbf{anti-singleton}(f).\exists x\,[f(P)(x) \wedge Q(x)]$

One reason a speaker might use *algún*, argues Alonso-Ovalle and Menéndez-Benito (2010), is to avoid making a false claim.[4] As *algún* doesn't commit the speaker to any particular referent, a speaker might use *algún* to avoid making a false statement about some referent. To see how this works, consider the utterance in (17), which has the assertion in (a) and the presupposition in (b). Together, the speaker asserts that Juan is in some room of the house, but the anti-singleton constraint forbids the speaker from saying anything about which particular room.

(17) Juan tiene que estar en alguna habitación de la casa.
Juan has to be in ALGUN room of the house
a. Assertion: $\Box\,[\exists x\,[x \in f(\textbf{room}) \wedge \textbf{Juan is in } x]]$
b. Anti-singleton constraint: $|f(\textbf{room})| > 1$

For clarity, suppose that the set of rooms is as in (18), and that Juan can be in any of these rooms. The hearer then has to consider why the speaker didn't utter any of the stronger claims in (19).[5] Because none of the stronger alternatives were uttered, the hearer generates the implicature that the speaker cannot commit to any of them.

(18) {the bedroom, the living room, the bathroom}

(19) a. $\Box\,[\exists x\,[x \in f(\textbf{the-bedroom} \wedge \textbf{Juan is in } x]]$
$\Box\,[\textbf{Juan is in the bedroom}]$
b. $\Box\,[\exists x\,[x \in f(\textbf{the-living-room} \wedge \textbf{Juan is in } x]]$
$\Box\,[\textbf{Juan is in the living room}]$
c. $\Box\,[\exists x\,[x \in f(\textbf{the-bathroom} \wedge \textbf{Juan is in } x]]$
$\Box\,[\textbf{Juan is in the bathroom}]$

[4] Alonso-Ovalle and Menéndez-Benito (2010) also argue that a speaker may use *algún* in order to avoid an exhaustivity inference, which I won't discuss here.

[5] $\Box$ is notational shorthand for a covert assertoric operator. See Alonso-Ovalle and Menéndez-Benito (2010) for more details.

5. Representing cardinal numbers

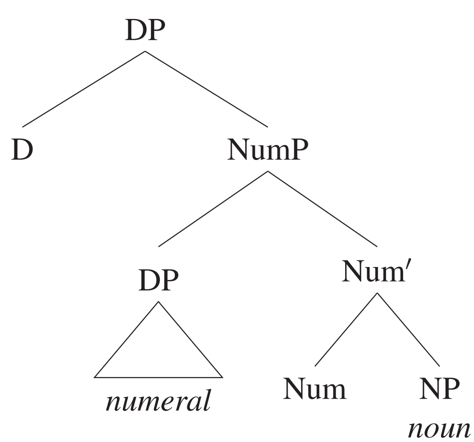
5.1. Simple cardinal numbers

In representing the syntax and semantics of cardinal numbers, I borrow from both Solt (2015) and Ionin and Matushansky (2006). First, I assume a degree semantics for cardinal numbers, following a similar move by Solt for quantity words such as *few* and *many*. I treat simple numerals as denoting properties of degrees, type $\langle d, t\rangle$, rather than degrees themselves. This makes a cardinal such as *twenty* have the denotation as in (20).

(20) $[\![\textit{twenty}]\!] = \lambda d\, [d = 20]$

Syntactically, numerals are inserted in the specifier of a NumP projection, as in (21). The role of the Num head is to measure the cardinality of an individual, as in (22).

(21) Structure of the DP:



(22) $[\![\text{Num}]\!] = \lambda e \lambda d\, [|x| = d]$

Solt notes that there is a compositional issue in defining the Num head in this way. Under standard assumptions, the NP that Num combines with is simply a property of individuals, $\langle e, t\rangle$. However, Num is of the wrong type to combine with the NP, being type $\langle e, dt\rangle$. To solve this, Solt uses the Degree Argument Introduction rule in (23) to put the NP and Num together. The resulting function is now type $\langle d, et\rangle$.

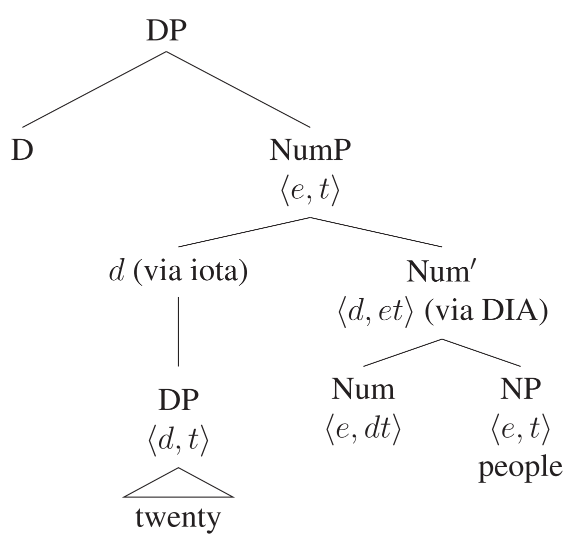
(23) Degree Argument Introduction (DAI): Solt (2015)
If α is a branching node, $\{\beta, \gamma\}$ are the set of α's daughters, and $[\![\beta]\!] = \lambda x_e.P(x)$, $[\![\gamma]\!] = \lambda x_e \lambda d_d.Q(d)(x)$, then $[\![\alpha]\!] = \lambda d_d \lambda x_e.P(x) \wedge Q(d)(x)$.

At this point, the denotation of a numeral and Num are incompatible (i.e., Num′ needs a degree and not a property of degrees, as denoted by the numeral). This can be fixed quite readily using the iota typeshift (Partee 1987). Generalizing iota to degrees, iota can take a property of degrees to a degree so long as there is a unique degree that can satisfy that property.

(24) Iota Typeshift (from $\langle d, t\rangle$ to d, where d is the type of degrees):
Shift P to $\iota d\,[P(d)]$

Simple numerals like *twenty* can have the iota typeshift applied to them; the function denoted by *twenty*, for instance, is satisfied only by the degree 20. Putting this together, a partial derivation for *twenty people* would look as in (25).

(25) *twenty people*:



The derivation for *twenty people* would then proceed as follows in (26).

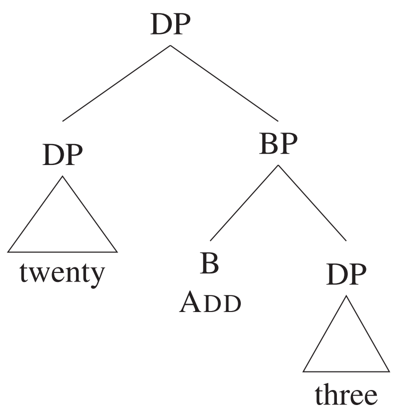
(26) a. $[\![\textit{Num people}]\!] = \lambda d \lambda x\,[|x| = d \wedge \textbf{people}(x)]$ (via DIA)
b. $[\![\textit{twenty}]\!] = \lambda d\,[d = 20]$
c. $[\![\textit{twenty}]\!] = \iota d.d = 20$ (via iota)

d. $[\![\textit{twenty Num people}]\!] = \lambda x \left[\begin{array}{c} |x| = (\iota d.d = 20) \wedge \\ \textbf{people}(x) \end{array} \right]$

5.2. Complex cardinal numbers

Cardinal numbers can also be complex, such as with *twenty-two* or *eighty-nine*. Examples such as these are semantically additive; *twenty-two* intuitively is formed by the addition of 20 and 2, and *eighty-nine* is intuitively formed by adding 80 and 9. Following Ionin and Matushansky (2006), I assume that additive cardinal numbers are built up syntactically by coordinating smaller cardinal numbers. Ionin and Matushansky attempt to show how coordination naturally gives the correct semantics for additive numerals. (27) demonstrates how an additive numeral such as *twenty-three* would be constructed.

(27) Structure of an additive numeral (*twenty-three*):



A key difference between the formulation in this paper and that of Ionin and Matushansky is the use of a morpheme ADD in the head of the BP, which transparently does the work of additively composing the two numerals. ADD is defined as in (28).

(28) $[\![\textsc{Add}]\!] = \lambda D \lambda D' \lambda d \exists d', d'' \left[d = d' + d'' \wedge D(d') \wedge D'(d'') \right]$

Twenty-three would have the logical form in (29). Essentially, *twenty-three* is split into its component parts, a degree equal to 3 and a degree equal to 20, and the predicate is satisfied by degrees that are equal to the sum of 3 and 20.

(29) $[\![\textit{twenty}\ \textsc{Add}\ \textit{three}]\!] = \lambda d \exists d', d'' \left[d = d' + d'' \wedge [\![\textit{three}]\!] (d') \wedge [\![\textit{twenty}]\!] (d'') \right]$

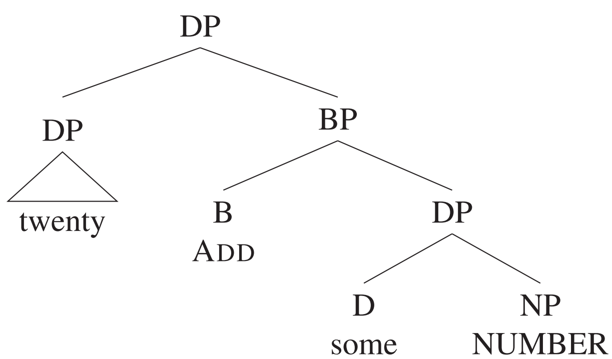
6. Proposal

6.1. Syntax and semantics of *#-some*

As demonstrated previously, *#-some* is only possible with additive numeral constructions. I analyze the *some* component of the construction as being like a numeral, albeit an indefinite numeral. In keeping with the pragmatic parallels between *#-some* and the more canonical determiner *some*, I analyze *some* here as a determiner as well, taking an NP complement.

I assume that the NP complement to *some* is a silent noun NUMBER (Kayne 2005; Zweig 2005). The meaning for NUMBER will be intentionally weak, being simply the domain of degrees, D_d.

(30) *twenty-some*:



Based on the similarities with *algún*, I propose treating *some* in a similar way, adopting the formalization for *algún* from Alonso-Ovalle and Menéndez-Benito (2010). Weir (2012) also proposes treating the determiner *some* in a way that parallels *algún*, using the denotation in (31).

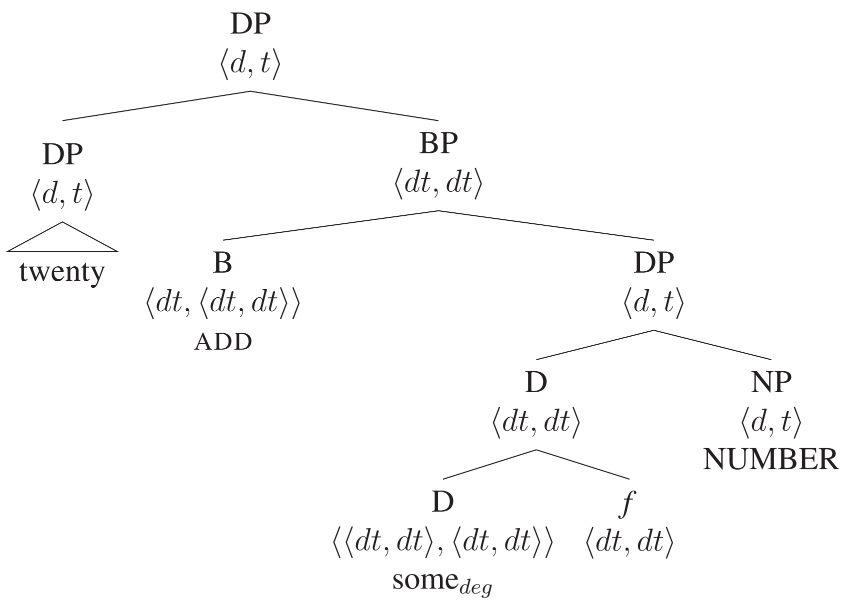
(31) $[\![\textit{some}]\!] = \lambda f_{\langle et,et\rangle}\lambda P \lambda Q : \textbf{anti-singleton}(f).\exists x\, [f(P)(x) \wedge Q(x)]$ (Weir 2012)

However, this will not quite work for *#-some*. In order to combine additively, *some NUMBER* needs to be a property of degrees (and not a generalized quantifier). The revised denotation in (32) for the *some* in *#-some* (which I will refer to as $\textit{some}_{deg}$) reflects these changes, with the existential force stripped out of *some*. Crucially, however, the anti-singleton presupposition remains, as this drives the pragmatic effects of *#-some*.

(32) $[\![\textit{some}_{deg}]\!] = \lambda f_{\langle dt,dt\rangle}\lambda D \lambda d : \textbf{anti-singleton}(f)\, [f(D)(d)]$

Twenty-some, annotated with types, would look as below in (33). Note that the subset selection function (f) has been represented syntactically. The logical form, after some reduction, would look as in (34). Essentially, *twenty-some* expresses twenty plus some indefinite number.

(33) *twenty-some*:



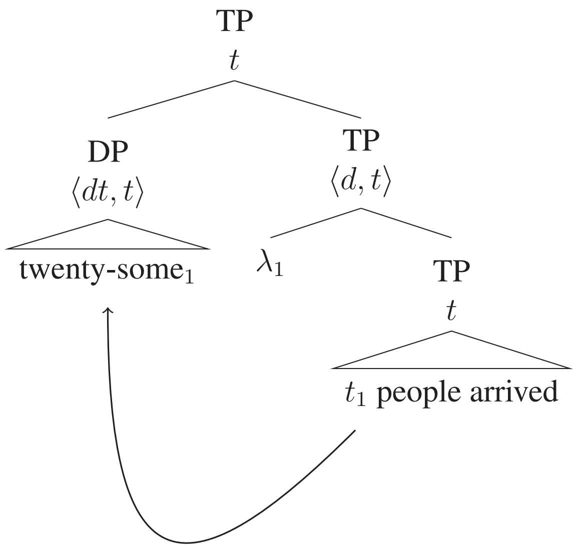
(34) $[\![\textit{twenty-some}]\!] = [\![\textit{twenty [}\text{ADD}\textit{ [some}_{deg}\textit{ NUMBER]]}]\!]$
$= \lambda d \exists d', d'' \, [d = d' + d'' \wedge [\![\textit{twenty}]\!] \, (d') \wedge [\![\textit{some}_{deg} \textit{ NUMBER}]\!] \, (d'')]$

Our indefinite numeral (*twenty-some* in the example above) is still type $\langle d, t \rangle$, like other numerals. But, there is still a type clash between the type required of Num′ (which is type $\langle d, et \rangle$) and our numerals. This time the iota typeshift cannot a solution to this problem; iota requires a unique degree, but there is no such degree that can satisfy our numeral. The new strategy is to raise rather than lower the type, using the typeshift in (35) (see also Partee (1987)).

(35) Generalized Quantifier Typeshift (from $\langle d, t \rangle$ to $\langle dt, t \rangle$, where d is the type of degrees):
Shift P to $\lambda Q \exists d \, [P(d) \wedge Q(d)]$

By raising the numeral to the type of a generalized quantifier (shifting from $\langle d, t \rangle$ to $\langle dt, t \rangle$) and Quantifier Raising the numeral, we can circumvent the typeclash. The trace left behind by the movement will be interpreted as type d, precisely what is required of Num′.

(36)



The derivation for *twenty-some people arrived* proceeds as follows in (37).

(37) a. $[\![\textsc{shift}]\!]\,([\![\textit{twenty-some}]\!])$
$= \lambda P \exists d\,[[\![\textit{twenty-some}]\!]\,(d) \wedge P(d)]$
$= \lambda P \exists d, d', d'' \begin{bmatrix} d = d' + d'' \wedge [\![\textit{twenty}]\!]\,(d'') \\ \wedge\, [\![\textit{some NUMBER}]\!]\,(d') \wedge P(d) \end{bmatrix}$

b. $[\![t_1]\!] = d_1$

c. $[\![\textit{Num people}]\!] = \lambda d \lambda x\,[|x| = d \wedge \textbf{people}(x)]$

d. $[\![t_1 \textit{ Num people arrived}]\!] = \lambda x \begin{bmatrix} |x| = d_1 \wedge \\ \textbf{people}(x) \wedge \\ \textbf{arrived}(x) \end{bmatrix}$

e. $[\![\lambda_1\ \exists\ t_1 \textit{ Num people arrived}]\!] = \lambda d_1 \exists x \begin{bmatrix} |x| = d_1 \wedge \\ \textbf{people}(x) \wedge \\ \textbf{arrived}(x) \end{bmatrix}$

f. $[\![\textit{twenty-some people arrived}]\!]$
$= \exists d, d', d'' \begin{bmatrix} d = d' + d'' \wedge [\![\textit{twenty}]\!]\,(d'') \wedge \\ f(D)(d') \wedge \exists x \begin{bmatrix} |x| = d \wedge \\ \textbf{people}(x) \wedge \\ \textbf{arrived}(x) \end{bmatrix} \end{bmatrix}$

6.2. Ignorance component of *#-some*

How does the anti-singleton subset selection function create the ignorance inference with *#-some*? The analysis of this parallels that of *algún*, in that the anti-singleton constraint forces the hearer to consider why the speaker uses *#-some* and not some particular number. In doing this, the hearer considers alternatives which are represented with singleton domains. As these are stronger claims, and the speaker did not utter any of them, the hearer can draw the inference that the speaker could not commit to any of them.

To see how this works, consider the utterance in (38), with the assertion in (a). The anti-singleton constraint in (b) prevents the domain of numbers from being a singleton.

(38) Twenty-some people arrived.

a. Assertion: $\Box \left[\exists d, d' \left[\begin{array}{c} d = d' + 20 \wedge f(D)(d') \\ \wedge\, \exists x \left[\begin{array}{c} |x| = d\, \wedge \\ \textbf{people}(x) \wedge \\ \textbf{arrived}(x) \end{array} \right] \end{array} \right] \right]$

b. Anti-singleton constraint: $|f(D)| > 1$

For concreteness, suppose that $D = \{1, 2, 3\}$. The alternatives that the hearer will consider would be represented as in (39) — namely, the hearer considers that twenty-one through twenty-three people arrived at the party.

(39) Alternatives:

a. $\Box \left[\exists d, d' \left[\; d = d' + 20 \wedge d' \in \{1\} \wedge d\text{-people arrived} \; \right] \right]$
b. $\Box \left[\exists d, d' \left[\; d = d' + 20 \wedge d' \in \{2\} \wedge d\text{-people arrived} \; \right] \right]$
c. $\Box \left[\exists d, d' \left[\; d = d' + 20 \wedge d' \in \{3\} \wedge d\text{-people arrived} \; \right] \right]$

None of the alternatives in (39) were uttered by the speaker, however — the speaker uttered the much weaker (38). From this, the hearer draws the inference that, since none of the stronger alternatives in (39) were uttered, the speaker couldn't commit to any of them, generating the implicatures in ((40)).

(40) Implicatures:

a. $\neg\Box \left[\exists d, d' \left[\; d = d' + 20 \wedge d' \in \{1\} \wedge d\text{-people arrived} \; \right] \right]$
b. $\neg\Box \left[\exists d, d' \left[\; d = d' + 20 \wedge d' \in \{2\} \wedge d\text{-people arrived} \; \right] \right]$
c. $\neg\Box \left[\exists d, d' \left[\; d = d' + 20 \wedge d' \in \{3\} \wedge d\text{-people arrived} \; \right] \right]$

The strengthened meaning of *#-some* is the conjunction of the implicatures and the assertion, deriving the ignorance effect. The hearer reasons that the speaker is ignorant about the particular number of people that arrived at the party because the speaker chose to utter a form that committed herself to no particular number of people.

6.3. Overgeneration issues

Although the analysis of *#-some* in the previous sections accounts for the “at least” interpretation, an issue is how to account for the “at most” interpretation. To illustrate this, consider again the example of *twenty-some*, which is analyzed as *twenty-[some NUMBER]*. *Some NUMBER* has a very weak meaning — it simply means some number in the domain of degrees, which could very well be anything. Although *twenty* naturally provides the lower bound, there’s nothing that prevents *twenty-some* from meaning thirty, or forty, or even twelve thousand three, depending on the number that *some NUMBER* refers to.

The situation isn’t hopeless, however; there are a couple preliminary options as to how we might get the “at most” interpretation for *#-some*. The first option is to derive the “at most” reading as a very strong implicature. Suppose that *twenty-some people arrived* has (41) as a set of alternatives. This set includes alternatives that an “at most” reading would rule out, such as *thirty-one people arrived*.

(41)
$$\left\{\begin{array}{l} 20+1 \text{ (twenty-one) people arrived,} \\ 20+2 \text{ (twenty-two) people arrived,} \\ 20+3 \text{ (twenty-three) people arrived,} \\ \ldots \\ 20+10 \text{ (thirty) people arrived,} \\ 20+11 \text{ (thirty-one) people arrived,} \\ 20+12 \text{ (thirty-two) people arrived} \end{array}\right\}$$

The use of *twenty-some* explicitly sets one of the numbers to be added as 20. From $20+1$ through $20+9$, the preferred way to utter these numbers is by composing *twenty* with another number. However, for higher numbers, such as $20+10$ and $20+11$, the preferred way to lexicalize these is by using *thirty* (similarly, $20+20$ uses *forty*, $20+30$ uses *fifty*, and so on). As the speaker went to the trouble of using *twenty-some* (and not *thirty-some*), Gricean reasoning kicks in and rules out interpretations for *twenty-some* that would preferably be expressed by *some NUMBER* composing with some other number. For example, the interpretation of *thirty-one* for *twenty-some* would be ruled out due to *thirty-some* being a more preferred way of expressing numbers higher than those in the twenties series. In other words, interpretations for *twenty-some* higher than 29 are ruled out due to the spoken forms not using the numeral that *some NUMBER* has composed with.

A second, related proposal also concerns the way the alternatives would be said. The logical form for each alternative for *twenty-some*, at some level, takes the form of $20 + n$, where n is some number. If we take the preferred way that n would be uttered in each case, we would have the set of alternatives in (42). Inspecting the alternatives, *twenty-one people arrived*, *twenty-two people arrived* and so on up to *twenty-nine people arrived* are all well-formed English sentences. However, *twenty-ten people arrived* and other such alternatives would not be well-formed English sentences, therefore ruling them out.

(42) $\left\{\begin{array}{l}\text{twenty-one people arrived,}\\ \text{twenty-two people arrived,}\\ \text{twenty-three people arrived,}\\ \ldots\\ \text{twenty-ten people arrived,}\\ \text{twenty-eleven people arrived,}\\ \text{twenty-twelve people arrived}\end{array}\right\}$

7. Conclusion

In this paper I have provided an analysis of what I have called the *#-some* construction, where a cardinal number is affixed with the determiner *some*. This does not happen unconstrained; only particular numerals allow this, and I've argued that this is based on whether the numerals can combine additively with other numerals. Furthermore, this construction has properties which make it behave like epistemic indefinites. I draw parallels between *#-some* and *algún*, and analyze the pragmatics of *#-some* using the analysis of *algún* in Alonso-Ovalle and Menéndez-Benito (2010).

The analysis provided here is also indirect support for analyses of complex determiners in other languages that rely on deriving ignorance via implicature. One example of this is Spanish *algún que otro* (Alonso-Ovalle and Menéndez-Benito 2013a), which expresses that a speaker does not know the precise number of individuals that satisfy a claim. Like *#-some*, *algún que otro* is also constructed from an epistemic indefinite, but unlike *#-some*, *algún que otro* only has an "at least" interpretation (and does not specify a maximum).

Looking more broadly cross-linguistically, we see that other languages such as Japanese also allow for approximation based on the position within the numeral. This can be done in Japanese by inserting an indeterminate pronoun *nan* into a position in the numeral. The indeterminate pronoun behaves like a variable over numbers that could appear in that position.

(43) Juu -nan -nin -ka -ga kita.
ten -what -CL(people) -ka -NOM came
'10 plus x people came.'

(44) Nan -juu -nin -ka -ga kita.
what -ten -CL(people) -ka -NOM came.
'x multiple 10 people came.'

While *#-some* is restricted in that it only appears in additive environments, Japanese allows the indeterminate pronoun to be used in both additive and multiplicative environments. As indeterminate pronouns are used in the construction of indefinites in Japanese (Kratzer and Shimoyama 2002), this represents another case of forms used in indefinites being used for numerical approximation. Further work needs to be done on what connections there are between *#-some*, investigated in this paper, data like the Japanese data above, and *algún que otro*.

References

Aloni, M. and A. Port (2012). On epistemic indefinites: a note on emphatic free choice uses. In A. Aguilar Guevara, A. Chernilovskaya, and R. Nouwen (Eds.), *Proceedings of Sinn und Bedeutung 16*, pp. 1–14.

Alonso-Ovalle, L. and P. Menéndez-Benito (2010). Modal indefinites. *Natural Language Semantics 18*, 1–31.

Alonso-Ovalle, L. and P. Menéndez-Benito (2013a). Modal determiners and alternatives: Quantity and ignorance effects. In T. Snider (Ed.), *Proceedings of Semantics and Linguistic Theory 23*, pp. 570–586.

Alonso-Ovalle, L. and P. Menéndez-Benito (2013b). Two views on epistemic indefinites. *Language and Linguistics Compass 7*, 105–122.

Alonso-Ovalle, L. and J. Shimoyama (2014). Expressing ignorance in the nominal domain: Japanese wh-ka. In R. E. Santana-LaBarge (Ed.), *Proceedings of West Coast Conference on Formal Linguistics 31*, pp. 11–20.

Becker, M. (1999). The *some* indefinites. In G. Storto (Ed.), *Syntax at Sunset 2, UCLA Working Papers in Linguistics*, pp. 1–13.

Fălăuş, A. (2009). Polarity items and dependent indefinites in Romanian. *Université de Nantes dissertation*.

Farkas, D. (2002). Extreme non-specificity in Romanian. In C. Beyssade, R. Bok-Bennema, F. Drijkoningen, and P. Monachesi (Eds.), *Romance languages and linguistic theory 2000*, pp. 127–151. Amsterdam: John Benjamins.

Ionin, T. and O. Matushansky (2006). The composition of complex cardinals. *Journal of Semantics 23*, 315–360.

Kaneko, N. (2011). DP external epistemic 'determiners' in Japanese. In O. Bonami and P. Cabredo Hofherr (Eds.), *Empirical issues in syntax and semantics 8*, pp. 239–66. [Online, available at http://www.cssp.cnrs.fr/eiss8/eiss8.pdf].

Kayne, R. S. (2005). A note on the syntax of quantity in English. In R. S. Kayne (Ed.), *Movement and Silence*, pp. 176–214. Oxford University Press.

Kratzer, A. and J. Shimoyama (2002). Indeterminate pronouns: The view from Japanese. In Y. Otsu (Ed.), *Third Tokyo Conference on Psycholinguistics*, Tokyo, pp. 1–25. Hituzi Syobo.

Partee, B. (1987). Noun phrase interpretation and type-shifting principles. In J. Groenendijk, D. de Jongh, and M. Stokhof (Eds.), *Studies in Discourse Representation Theory and the theory of generalized quantifiers*, pp. 115–143. Foris Publications.

Solt, S. (2015). Q-adjectives and the semantics of quantity. *Journal of Semantics 32*, 221–273.

Sudo, Y. (2010). *Wh-ka* indefinites in Japanese. Talk presented at the Workshop on Epistemic Indefinites, University of Göttingen and Lichtenberg-Kolleg, June 11th, 2010.

Weir, A. (2012). *Some*, speaker knowledge, and subkinds. In R. K. Rendsvig and S. Katrenko (Eds.), *Proceedings of the ESSLLI 2012 Student Session*, pp. 180–190.

Zweig, E. (2005). Nouns and adjectives in numeral NPs. In L. Bateman and C. Ussery (Eds.), *Proceedings of the Northeast Linguistics Society 35*, pp. 663–675.