Portions and countability

a crosslinguistic investigation

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Outline

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Background: mass versus count

Mass: the absence of countability

(1) a. One/a/each cat/*milk/*furniture
b. Three/several/many cats/*milks/*furnitures

In order to be counted, mass nouns require the intervention of a measure or classifier phrase:

(2) a. Several items/lots of furniture
b. Three liters of milk

Count morphology without countability

This talk focuses on several cases in which mass nouns appear with count morphosyntax, but the construction as a whole remain mass.

'Q-nouns': (Klockmann 2017)

(3) a. I ate (*three/*multiple/*many) loads of cake and now I'm sick.
(cf.: I did three loads of laundry)
b. Heaps, lots, oodles, reams, scores, masses...

Count morphology without countability

Bare measures and shape classifiers:

(4) a. Mary wasted LITERS of water watering her garden just before it started to rain.

b. Nobody likes reading chunks and chunks of text - not even me and I love reading. We like it broken up with photos, infographics, things that make us laugh out loud.

Count morphology without countability

Plural mass nouns: (e.g. Tsoulas 2009, Alexiadou 2011, Kane et al 2015 for Greek; also in Yup'ik (Corbett & Mithun (1996), Ojibwe (Mathieu 2012), Innuttut (Gillon 2012), Old High German (Carr 1936), Blackfoot (Wiltschko 2012), Nez Perce (Deal 2013), Evenki (Nedjalkov 1997), Persian (Sharifian & Lotfi 2003), Indonesian (Dalrymple & Mofu 2012))

(5) Trexoun nera apo to tavani.
drip-3-PL water-PL-NEUT-NOM from the ceiling.
'Waters are dripping from the ceiling.' (i.e., 'a lot of water is dripping from the ceiling') (Greek)

Count morphology without countability

(6) a. O Yanis patise se laspes.
THE-MASC-SING Yanis step.PAST in mud-PL
Yanis stepped in muds.

b. *O Yanis patise se tris laspes.
THE-MASC-SING Yanis step-PAST in three-FEM-PL mud-PL
Yanis stepped in three muds.

What's going on?

Shared characteristics:

- Mass, despite involving expressions or constructions that also have a genuine count use (either within or across languages)
- Structural ambiguity between mass and count interpretations of the same NP
- Mass version triggers abundance inference (a lot of X, or X scattered over a wide area)

(We'll look at each of these in turn)

Outline

Mass/count alternations

Klockmann (2017) treats Q-nouns as quantifier-like elements; she treats *lot* as lexically ambiguous between a Q-noun and a classifier:

(7) a. I drank lots of water.
b. I sold two lots of furniture.

Mass/count alternations

However, this alternation is widespread:

(8) a. The geologists found several masses of Paleozoic rock.
b. These Victorian hairstyles required (*several) masses of hair.

(9) a. Sort the toys into three heaps.
b. Drink (*three) heaps of water.

(10) a. There's only two reams of printing paper left in the supply closet.
b. We need to analyse (*multiple) reams of data before we can draw any conclusions.

Mass/count alternations

What's going on?

- Systematic lexical ambiguity?
  ...preferably not.
- A metaphorical, vague use meaning 'large quantity'?
  ...but that does not explain the lack of countability!

(11) Drink three large quantities of water every day.

Mass/count alternations

Recognising that Q-nouns systematically alternate with a classifier-like use means we can treat them on a par with other alternating classifiers and measure words:

(12) a. Many kilos of flour were contaminated.
b. KILOS of flour were contaminated.

(13) a. Season each slab of meat with two teaspoons of the spice mixture.
b. If you like slabs and slabs of meat, you've come to the right restaurant.

(14) a. Mary gave me two buckets of delicious fruit.
b. I was able to harvest buckets and buckets of fruit this year.

Mass/count alternations

Plural mass nouns, too, can be either countable or uncountable (sometimes within the same language).

Blackfoot (Wiltschko 2012):

(15)

a.	aiksinoosak	aiksinoosak.iksi
	bacon	bacon.PL
	'bacon'	'slabs or slices of bacon'
b.	kaatsi	káatsi.istsi
	driftwood	driftwood.PL
	'driftwood'	'pieces of driftwood'

Mass/count alternations

Evenki (Nedjalkov 1997):

(16)

a.	se:kse 'blood'	se:ksel 'a lot of blood'
b.	singilgen 'snow'	singilger 'lots of snow'
c.	ulle 'meat'	ullel 'multiple pieces of meat' or 'a lot of meat'

Innu-Aimun (Gillon 2010):

(17)

pimî	pimî.a
'oil'	'amounts of oil' or 'lots of oil'

Proposal: same operators, different structure

Klockmann (2017): with Q-nouns, VP agreement tends to be with the embedded predicate.

(18) Lots of water was/*were dripping from the ceiling.

(19) Een hoop mensen liep.en voor het einde van de film weg.
A heap people walked.PL before the end of the film away
'A heap of people walked out before the end of the film.' (Dutch)

Compare:

(20) A lot of watch parts is very cheap on eBay.

Tentative conclusion: *lot* is the head of the phrase in (20), but not in (19).

Proposal: same operators, different structure

Generalisation: (more data/arguments in the paper: `http://medusa.york.ac.uk/minsyn-g/pluralmass/wp-content/uploads/sites/9/2018/05/DeVriesTsoulas18-portions.pdf`)

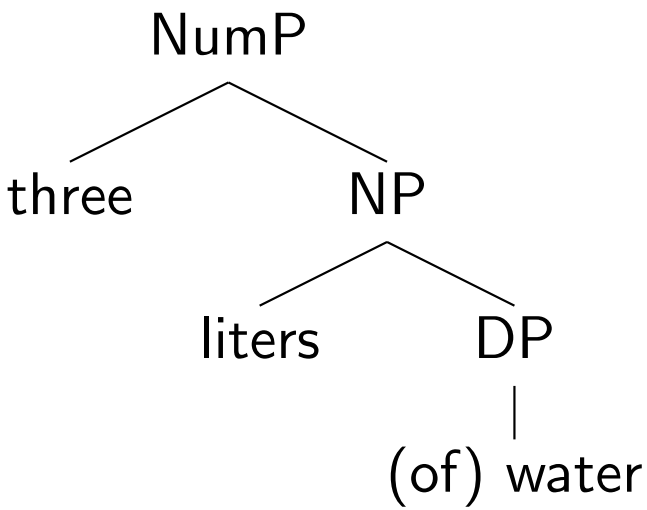
(21) A complex phrase containing a portion operator (overt or covert) and a mass predicate is:
...count when the portion operator is the head of the phrase
...mass when the mass predicate is the head of the phrase

(cf. the 'Head Principle' of Landman (2017))

The syntax of portioning-out: towards an analysis

- Measure expressions in the cases under discussion are portion-shifted (Rothstein 2011, Khrizman et al. 2015), e.g. *liter* $\rightarrow$ 'liter-sized portion'. (Independent evidence for this from Dutch.)
- **Count** portioning-out proceeds much along the lines of Rothstein 2011: the portion word heads its own phrase.

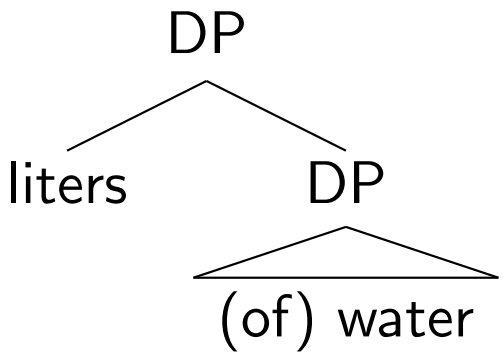
(22)



The syntax of portioning-out: towards an analysis

- With **mass** portioning-out, the embedded noun remains the head; the portion word is (part of) an adjunct or specifier.

(23)



We will make this more precise once we derive the semantics.

Outline

From atomicity to disjointness

A common view on mass/count ontology ties (lack of) countability to (lack of) atomicity (e.g. Link 1983, Chierchia 1998, 2010)

Alternative view: countability requires non-overlapping reference (Rothstein 2011, Landman 2011, 2016, Khrizman et al. 2015, Sutton & Filip 2016...)

- Both count and mass nouns range over **sums**.
- The sums in the extension of a count noun are **disjoint** (non-overlapping).
- The sums in the extension of a mass noun overlap.

From atomicity to disjointness

No type/domain-shifting required to deal with mass/count flexibility

- **cauliflower** in *I juggled cauliflowers*:
  $\{a \oplus b \oplus c,\ d \oplus e \oplus f,\ g \oplus h \oplus i\}$
- **cauliflower** in *I like cauliflower*:
  $\{a \oplus b \oplus c,\ d \oplus e \oplus f,\ g \oplus h \oplus i,\ a \oplus b \oplus c \oplus d \oplus e \oplus f \oplus g \oplus h \oplus i,\ a \oplus b,\ b \oplus c,\ c \oplus d,\ a,\ b,\ c...\}$

Portioning-out in disjointness semantics: intuitive idea

Since everything is 'stuff', combining mass nouns with e.g. a shape classifier can involve simple intersection.

- *slab of meat* $\rightarrow$ **slab** $\cap$ **meat** $\rightarrow$ the set of sums that are both meat and slabs (disjoint because slabs are disjoint)
- But within those disjoint **slabs-of-meat**, there's still overlapping **meat-in-slabs**.
- Intuition: this is precisely the difference between count and mass portioning-out.

Portioning-out in disjointness semantics: formalities

Ingredient 1:

- An (overt or covert) portioning-out operator that turns mass denotations into sets of **disjoint** portions according to some individuation criterion.
- A portioning-out operator $\mathcal{P}^C$ is a function of type $\langle et, et \rangle$ such that:
  $\mathcal{P}^C(X) := \{y \in X | y \text{ meets an individuation criterion } C\}$
- Individuation criteria can be size, shape, separation in space, etc...

Portioning-out in disjointness semantics: formalities

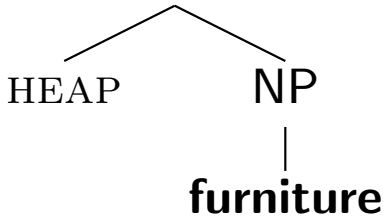
Ingredient 2 (only for mass portioning-out):

- An additional covert function MP that mediates between $\mathcal{P}^C$ and the mass noun.
- $\text{MP}(\mathcal{Q})(P) := \{x | x \in P \wedge \exists y[y \in \mathcal{Q}(P) \wedge x \sqsubseteq y]\}$ where P is a set of sums and $\mathcal{Q}$ a function from sets of sums to sets of sums.
- In words: $\text{MP}(\mathcal{P}^C)(P)$ is the set of sums that are (1) members of the non-portioned-out predicate P; (2) part of a portion of P individuated according to C. It is disjoint iff P is disjoint.
- cf. 'meat in slabs'

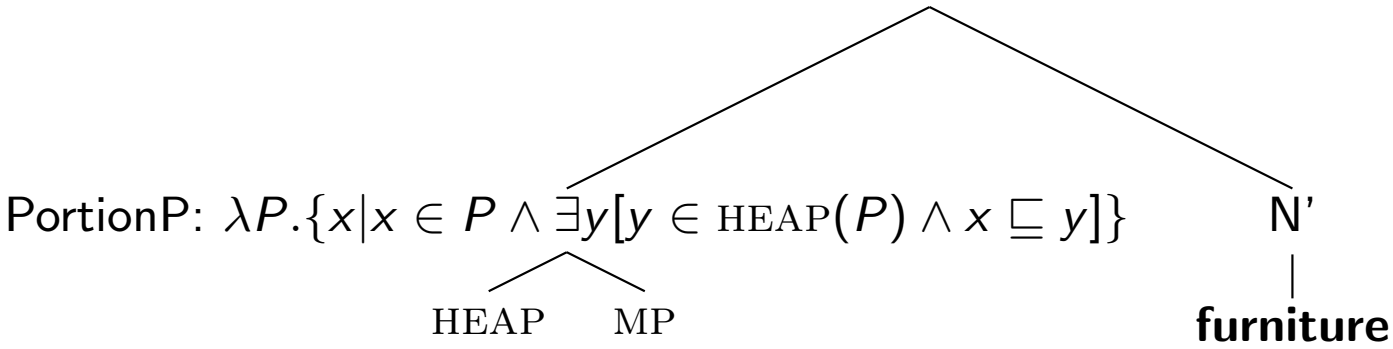
Back to some of our examples

Two derivations for [[*Heaps of furniture*]]

(24) PortionP: $\{y \in \textbf{furniture} | y \text{ is heap-shaped}\}$



(24) NP: $\{x | x \in \textbf{furniture} \wedge \exists y[y \in \text{HEAP}(\textbf{furniture}) \wedge x \sqsubseteq y]\}$



Back to some of our examples

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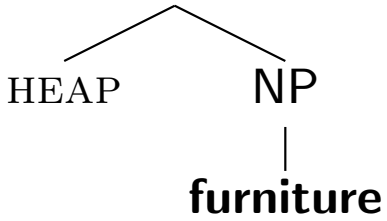

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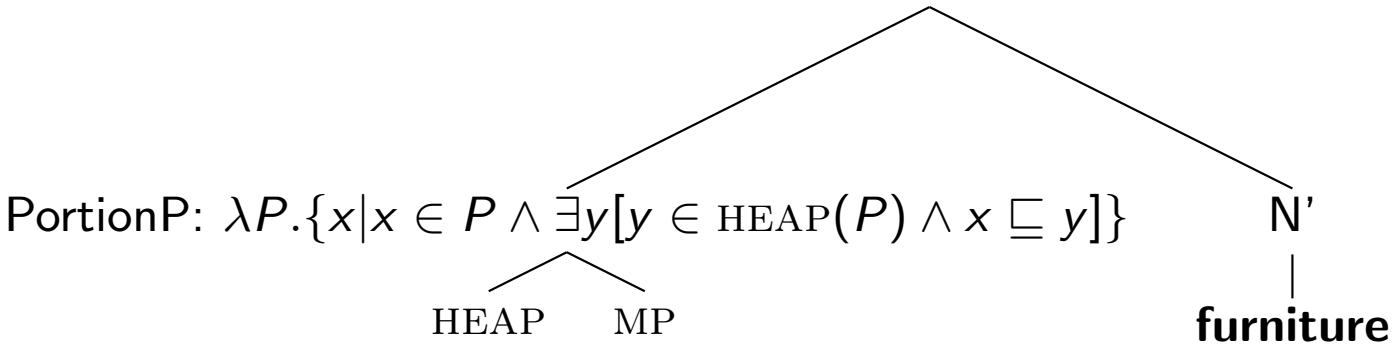

Covert portioning-out ('waters')

- $\text{MP}(\text{PORTION})(\textbf{water}) : \{x | x \in \textbf{water} \wedge \exists y[y \in \text{PORTION}(\textbf{water}) \wedge x \sqsubseteq y]\}$
- ...where PORTION is a covert portioning-out operator that provides a context-based disjoint covering of the set it applies to
- 'the set of all water-sums that are part of a portion' (not closed under sum)
- This set can be non-vacuously pluralised with *
- $^*\text{MP}(\text{PORTION})(\textbf{water}) = \textbf{water}$

Outline

Where does abundance come from?

So far so good: count morphosyntax can still result in a mass NP provided the NP's head is mass. But nothing about our syntax or semantics explains why these mass NPs trigger an abundance inference.

- Metaphorical 'large quantity' does not explain lack of countability.
- Something about the plural? Proposed (in different forms) by Alexiadou (2011) and Kane et al. (2015) for Greek mass plurals.

Where does abundance come from?

Kane et al. (2015) show convincingly that the abundance inference in Greek mass plurals behaves like an implicature.

For example, it disappears in downward entailing environments:

(26) O Yanis den ehise nera.
the John not spill waters
'John didn't spill any water.'

Renans et al (to appear): Greek children generally fail to derive the abundance inference, which conforms to the general acquisition pattern of scalar implicatures.

Abundance as a form of multiplicity?

Spector (2007) on the multiplicity implicature of plural count nouns:

- Step 1: singular nouns are enriched with an 'exactly 1' meaning through pragmatic competition with the alternative form *multiple N*.
- Step 2: plural nouns are enriched with a 'more than 1' meaning through pragmatic competition with the enriched singular.

Kane et al.'s parallel for plural mass nouns:

- Step 1: singular mass nouns are enriched with the implicated meaning 'not much' through pragmatic competition with the alternative *much N*.
- Step 2: plural mass nouns are enriched with a 'much' meaning through competition with the enriched singular.

Abundance ≠ multiplicity

First problem: hard to maintain our parallel with other types of mass portioning-out.

Second problem: 'reverse abundance':

(27) One stepped down, but the other, despite having been found to have violated the code, remained employed and in an office **feet away** for six months from one of the women who filed the complaint.

Abundance ≠ multiplicity

Similarly:

(28) Yet if polls are right [the Labour party] is **days away** from utter collapse north of Hadrian's Wall.

The same effect arises with some shape classifiers that inherently express a small quantity, such as *drop*:

(29) Although it may take two or three weeks to get even **drops of milk**, the fact that the adopting mother starts to get even drops can be very reassuring.

Mass portioned-out predicates are size-ordered

We argue that mass portioning-out equips the resulting set with a size ordering, similarly to 'quality nouns' like *courage*, *fear*, *wisdom* (Tovena 2001, Francez & Koontz-Garboden 2017)

Diagnostics for size ordering:

- Exclamatives
- Size and evaluative modification
- Intensifiers
- Degree-targeting with *such*

Exclamatives

(30) a. What water she drank!
≠ How much water she drank!
b. What courage she has!
≡ How much courage she has / how courageous she is!

(31) And, **what heaps of gear** you can pack in this roof top carrier!

(32) O **what floods of turtle-soup; what tons of turbot and lobster-sauce** must have been sacrificed to make those sinners properly miserable.

Size and evaluative modification

(33) a. *She drank major/enormous/incredible water.
b. She has major/enormous/incredible courage.

(34) I've also talked to my [hybrid striped bass] supplier who goes through **major tons of [AquaMax fish feed]** and he said there is a noticeable difference in the new feed.

(35) Australia is a huge country – after all, it's also its very own continent – with cities dotted along **its incredible miles of coastline**. But it's not just big in terms of square miles.

Size and evaluative modification

(36) a. To karavi evaze **hodra nera**
The ship was-taking fat waters
'The ship was taking huge amounts of water'

b. %To karavi evaze **hodro nero**
The ship was-taking fat water
'The ship was taking fat water' (whatever that means)

Intensifiers

(37) a. *She drank utter/total/absolute water.
b. He has absolute conviction.
c. She is a person of utter beauty.

(38) **Absolute tons of soft drinks, wines, beers and food** included.

(39) I'm just astounded by them dismissing **outright years of our national history** as insignificant.

Such

(40) a. Drinking such water is bad for your health.
≠ Drinking so much water is bad for your health.
b. Such wisdom is rarely seen in someone so young.
≡ So much wisdom is rarely seen in someone so young.

(41) Why have the artistic gymnasts put on **such oodles of makeup**?

(42) Added to soot, **such heaps of dust, mud, ash, horse-dung and other detritus** littered the city's thoroughfares that the rich were also sullied.

Degree predicates and the positive form

In the absence of degree morphology, gradable predicates like *tall* and *idiot* are interpreted as 'X to an above-average degree' (43-a)

(43) a. John is tall.
b. John is 5 feet tall.

General consensus: this inference is not part of the lexical meaning of the adjective, but contributed either by a covert morpheme POS or, as argued in recent work by Jessica Rett (2011, 2015), through a pragmatic process.

The pragmatics of the positive form

According to Rett:

- (43-a) simply means 'John has a height' (i.e., 'John's height falls somewhere on the tallness scale')
- This is trivially true, hence violates Grice's maxim of Quantity (according to which our discourse contributions need to be informative to an appropriate degree).
- A cooperative speaker would not violate Quantity, so the hearer infers that the intended meaning meaning is stronger than the utterance's logical meaning.
- Strengthened, informative interpretation: 'John's height falls on the *higher* end of the tallness scale'.

Deriving abundance

We enrich our MP operator so that it provides a size ordering:

(44) $\text{MP}(\mathcal{Q})(P) := \{x | x \in P \wedge \exists y[y \in \mathcal{Q}(P) \wedge x \sqsubseteq y] \wedge \exists d[\textbf{size}(d)(x)]\}$ where **size** expresses a relation between individuals and degrees on a size scale

- This addition is trivial: it does not change the membership of the resulting portioned-out predicate.
- But it does provide the compositional material for the portioned-out NP to participate in degree modification constructions...
- ...as well as the basis for an uninformativity-based Quantity implicature along the lines of Rett.

Deriving abundance

[[*John spilled waters/John spilled lots of water/John spilled liters of water*]] =

a. $\exists x[\textbf{spill}(x)(j) \wedge x \in \textbf{water} \wedge \exists y[y \in *\text{PORTION/LOT/LITER}(\textbf{water}) \wedge x \sqsubseteq y] \wedge \exists d[\textbf{size}(d)(x)]]$
'There exists a sum of water that's part of a sum of portions/lots/liters of water and was spilled by John and has a size.'

b. Pragmatically strengthened interpretation:

$\exists x[\textbf{spill}(x)(j) \wedge x \in \textbf{water} \wedge \exists y[y \in *\text{PORTION/LOT/LITER}(\textbf{water}) \wedge x \sqsubseteq y] \wedge \exists d[\textbf{size}(d)(x) \wedge d > s_{size}]]$
'There exists a sum of water that's part of a sum of portions/lots/liters of water and was spilled by John and *has an above-standard size*.'

Reverse abundance

- Assumption: in the case of reverse abundance, the size scale is reversed (i.e. the imposed ordering relation is $\leq$, not $\geq$)
- Why? Either because the portioning-out operator lexically expresses smallness (e.g. *drop*)...
- ...or because the abundance inference conflicts with the scalar implicature triggered by the use of certain measure words (e.g. *days away* $\rightarrow$ 'less than a week away')
- Challenge: reverse abundance is not always available (e.g. *I spent hundreds of pounds* implicates 'less than 1000 pounds', but no reversal. OTOH, *I spent pennies* involves reversal but is also somewhat idiomatic).

Outline

Conclusions

- Count and mass portioning-out involve the same ingredients but in different syntactic configurations. Mass/count status of the complex NP is determined by the head.
- Semantically, the contrast is between 'portions of stuff' and 'stuff in portions'.
- Mass portioned-out predicates are equipped with a size ordering.
- Abundance is a Quantity implicature.
- Reverse abundance and differences between different portioning-out operators: partially solved, but still loads of questions.