# Licensing (non-)exhaustivity in *wh*-questions: Experimental studies

**INTRODUCTION**. Embedded questions such as the underlined part of (1) seem to require exhaustivity: Dana must know <u>all</u> of the relevant party-goers. In contrast, those like (2) also allow exhaustivity, but seem to also permit non-exhaustivity: Dana should know some place to find coffee (Hintikka 1976, 1978; Karttunen 1977). This contrast illustrates the contrast between Mention-All (MA) and Mention-Some (MS) readings. MS thus appears to be more constrained in distribution than MA, but the question is *why*.

(1) Dana knows <u>who came to the party</u>.                    #MS /   MA
(2) Dana knows <u>where we can find coffee</u>.                 MS /   MA

    **Account 1** claims that ***linguistic form*** constrains readings. This approach comes in three parts. (a) Ginzburg (1995) and Asher & Lascarides (1998) observe that *who*-questions prefer MA, while *where*- and *how*-questions allow MS. (b) George (2011), following Heim 1994), claims that the matrix verb *know* selects for MA, but (c) overt existential modals/non-finite clauses with covert modals allow MS (Bhatt 1999; George 2011; Fox 2014; Nicolae 2014; Xiang 2016; Dayal 2016).

    **Account 2** claims that MS requires special licensing by ***contextual goals*** (Groenendijk & Stokhoff 1982, 1984). Thus, the MS reading is available in (2) but should also be allowed with (1).

    Recent semantic theories within Account 1 have focused almost exclusively on the contribution of modals to licensing MS readings (Fox 2014, Nicolae 2014, Xiang 2016). Such Modal Theories derive MS grammatically via scope interaction, and thus predict that the modal is necessary for MS. Xiang's semantics further predicts that modal questions are obligatorily Mention-One (MO) and not just MS. In contrast, Pragmatic Theories (Ginzburg 1995; Asher & Lascarides 1998; Beck & Rullmann 1999; van Rooij 2003, 2004; George 2011 Ch.2) predict that MS should be allowed in any embedded clause (*via* grammatical ambiguity or underspecification), modulo contextual licensing and verb selectional restrictions (Grimshaw 1979). Van Rooij further predicts that since MA is maximally informative, MS will never be more acceptable than MA.

**The goal of this research is to gather systematic empirical evidence to adjudicate between these two theories, and thus to account for the readings permitted by questions.**

We target the three main surface variables identified above (*wh* word, matrix verb, modal/finiteness) and contextual goals in order to identify the division of labor between semantics and pragmatics in licensing the various readings of embedded questions.

**Experiment 1** (an acceptability judgement task) fully crosses *Answer* (Mention-Some (MS), Mention-All (MA), Mention-False (MF) (answers that are unequivocally false)), with embedded *Question Form* (±Finiteness (presence/absence of covert modal), Verb (*know*, *predict*), *wh* word (*who*, *where*)). Participants were given a series of contexts in which someone (X) posed a question (e.g., *Jane is going to be in the neighborhood tomorrow. She loves cappuccinos, and texts Mary to ask where to get a cappuccino.*), and someone else (Y) answered them (*Answer*) (e.g., *Mary responds, "D."*), based on information provided (e.g., *The places that serve cappuccinos around the neighborhood are A, B, C, and D. E, and F do not. Mary usually gets her cappuccino at D.*). X then reported on what Y knows with an embedded question (*Question Form*) (e.g., *Mary knows where to find cappuccinos*). Participants (n=232) were asked to judge the truth of this report based on the context. The main question was the effect of question form on MS answers.

Results are in **Figure 1**. They reveal a significant effect of Finiteness ($p<.0001$), and a Finiteness x Verb Interaction ($p<.0001$). While -FIN clauses do increase MS acceptability, +FIN clauses allow MS answers, and the ±FIN difference is driven by *know* as an embedding verb. MS is acceptable in +FIN (non-modal) *predict-wh*.
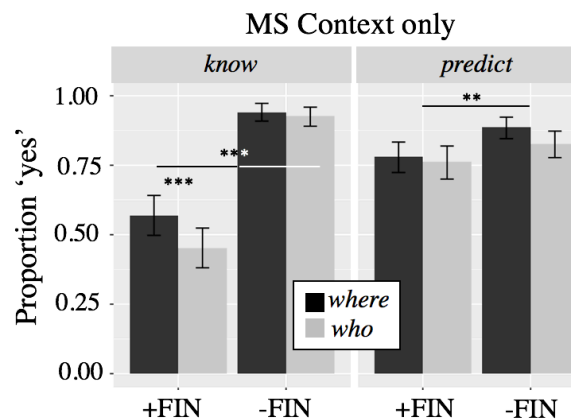


**Figure 1**. Experiment 1 results

**Experiment 2** focuses on the manipulation of contextual goals, at the same time as it tests the predictions of Xiang (MS is only MO, and not MS) and van Rooij (MS is never more acceptable than MA). It crosses contextual "Stakes" (High, Low), Finiteness (±), Answer (MS, MO, MA), and (to get at MS/MO status) level of Informativity (Max, Min). We operationalized Stakes as whether or not lives were at risk (e.g., food contamination, fires, bomb plots vs. coffee spots, restaurants, yoga studios). Participants were shown multiple answers (MA, MS, MO), which varied by Informativity (manipulated by ranking/frequency). (3) presents a sample High Stakes context.

(3) A local apartment building has caught on fire. The fire department has been called, and firefighters are currently on their way. The landlord has a list showing the number of tenants on each floor. **The floors are ordered by how many tenants each one has**:
Floor A has 20 residents, the Floor B has 16 residents, then Floor C has 10, Floor D has 4, Floor E has 2, and Floor F is empty.
The fire chief is deciding where to send his firefighters, because there are people trapped but they don't know on which floors. He asks his firefighters, "Where should we go to find the trapped people?"
Firefighter A answers, "Floors A, B, C, D." [MA], Firefighter B answers, "Floor A" [MO-Max], Firefighter C answers, "Floors A and B" [MS-Max].

Participants (n=318) were asked to respond to the embedded question prompt, *Who knows where to look for the trapped people?" (choose all that apply)*. Results are shown in **Figure 2**. There was a Stakes X Answer Interaction in +FIN ($p<.0001$) whereby MA is *more* acceptable than MO-MAX in High-Stakes ($p<.01$), but *less* than MS in Low-Stakes ($p<.0001$). There was also a significant difference between MAX vs. MIN Answers ($p>.0001$) showing that the type of MS/MO answer matters. Contra Xiang, there was no difference between MO-/MS-MAX or MS-MAX/M, and MS was as acceptable as MO in Low Stakes, and as acceptable as MA in High Stakes. Contra van Rooij, MO-MAX was *more* acceptable than MA in Low Stakes.

**CONCLUSIONS**. Experiment 1 confirmed that a non-finite clause greatly increases MS felicity with *know*, but less so with *predict*. This suggests verb restrictions on MS, but does not support a stronger claim that the modal is necessary for it. Experiment 2 showed that explicitly manipulated aspects of the discourse context can override question form constraints. Finally, the lack of difference between MS/MO in Low, and MS/MA in High Stakes suggests that participants calculate a "mention-enough" threshold. While all theories require contextual licensing for disambiguation, scope or precisification, our data provides support for a proposal that questions have an underspecified semantics. The form of a question does not dictate what readings *must be allowed*, along the lines of semantic theories, but rather, which ones *can be allowed*, along the lines of a pragmatic approach.
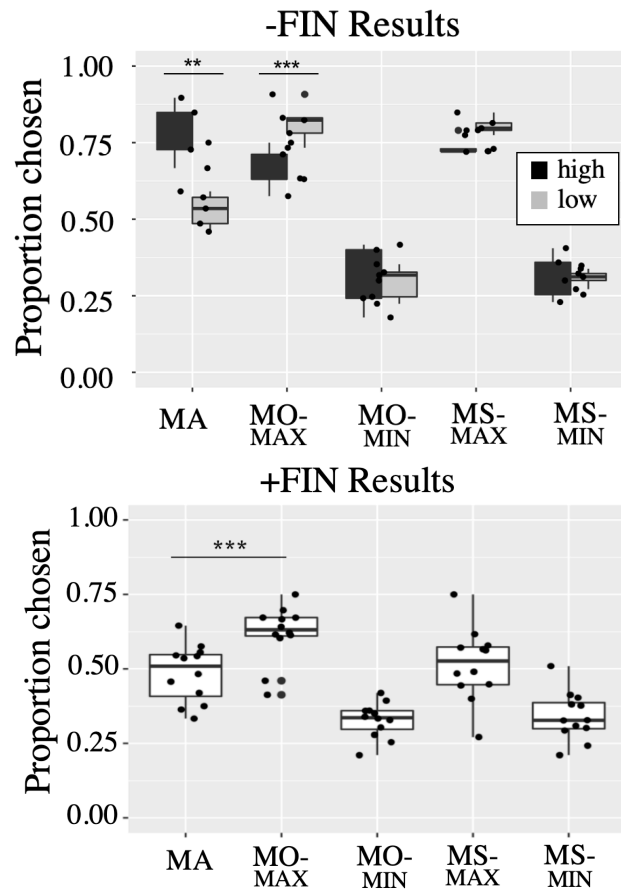


**Figure 2**: Experiment 2 Results. +FIN questions appeared only in Low stakes.