RHIC | USERS' EXECUTIVE COMMITTEE

RHIC Diversity Update and Field-wide Conference Gender Diversity Statistics Analysis

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RHIC

U.S. DEPARTMENT OF ENERGY

RHIC Diversity Working Group

- RHIC UEC Diversity Working Group
  - Started in ~2015
  - website https://rhicdiversity.blogspot.com
  - Several workshops/events at the AUM's: the message of many we have problems with diversity and equity in Physics. It's a continual battle.
  - Traditionally we've been a little more focused on Women in Physics, but that is changing as it is in the whole field due to the Black Lives Matter movement

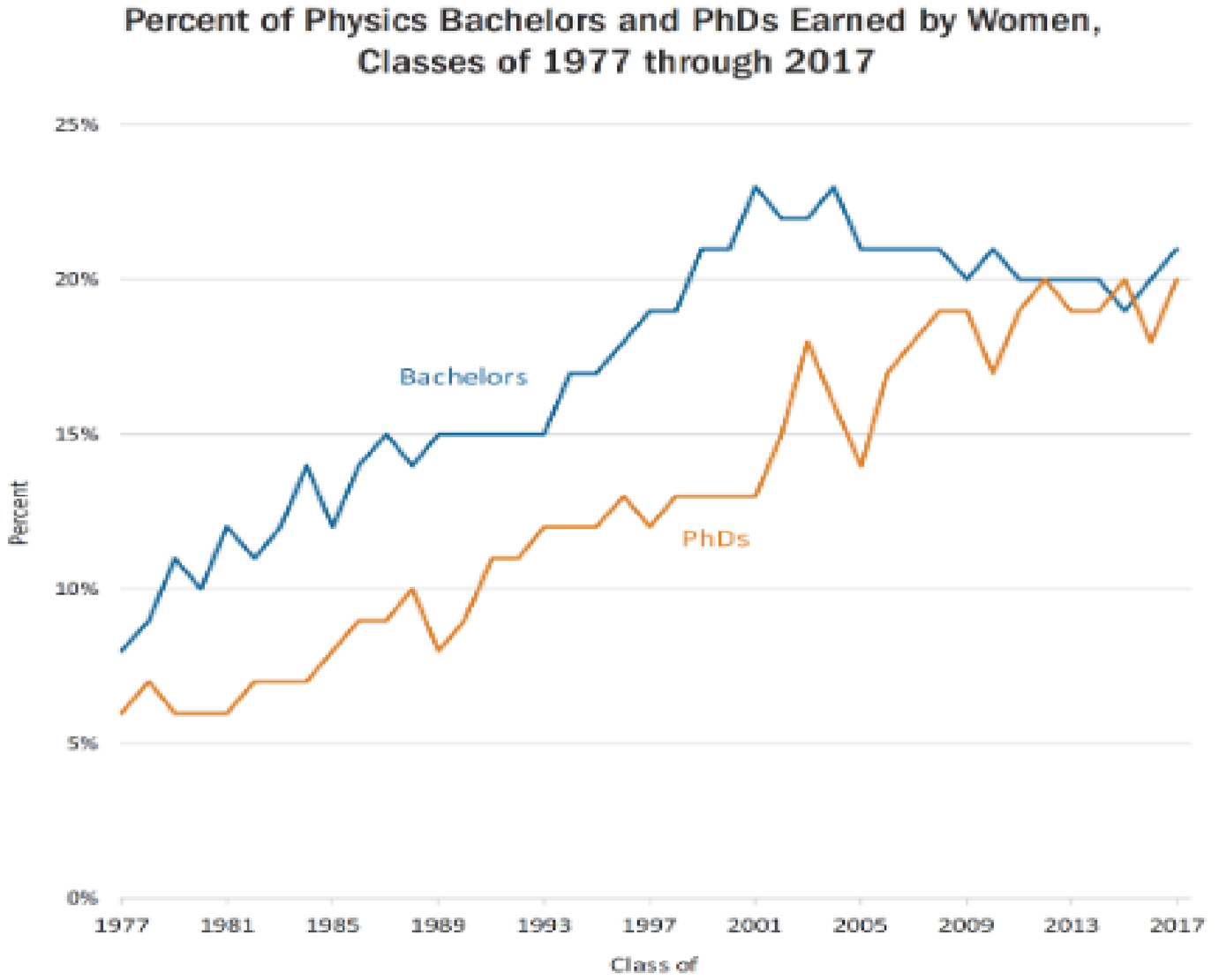
- One of our goals/early ideas have always been to collect and distribute Diversity and Equity statistics of all kinds

- Today I want to tell you about one such analysis which will be our first public contribution to these ideas… regarding Women in Physics and Gender Equity

Example of Global Women in Physics Statistics

- Good news: it has been increasing
- Lately leveling off

- https://www.aip.org/statistics/reports/women-physics-and-astronomy-2019



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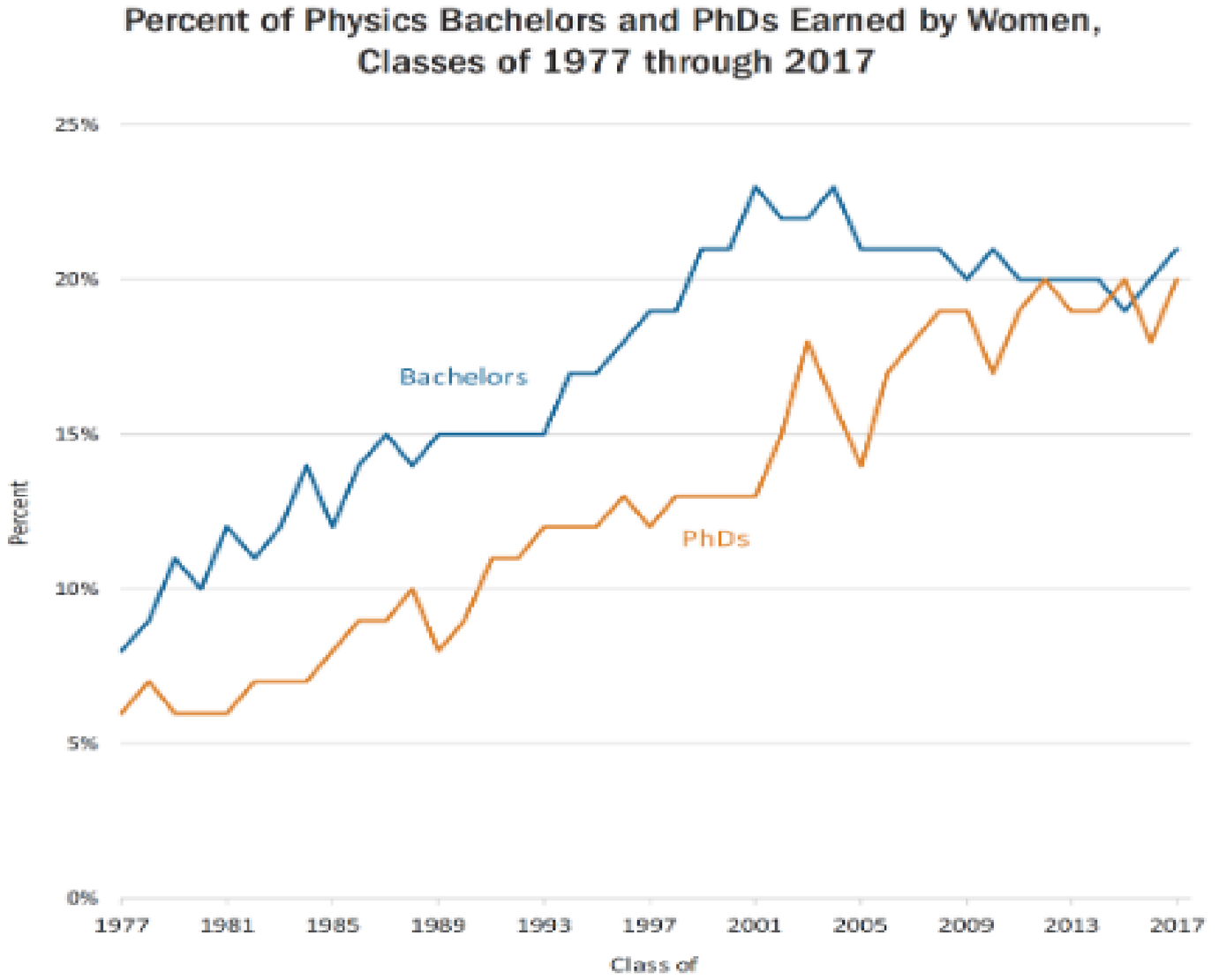


Intro to Conference Gender Statistics project

- At the end of 2019 a group of individuals many of whom participate in the RHIC DWG collected and analyzed data on the number speakers in various gender and other categorizations for a large number of Relativistic Heavy Ion conferences
- Main data taken from the publically available conference websites for the following conferences
  - **Quark Matter (QM)** Strange Quark Matter (QM) Hard Probes (HP) (since 2016)
  - Hot Quarks (HQ) Initial Stages (IS) Corr POD (CPOD)
- Years Analyzed started in 2011 (All QM's since) : Excluding HP20
  - Plenary speakers for all except HQ, since HQ does not have plenary speakers
  - SQM17 +SQM19 still include all speakers
- **20 Conferences ~2500 Unique Speakers >1000 talks (lots of data to sort!!!)**
- Identification of gender of speakers done by analyzers--could not always be made unambiguously
  - even with UEC wide help

Why Conferences? Theory vs Experiment

- Conference talks are one of the most important ways to be recognized and also are the most visible reflection of the make-up of our community

- An important role of the UEC is to advocate for theorists who often don't have the infrastructure of our large experimental collaborations
  - Our DWG has looked into a number of other sources for estimating some diversity statistics --conference offer reliable theorist identification, many other practical advantages (data!)

- Because of this difference, an important part of the analysis involved separating theory from experimental speaker statistics

Caveats for Data Shown Today

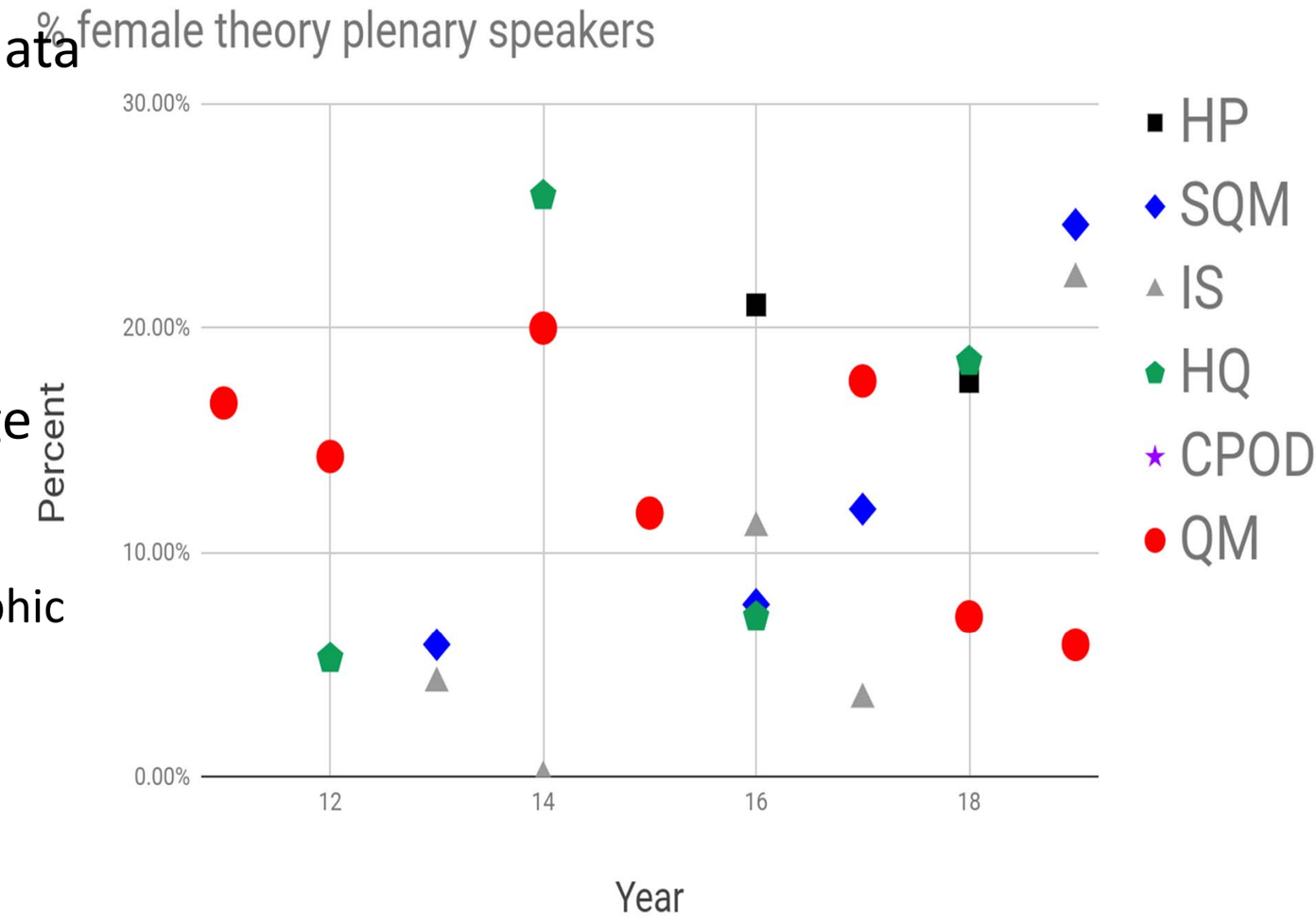
- Data collection/determination is fairly stable (may add e.g. HP20) but current interpretations ARE still PRELIMINARY so….
- Note: the analysis still has more work to be finished. It's not quite published yet. It will be published on our websites at rhicdiversity.blogspot.com : Initial Draft can be found here:
  - http://www.phy.ohio.edu/~frantz/conference_stats_test/

- Plenty is obvious enough to already start some discussions about this
- Initial findings indicate data like this should be looked at regularly

- **Please keep in mind:**
  - **1) my goal is to present the data and interpret it from the standpoint MINIMALLY of "even if the data doesn't necessarily support an interpretation CONCLUSIVELY, does it at least justify taking a closer look at causes, and in many cases should it justify keeping an eye on these statistics in the future." And that's really the main conclusion we are mostly trying to make.**
  - **2) It might seem like at points the interpretations are "accusatory" like " this or that Organizing Committees didn't do their job properly" -- we are not assuming this is the case– for example there could be other reasons, out of the organizers' controls why some of the statistics look a little off– but my/our point is regardless of the reason behind it, if the data in those cases is indicating an anomaly this needs looked into as to the causes, so we can as a field fix the problem if there is one.**

An Initial Example

- The plot shows an example of the kind of data analyzed.
  - will come back to this plot
- Particular focus on Quark Matter
- Many comparisons possible
- Ambitious to try to draw trends from a large variety of conference types
  - Hot Quarks aimed at younger participants
  - Nice to be able to compare different demographic aims in conferences
- Several major trends looking across many different kinds of this data



Main Preliminary Findings to Share Today

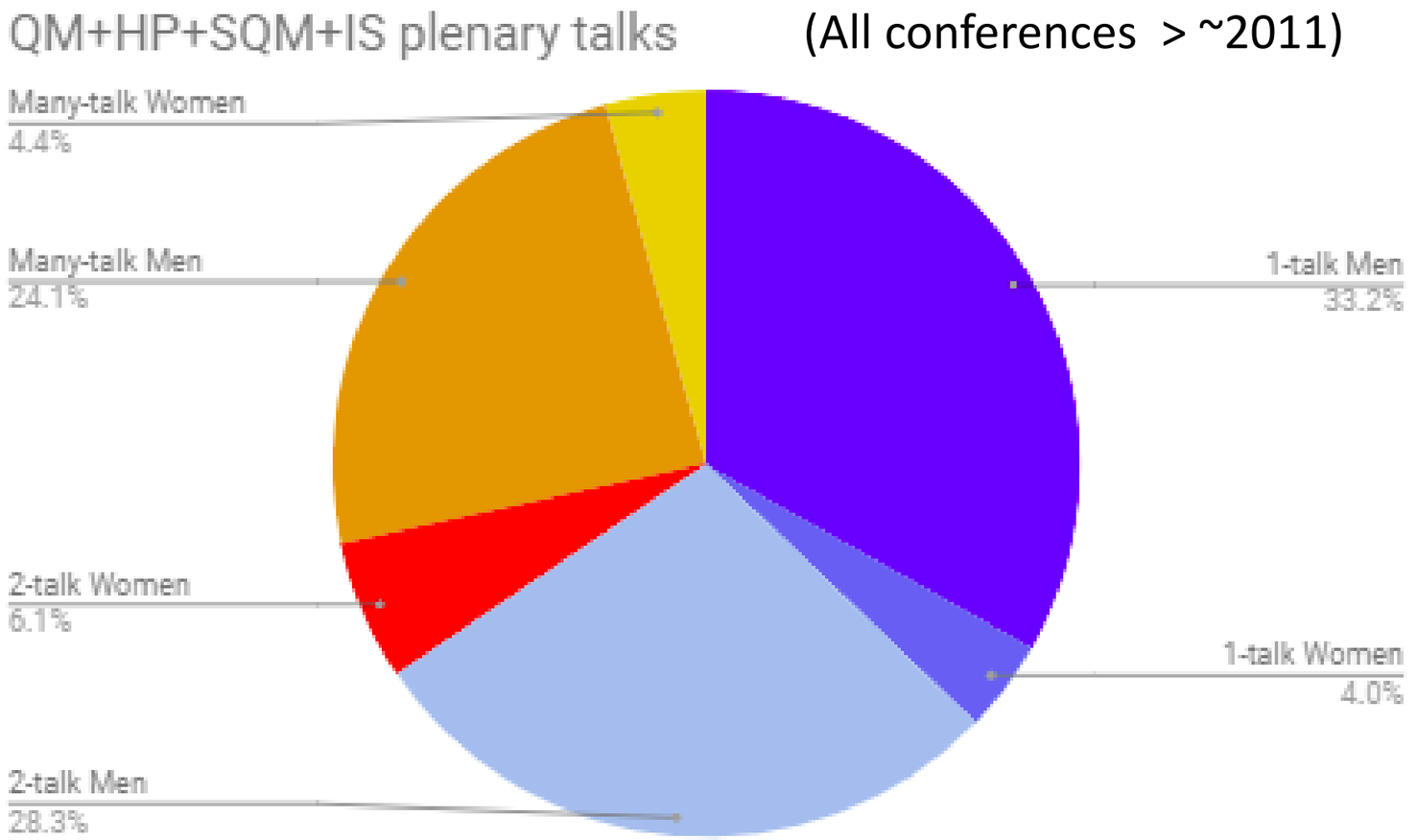
- There are two preliminary findings
- **1)The data seem to indicate that a large numbers of talks given by potentially disproportionately small number of speakers (repeats)**
- **2) The data seem to indicate problematically low fluctuations across many conferences in gender diversity of speakers**
- Other indications:
  - there is probably a sizable untapped pool of female speakers
  - the percentage of female theorists in the field appears to be increasing and a new larger such percentage should likely be used in determining how to judge whether low fluctuations

Part 1) Small Numbers of Speakers for Large Numbers of Big Talks

1) Small #’s of Speakers for Big Talks

- Looking at a few of the conferences/talks considered most prestigious a clear trend of repeat speakers was apparent
- Of ~700 plenary talks, ~1/3 of them (200 talks) were given by **58** speakers total.
- 2/3 of them were given by 176 speakers
- If we estimate 1500 eligible speakers in the field this is sampling only a ~10 percent of the fields’ views
- These numbers and even the philosophical legitimacy though perhaps arguable, already warrant consideration by speakers bureaus/conference organizers

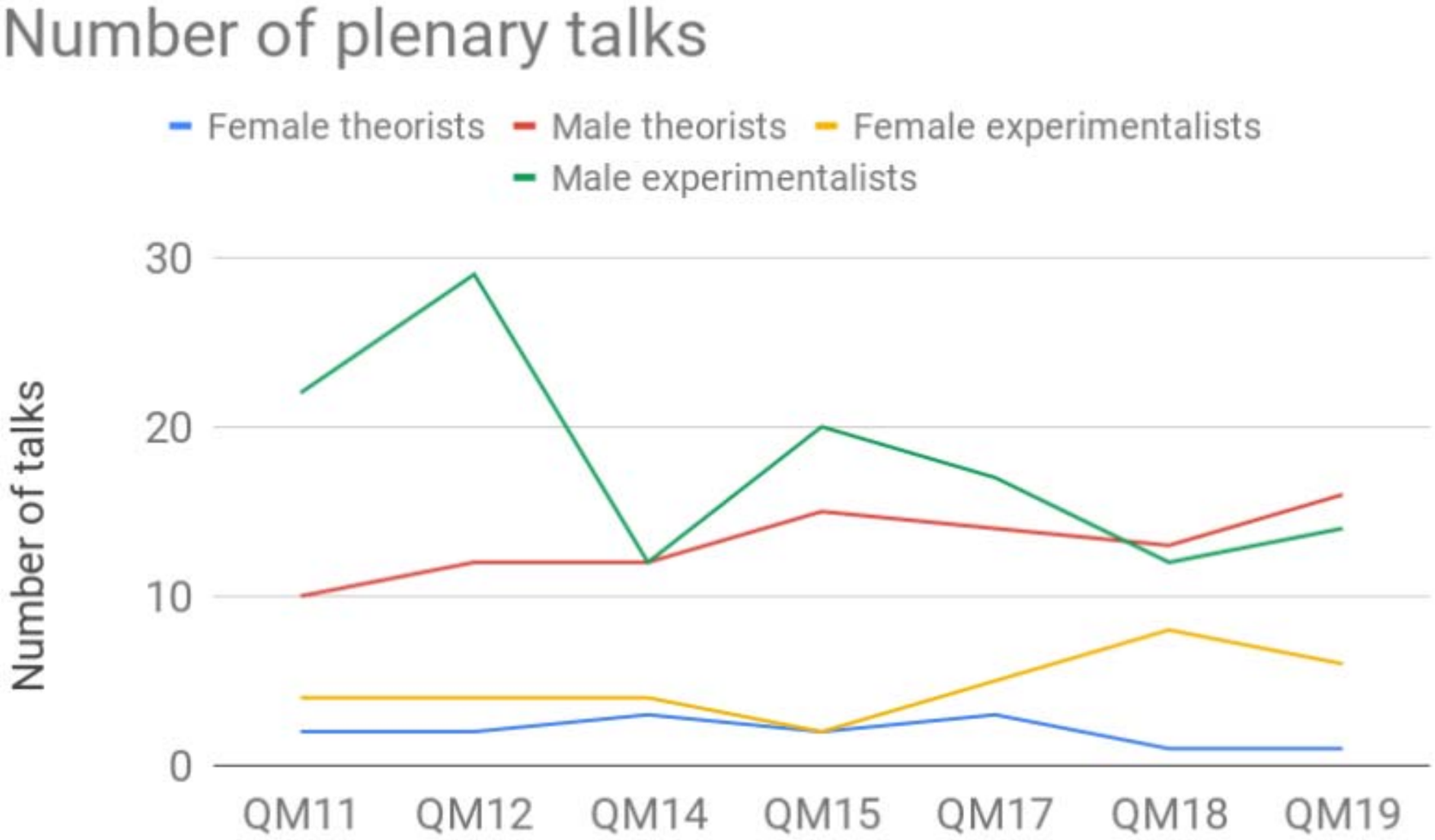
The Gender Divisions on this slide are not relevant yet



Many talk = 3 or more here

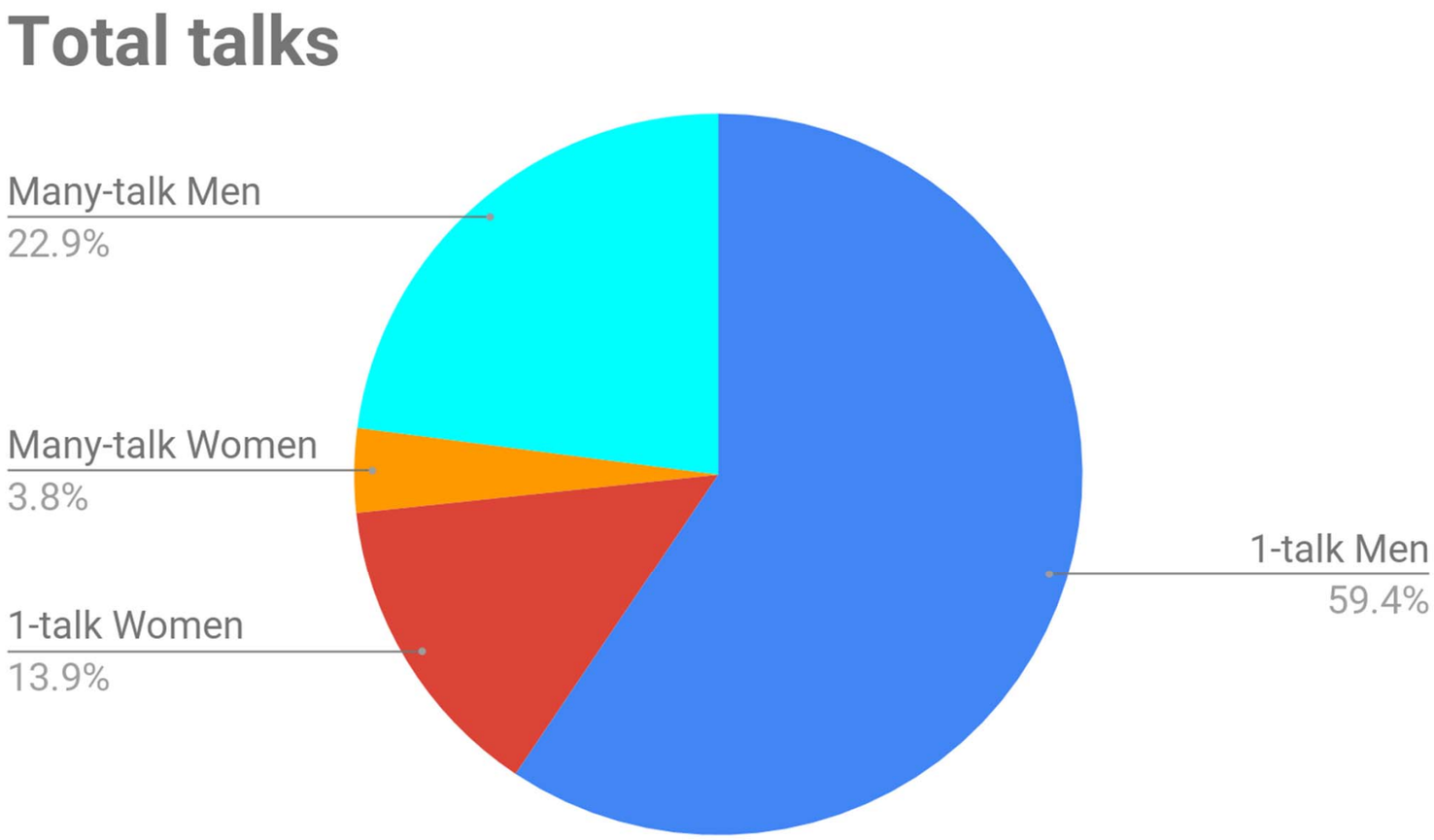
Quark Matter - only

For comparing to Quark Matter-only, there are obviously many less overall plenary talks



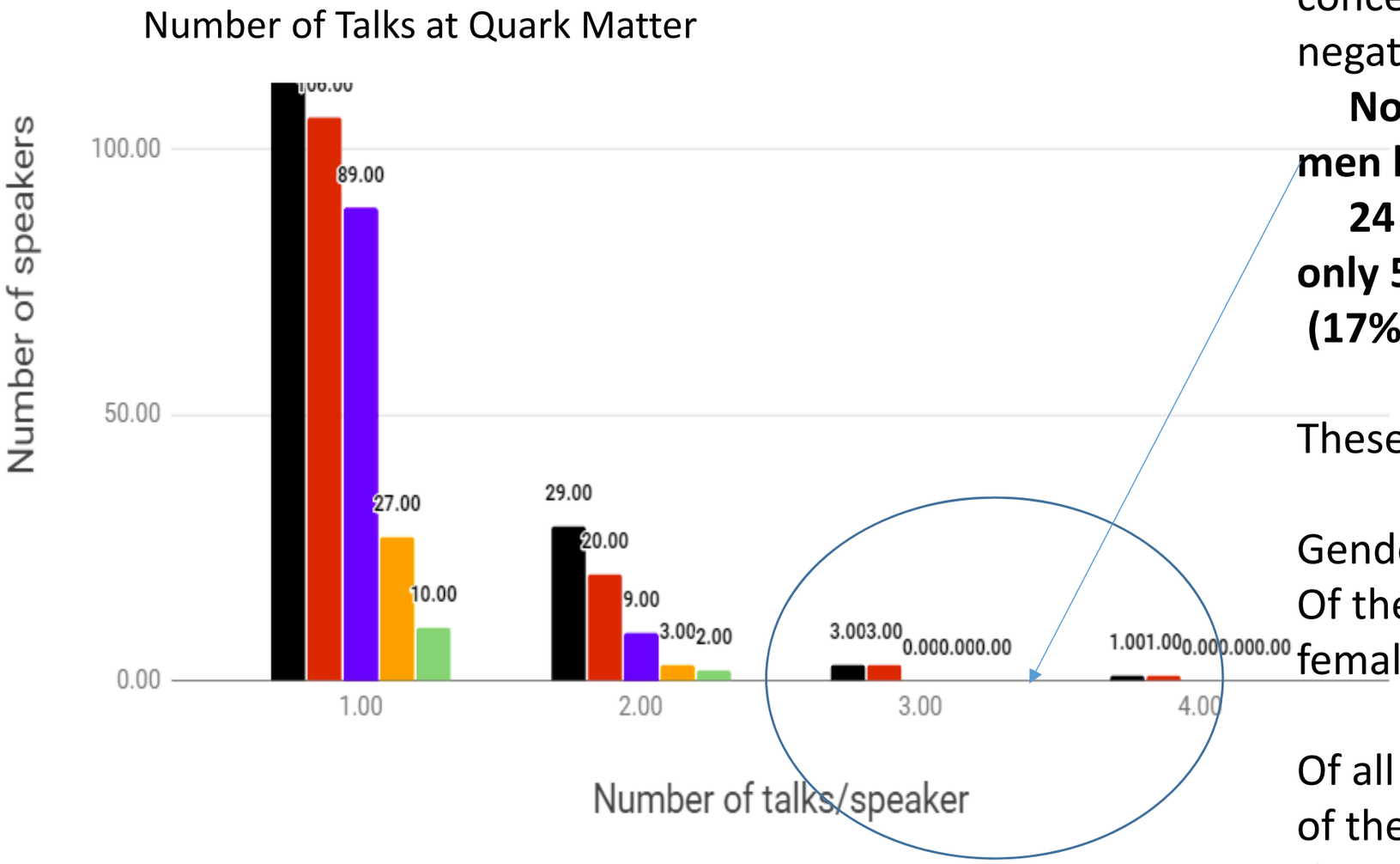
Similar Distribution of Many talks for Repeat Speakers in QM

- Scaling by the lower number of total talks, the distribution of large number of talks by small number of speakers MAY be similar in QM (Reminder since QM11)
- 1-talk fractions similar fractions to <= 2 talk totals for all conferences
- Can't really say it's problematic in the same way though since 1 talk per speaker is ideal.
- QM Many-talk fractions similar to Many talk fractions all conferences
- QM has IAC with many members staying constant--better possibility of "watching" stats like this



Many-talk = 2 or more here

Quark Matter plenary N_{talk} Distribution



Quark Matter data specifically show concerning trends in other ways that likely are negatively affecting our gender diversity goals

No woman given >= 3 QM talks while 4 men have (over 7 years!)

24 men have given 2 Plenary talks, while only 5 women have (17% female)

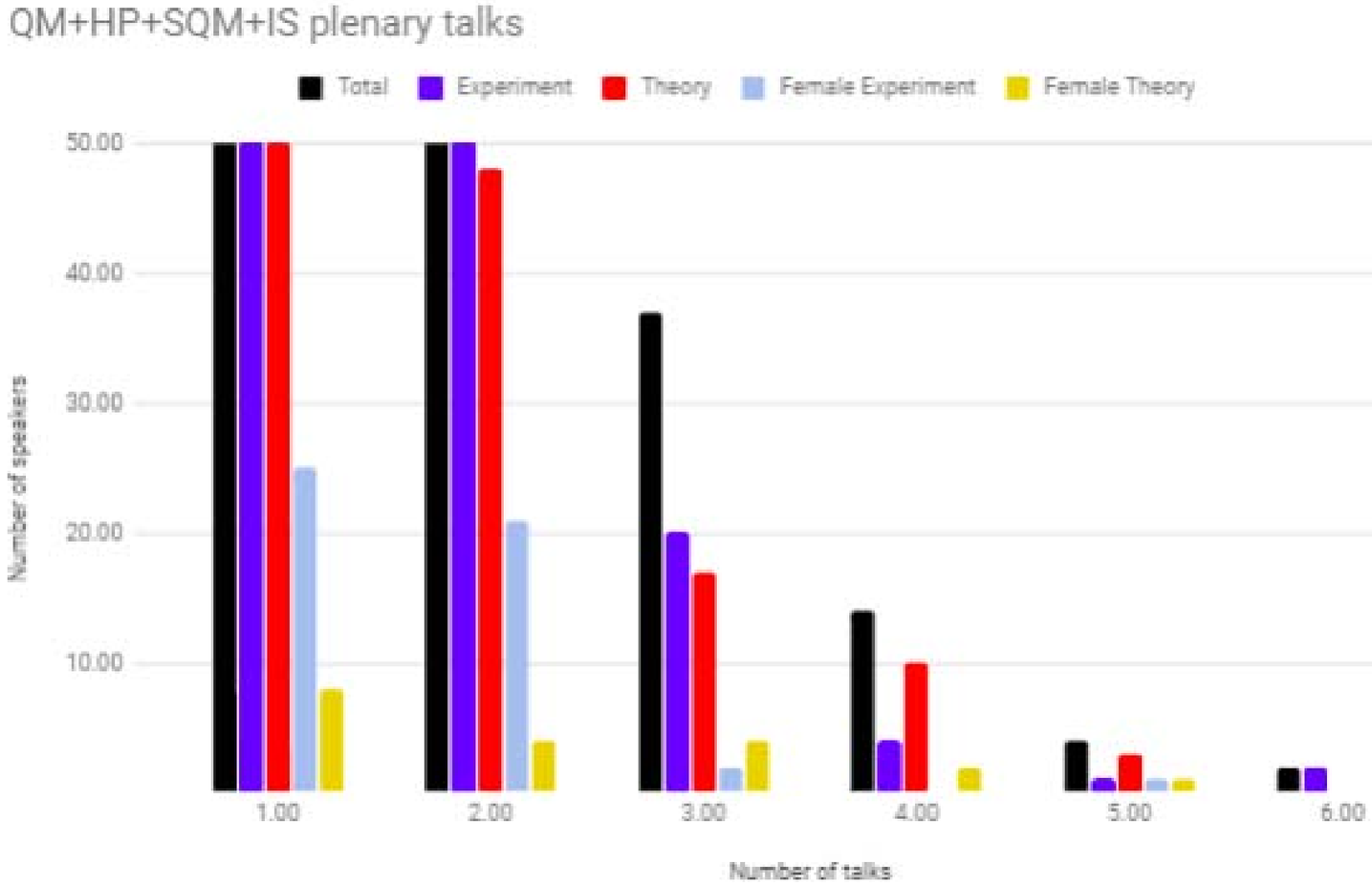
These are 71 of 260 plenaries (27%)

Gender effect worse in terms of N_{talks} :
Of these 71: 61 to 10 in favor of men (14% female)

Of all 14 talks given by 10 female theorists, 4 of them (28.5%) were given by female theorists who gave two talks each

N_{talks} Distribution for all conferences

More evidence of the disproportionate effect of this effect on Women in Physics



- Of 4 or more talks experimentalists
  6 were men 1 was a women (14%)
- (we'll see that this is pretty low considering the percentage of femail experimentalists)
- Total 4 or more talks people
  20 men 4 women
- There were 40 men >= 3; 10 women
- 20 men 4

Quark Matter Fractions Theory vs Experiment

Experimental-only fraction in QM is similar to ALL conf's and Total (summing men and women)

Theory is more different?

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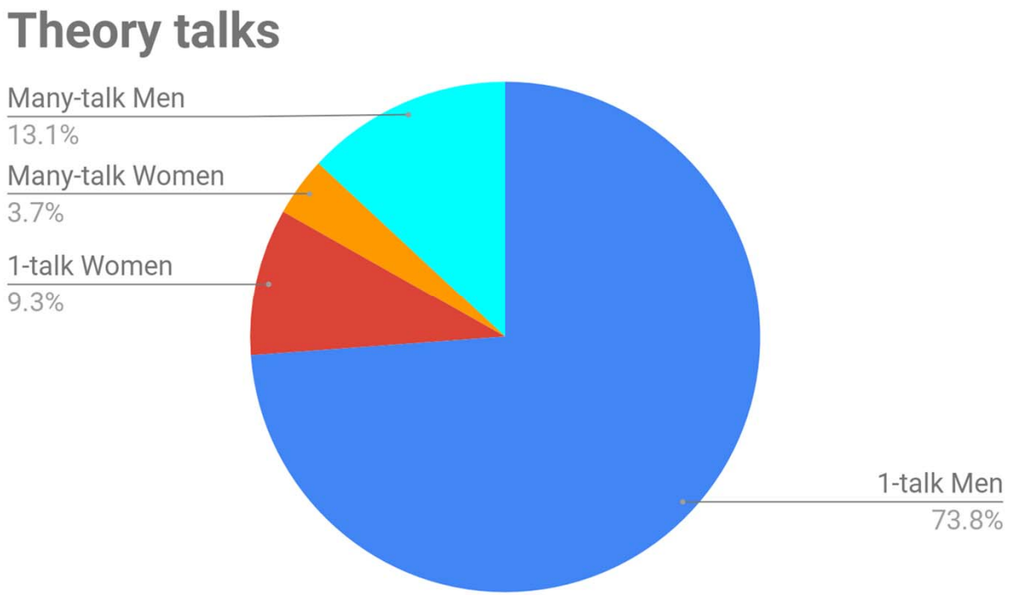
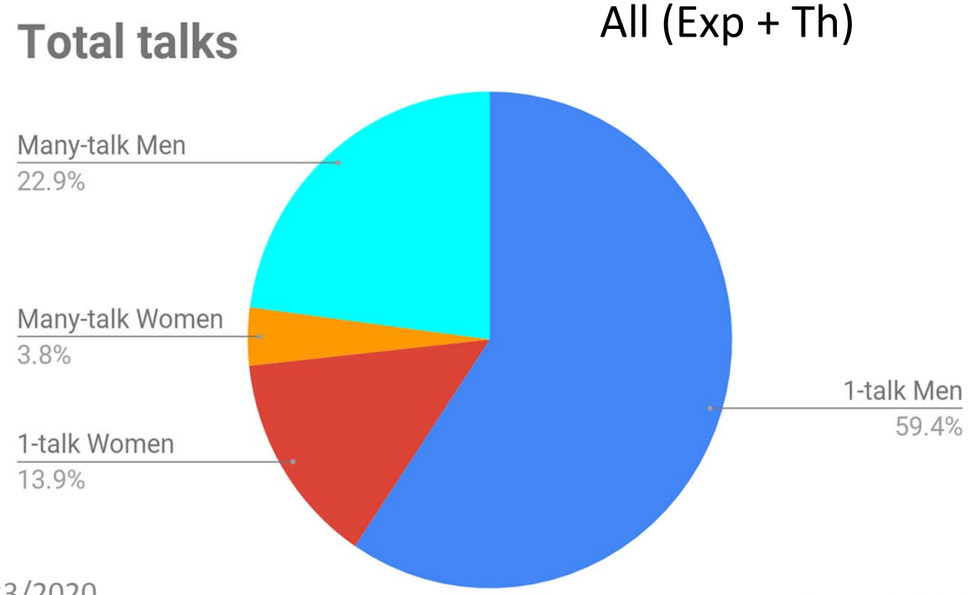
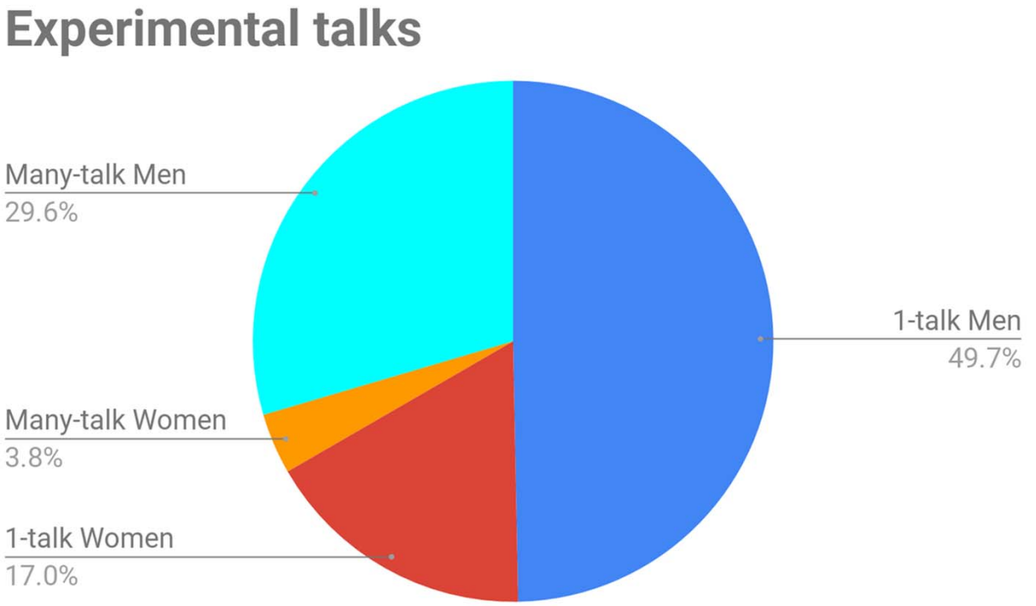


All (Exp + Th)

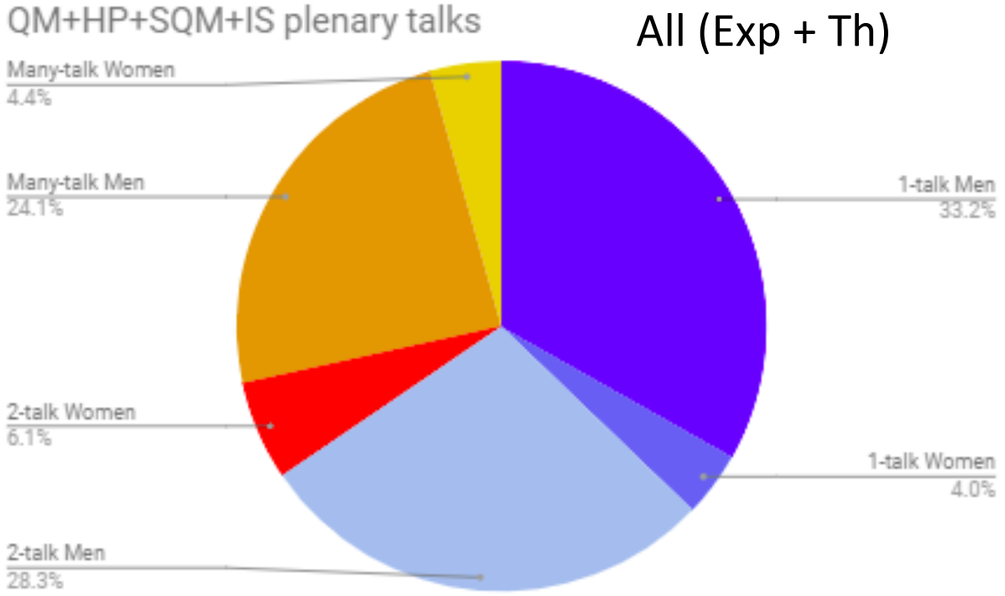




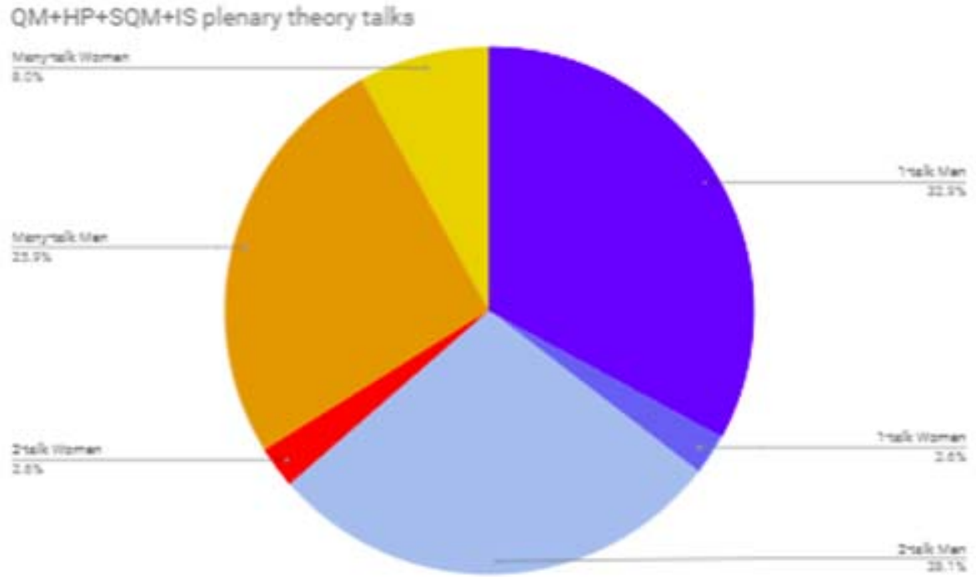
All conference Plenaries Theory vs Experiment

- Now experiment looks different
- One point then: Experiment and Theory are different on this --- presumably due to speakers bureaus.
- Comparing this one to the QM only could possibly reveal whether there is an effect of once a speaker is giving multiple talks at one conference, they are more likely to give multiples in others.

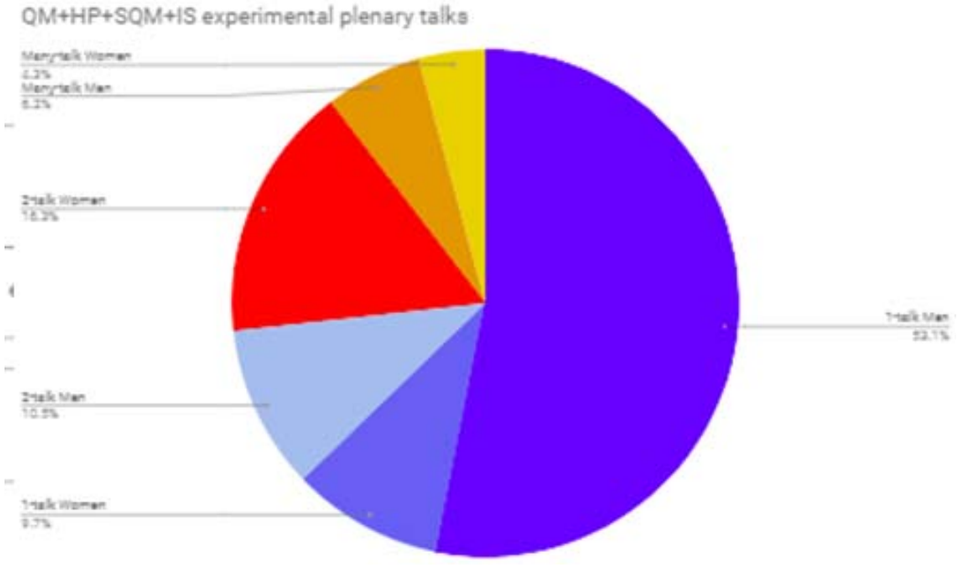
All (Exp + Th)



Theory



Experiment



Conclusion on N_{talks} and What to Do?

- Also it's not just a problem of particular speakers: small number of *institutions* give a disproportionate number of plenary talks. For QM in particular, these institutions also have disproportionate representation on the IAC.
- All this data taken together in our view, at least indicates that if we want to improve diversity and equity, we should treating this point more carefully
  - Not to mention the other benefits to the basic diversity of viewpoints
- **What to do? WILL ADDRESS MORE LATER**
- **Use a database to search for possible speakers ?**
  - **UEC DWG plans to make a rough list available – maintenance of this list?**
  - **HEP-Inspire Collect data and make it public**

Part 2) Low Fluctuations in Gender Representations at Conferences

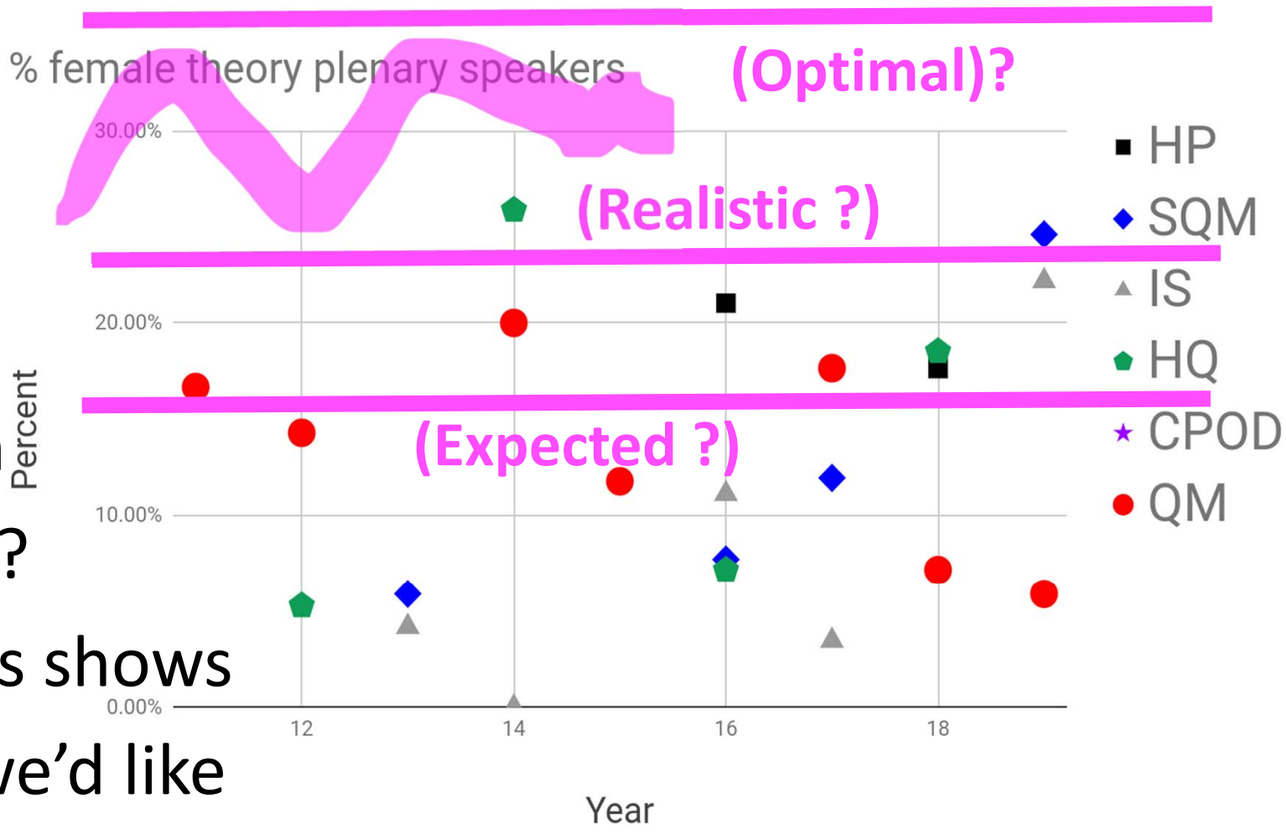
Part 2: Low Fluctuations in Gender Representation?

- The good news: many in the field are aware of gender diversity concerns and conference organizers are obviously making an attempt to be inclusive of women speakers
- Fluctuations are to be expected.
- Identifying situations as “low”

requires defining the expected or optimal rate of gender representation

- What is that for the plot on the right?
- In some areas like here initial analysis shows

we as a field are not doing as well as we’d like



Some problematic fluctuations are obvious

- In some cases we don't need to know where the line should be to see issues

	QM11	QM12	QM14	QM15	QM17	QM18	QM19
Female theorists	2	2	3	2	3	1	1
Male theorists	10	12	12	15	14	13	16
Female experimentalists	4	4	4	2	5	8	6
Male experimentalists	22	29	12	20	17	12	14
total	*38*	*47*	*31*	*39*	*39*	*34*	*37*

- This particular result raises the question of possible effects of variation of Local Organizing Committees (LOC) or possibly geography

How to define expected representation of women

AIP statistics indicate that in the US graduate students and post docs have been about 20-22% female for the last 15 years

Surveys of STAR and PHENIX indicate 20-22% Female. ALICE demographics several years ago: 20-25% depending on seniority/age

Sample of heavy ion physicists who received at least 1 talk at QM, HP, SQM, HQ, IS:
Theorists: 12.4% female Experimentalists: 20.3% female 5% unclassified T/E 12.4% unclassified as M/F

Sample from Hot Quarks Attendance (skews young, skews towards Europe & US):
Theorists: 14% female -(but 18%, last 3) Experimentalists: 25% female

Numbers based on conference presenters may also have a bias.

We therefore estimate that women comprised **15-18% of theorists and 20-25%** of experimentalists. The fraction of female theorists appears to be increasing. The fraction of female experimentalists may be increasing.

We should be shooting for much higher eventually…. optimal would be well above these rates -- what is realistic ? Change structures to redefine realistic?

Some other sources

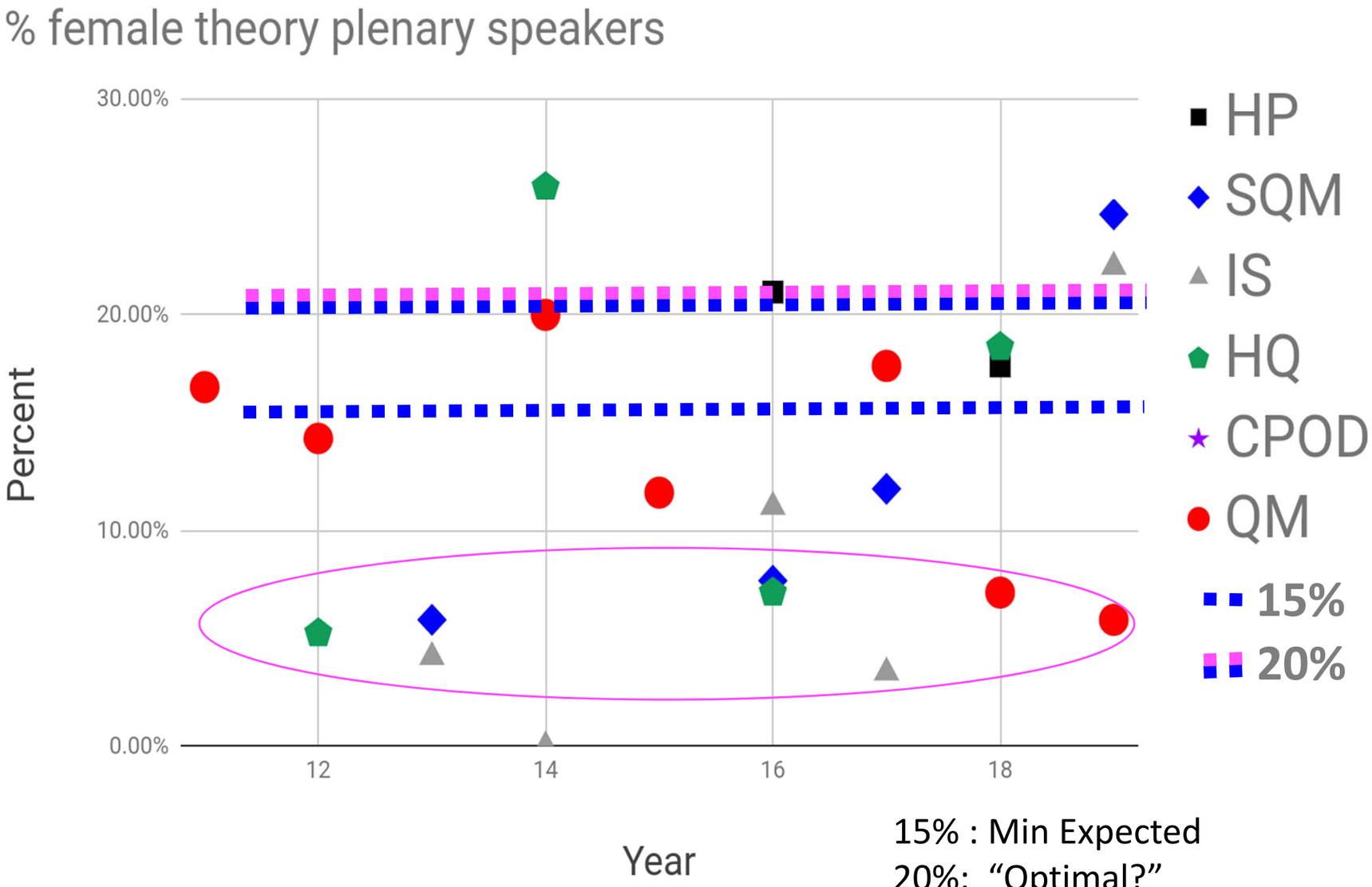
- **RHIC/AGS User's data:**
  - We've tried to use this data since the DWG was formed look at 2016-2017
  - Had a hard time: for example RHIC didn't reflect STAR/PHENIX, sort by career phase also looked skewed, theorists not separable
  - Obviously may not include many theorists
  - BNL Users office tried to help – addition of new fields on registration forms
- **Email Survey for Theorists ~2017-18:**
  - a few years ago to get at theory groups we just did an email survey (relying on self reporting—thanks to many who replied)
- In both cases we felt the results were not completely reliable, but they were fairly consistent with the numbers from the current conference analysis – provides a degree of confirmation of both sets of numbers – also not crazy different from AIP numbers
-

Sample from recent Jetscape school: Theorists 20% Female (up from ~16% this analysis)

This number has several cross checks making it especially reliable

Many Low Fluctuations in Theory

- First to Summarize--Theory All Conference look:
- Data shows majority (13 of 21) of conferences have female theory plenary fraction **below** expected, i.e. below fraction of female theorists in the field
  - Many EXTREMELY LOW
- Almost all conferences have low values compared to optimal percentage
- Doesn't necessarily mean in all cases it was the LOC's fault (they may have invited women)—but it still a problem we should try to rectify

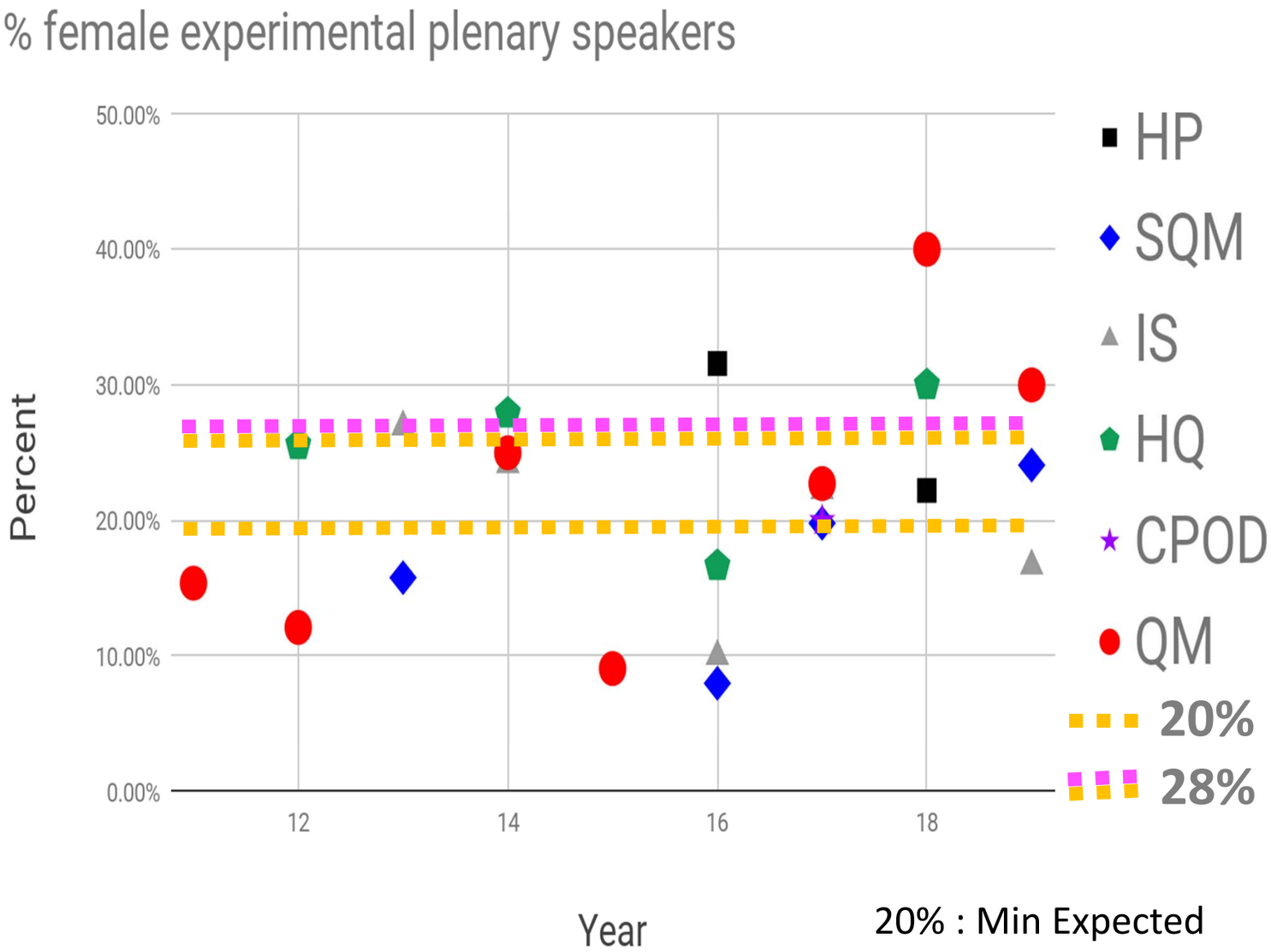


15% : Min Expected
20%: "Optimal?"

How about experiment?

- Experiment is different, less low fluctuations, less VERY low fluctuations
- Compared to expected rate (20% Female) about as many conferences with fractions above as below
- A repeating trend:
  - Experimental collaborations, speaker bureaus make a difference

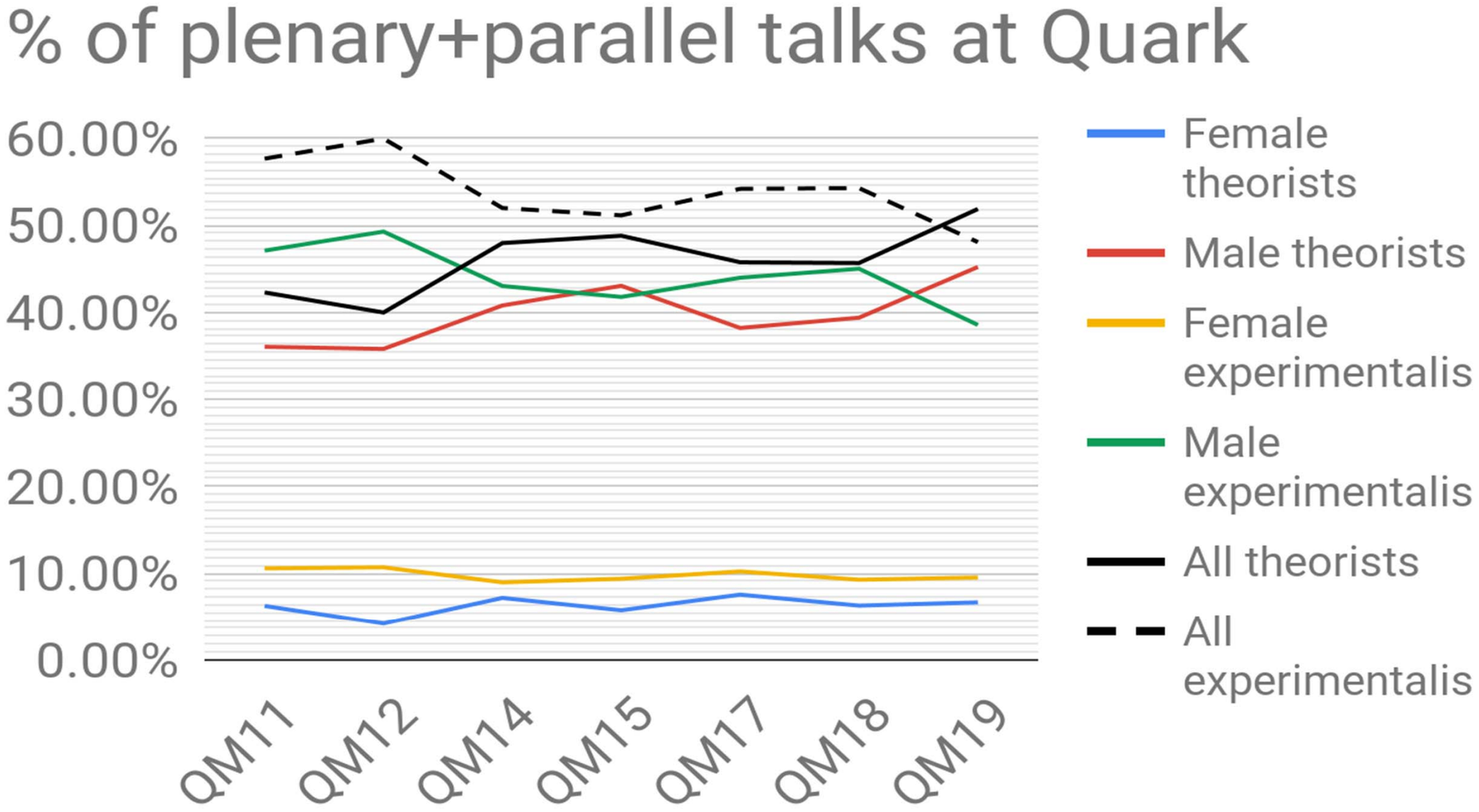
  (Collab speaker's bureaus generally are using databases to select speakers)
- A majority still lower than the more optimal percentage



20% : Min Expected
28%: Optimal

Quark Matter

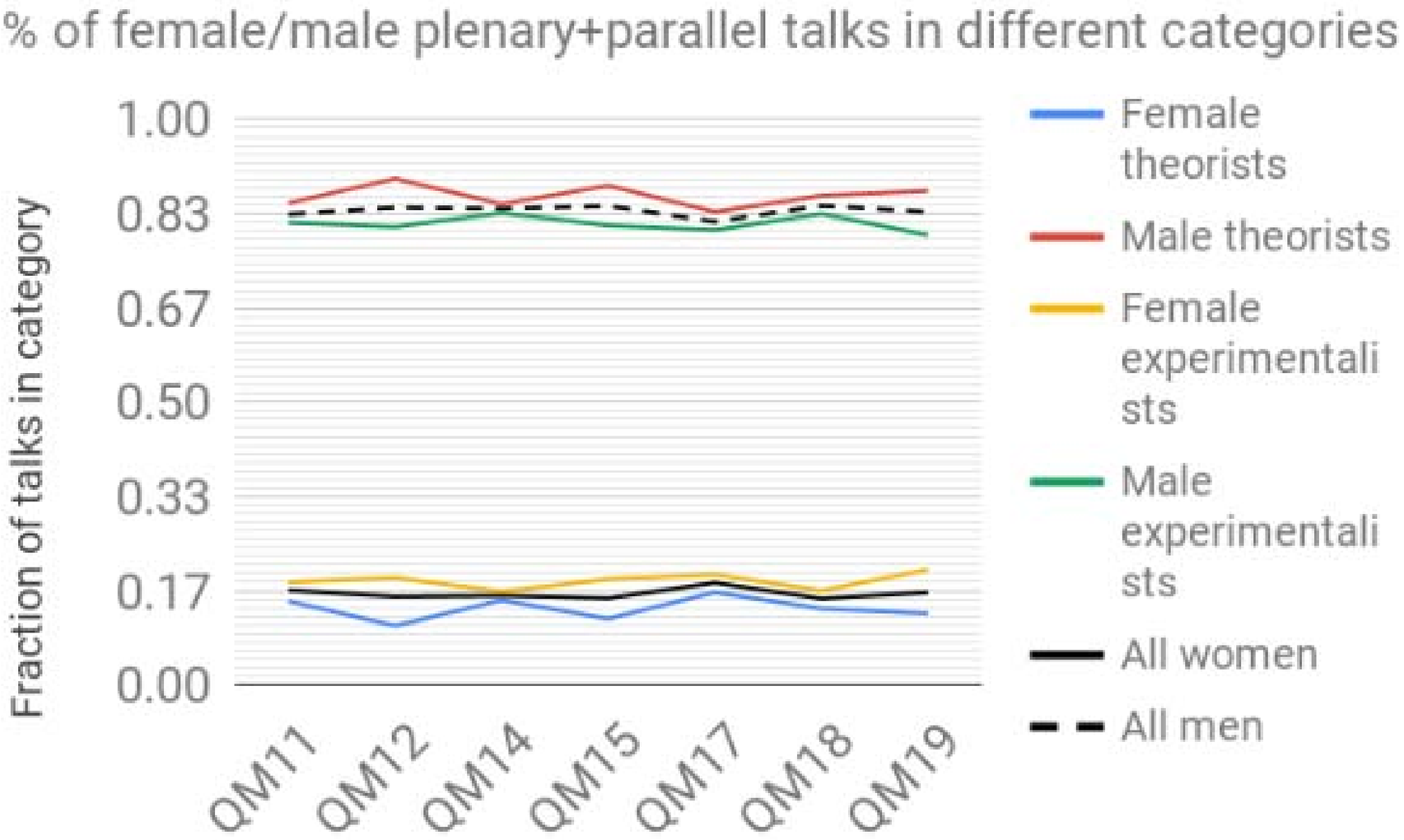
How about just focusing on Quark Matter. In this case we'll look at plenary + parallel



THESE ARE TOTAL FRACTIONS OF ALL TALKS

Quark Matter

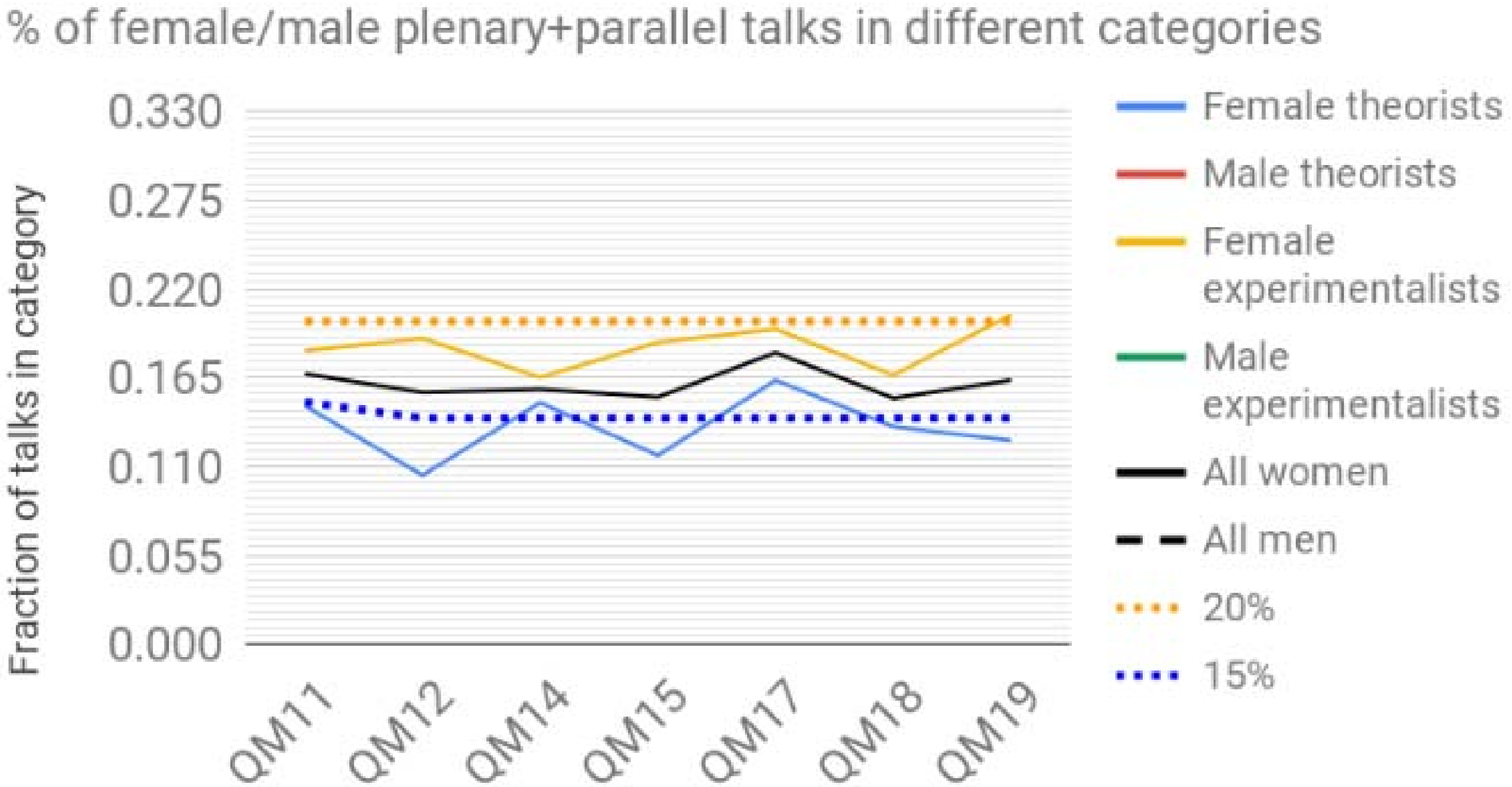
- Now divide Theory and Experiment



THESE ARE FRACTIONS WITHIN EACH CATEGORY THEORY VS EXPERIMENT

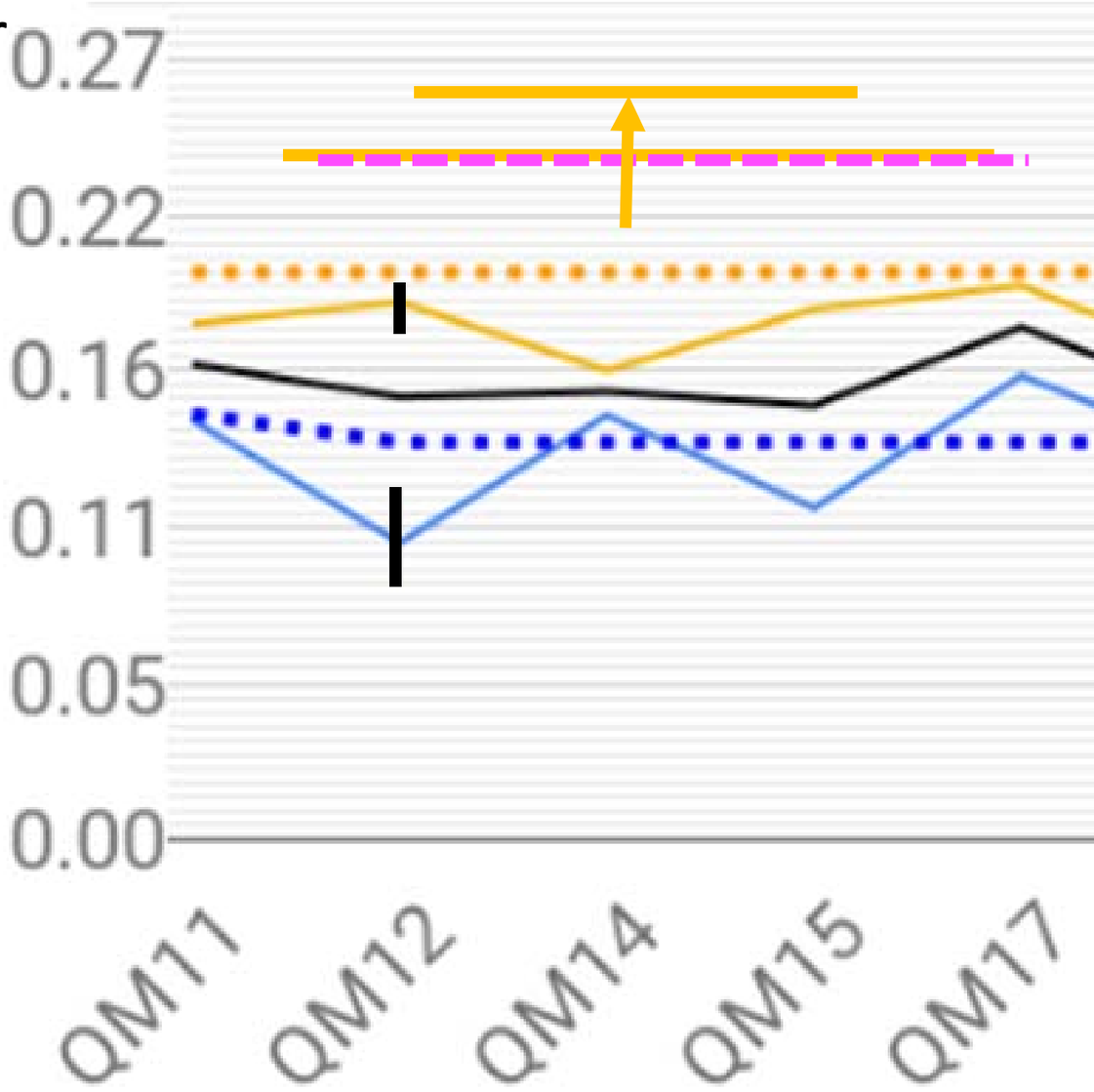
Closer up (Same plot zoomed)

- Zoomed in: Both Experimentalist and Theorist Female fractions most often or consistently below MINIMAL expectations for Theory/Exp



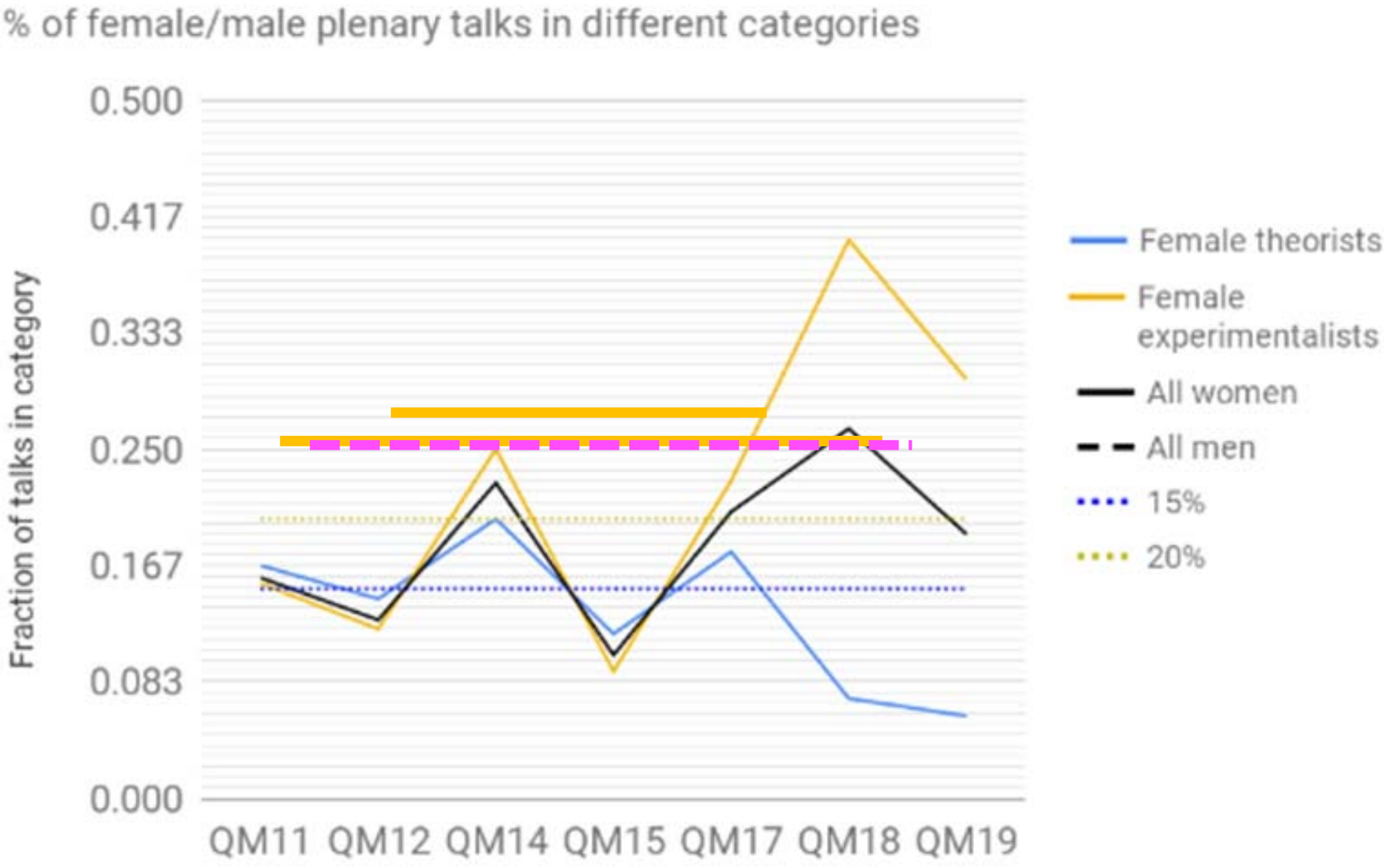
Uncertainties?

- You might be tempted to ask for statistical error bars on plots like this
  - Binomial errors? On this plot, for theory they are typically 0.02-0.035 “absolute” so sizable – avg all 7 ~0.01 ~Negligible for experimentalists
- The mostly-below trend transcends such statistics consideration anyway
  - These are NOT “unmonitored” random distributions– organizers can and should be imposing inclusion of women
    - assuming there is no lack of availability of high quality female speakers – we believe there is not any such lack
  - Even if they had natural fluctuations of order their binomial estimates: the lines are at the minimum of the range of the uncertainty on the expected rep. rate
  - …we should be shooting for something realistic but *higher* then even *upper* end of expected rate “bad” (yellow/pink dashed)
  - By that measure, they are unquestionably too low



QM Plenary

- Overall plenary talks more evenly distributed above and below minimal expectations
- But lower than high end of estimates/optimal
- Downward trend of female theory fraction
  - We think during this time the expected rate is increasing, not decreasing

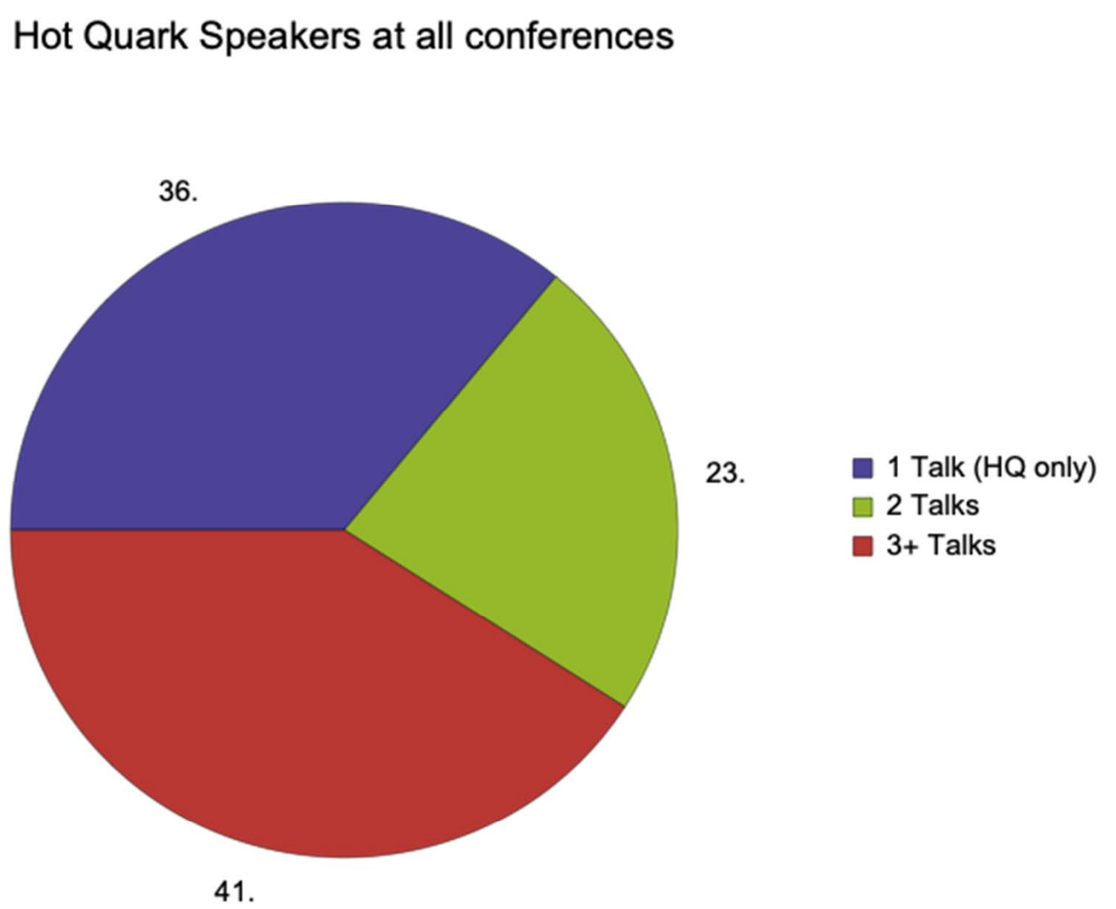


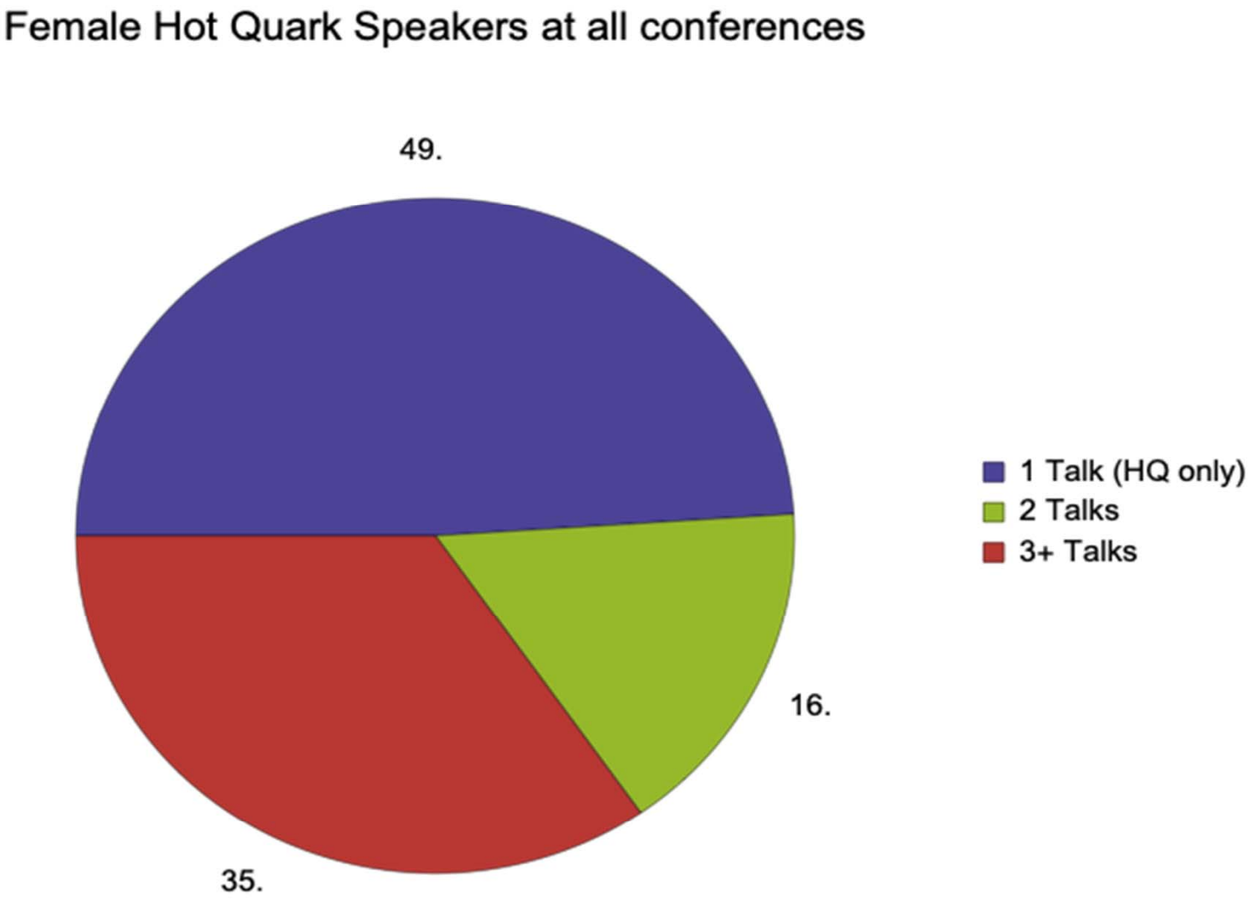
Higher Representation rates realistic?

- Gender representation at major conferences has been uneven, with women frequently underrepresented among speakers

- We also looked into whether this could be attributed to a lack of women speakers
- The following plots address that
- May also point to re-thinking what we define as “qualifications” for giving every high profile talk

Hot Quarks speakers with non-Hot Quark talks

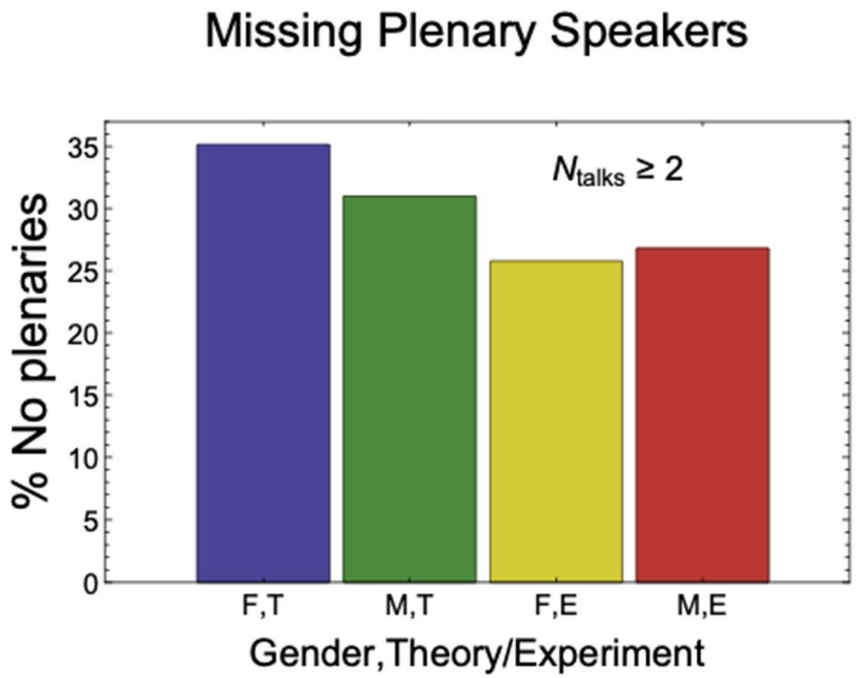


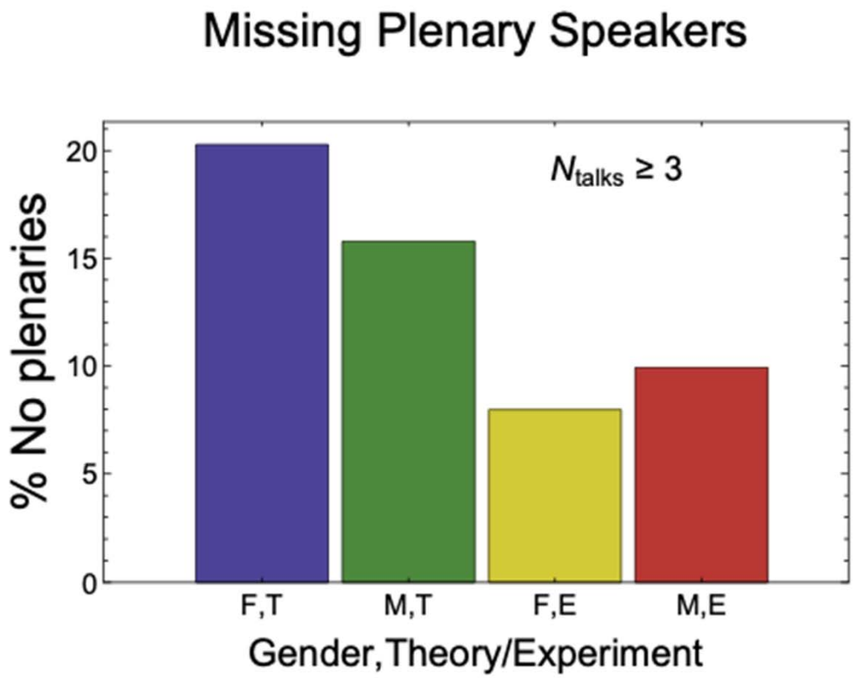


Many women only giving talks at Hot Quarks and not other conference. Untapped pool of women exists

JETSCAPE summer school numbers (20% Female Theory) also support that number of theorists is increasing and **higher going forward**

Missing potential plenary speakers?





- Here we look at the number of speakers with at least 2-3 talks at conferences who have not given a plenary talk in our studied time period. Total number of speakers with N talks without a plenary is: ~400 with 2+ talks, ~200 with 3+ talks and ~100 with 4+ talks
- As in other cases, effect of large collabs/speakers bureaus evident for experimentalists
  - Obviously it would be desirable also for theorists who don't have such infrastructures
  - How to address??

Some points summarized on Part 2

- The data indicates several signs that women are under represented compared to demographic expectations in the conferences in this study including some Quark Matter cases
  - May motivate looking into reasons
  - It may be a good thing to increase accountability of LOC or IAC on this
  - But just as important: justifies:
    - looking at these kind of statistics and continuing to look at them
    - reviewing and possibly modifying the way conference speakers are selected by organizers
- Another positive point is that for future such comparisons/directions it appears that a higher fraction of female theorists should be considered normal going forward.

Other things observed…common roots

- No female speaker has given the Quark Matter conference summary for 20+ years!
- Many experimental talks are overview talks for the collaboration. Female experimentalists appear to be less likely to be invited to give visionary talks than male experimentalists. Trying to quantify this

- Considerations like this, the two major observations previously discussed, and the likely-similar problems for other minoritized groups (African American, Latina/Latino, LGBTQ+, etc..) require a wholistic view across many conferences to catch and, likely, ongoing collection of these kinds of statistics.

Longer term solutions

- **Data Maintenance Solutions:**
- All these problems would be helped by using and recording data across conferences or years of the same conferences
- **Use a data base to search for possible speakers**
  - **UEC DWG plans to make a rough list**
  - **HEP-Inpsire Collect data and make it public**
- INSPIREhep.net New efforts from INSPIRE that can be used for this: E.g. Everyone adding “Inspire Seminars” would build up a database that can be used for this

- **Policy Solutions: Accountability**
- Have a public speaker policy
- Double-blind abstract submission
- Many good ideas stolen from PLoS Comput Biol 10(11): e1003903.

Longer Term Solutions

- **Other structural ideas to consider**
- Longer term structure for these major conference organization teams/IAC's?
- LOC picking new IAC → less reliable/consistent checks on the LOC.
- Standing committees for major conferences?
- Potential host Institutions/LOC's should include plan for equitable distribution of talks in conference hosting proposal?

Conclusions

- Active Diversity and Inclusion efforts by many in our field, but still more need to become involved
  - We need more people to be involved and a broader strategic approach for many inclusion and equity areas (e.g. African American representation, likely, a long-term culture change plan)
- Conference talk gender diversity and equity analysis: We hope this analysis can start some discussion, eventual improvement of consideration of these items by conference organization teams and committees
  - Large number of talks for small number of speakers
  - Low fluctuations in representation of women in conference talks in some areas
  - Untapped pool of Female speakers, especially for theorists (Jetscape and HQ)
- Accountability
- Long term collection of data like this, **also start doing it for other under-represented groups like** other minoritized groups (African American, Latina/Latino, LGBTQ+, etc..)
- **WE NEED HELP JOIN US!!!!**

https://rhicdiversity.blogspot.com

Backups

JetScape Numbers

- Here are the numbers for female theorists:

1. Using only people who self-identified: 23% female (N=66)
2. Attempting to identify people: 19% female (N=101, Unidentified participants, some of whom may be theorists: 7)

- Only students and post docs: 20% (N=76, Note research scientists excluded, Unidentified participants, some of whom may be theorists: 4) If we assume these four unidentified people are all either male or female theorists, we get a range of 19-24% female

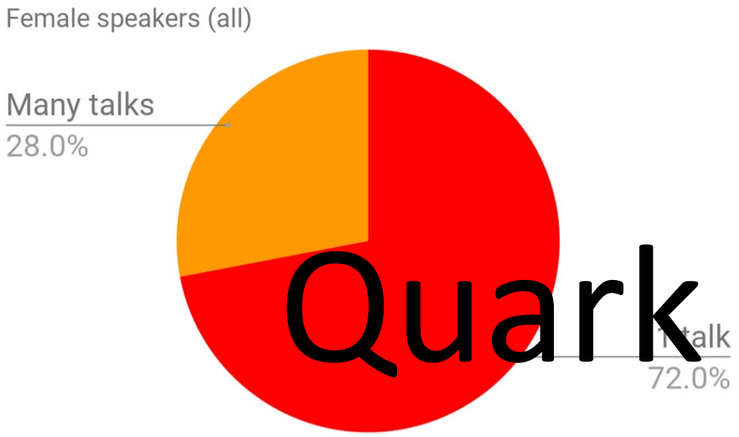
A Backup slide

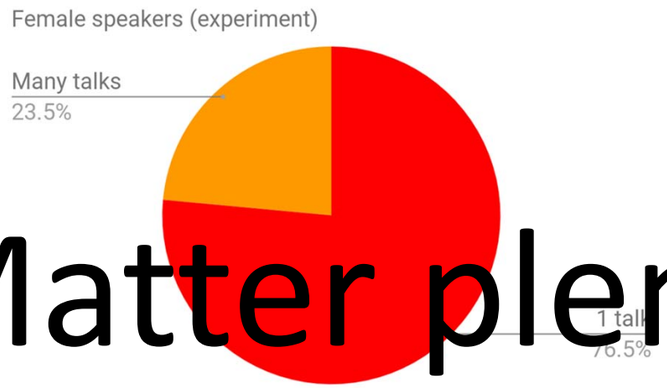
- double blind abstract submission but you can cite this paper https://www.sciencedirect.com/science/article/abs/pii/S0169534707002704

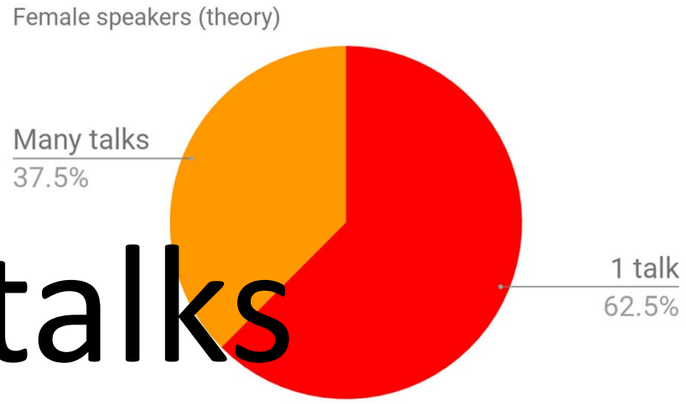
  Also, making the first round double blind doesn't mean the committee can't consider composition and speakers

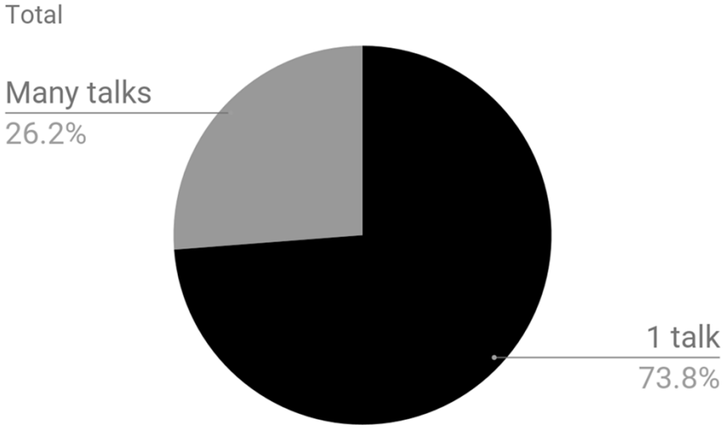
- Also, organizing committees do not *have* to accept the speaker suggestions from experimental speakers' bureaus, especially when N is large

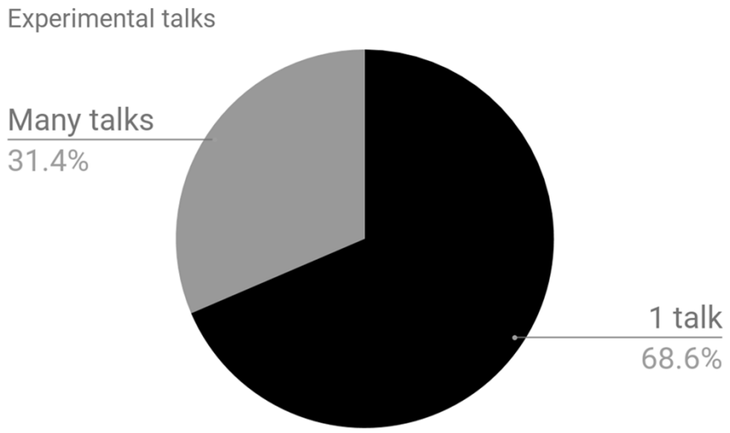
Quark Matter plenary talks

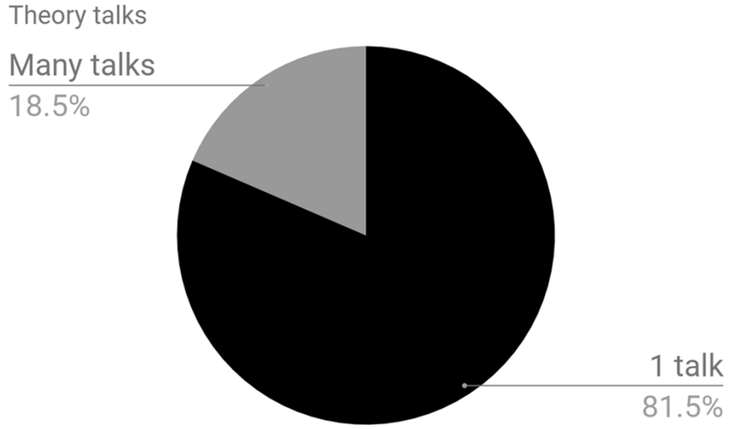


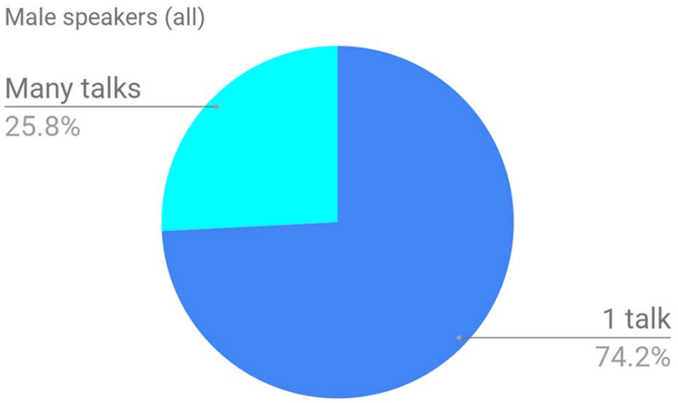


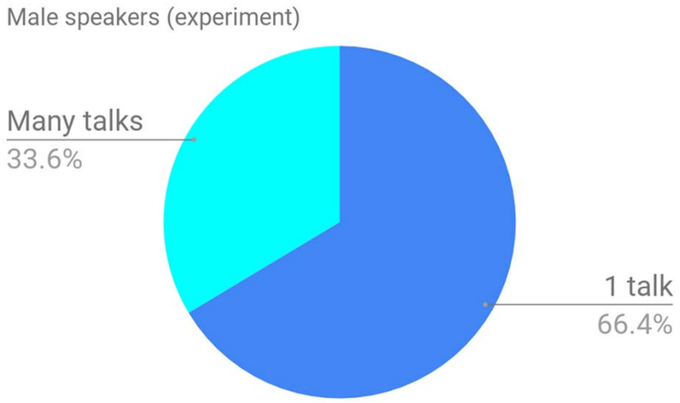


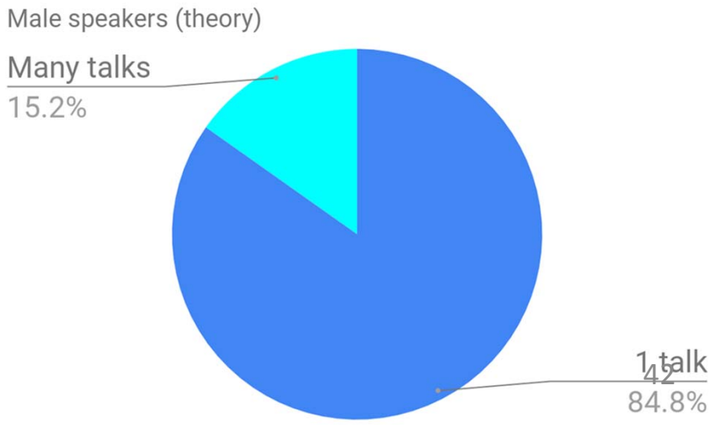












Percentage female speakers averaged over all conferences