

# IMPACT OF COVID-19 ON HEP RESEARCH

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ICHEP2020 Meeting, July 29, 2020



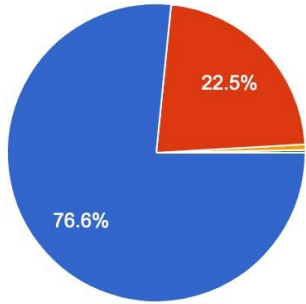
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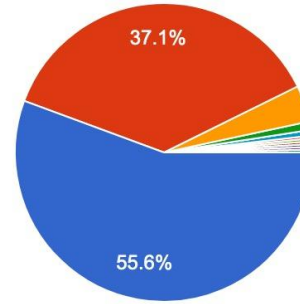
- **This study was commissioned by the High Energy Physics Advisory Panel (HEPAP).**
- **The HEPAP advises the US Federal Government on the national program in experimental and theoretical high energy physics (HEP).**
  - It is chartered by the U.S. Department of Energy (DOE) and reports directly to the Associate Director, Office of High Energy Physics, Office of Science (DOE), and the Assistant Director, Mathematical & Physical Sciences Directorate (NSF), under the guidelines established by the Federal Advisory Committee Act (FACA).
- **HEPAP's activities include:**
  - periodic reviews of the program and recommendation of any changes considered desirable on the basis of scientific and technological advances or other factors;
  - advice on long-range plans, priorities, and strategies for the national high energy physics program;
  - advice on recommended appropriate levels of funding to assure a world leadership position, and to help maintain appropriate balance between competing elements of the program.

# Demographics

## General Survey: 329 Responses

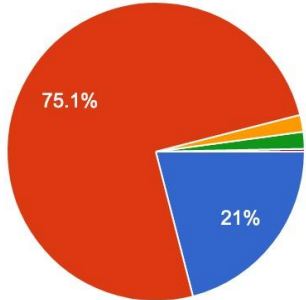


- University
- National Lab
- CERN
- University AND National Lab

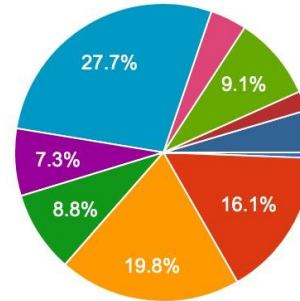


- an Experimentalist
- a Theorist
- a Computational Scientist
- an Accelerator Physicist
- an administrator
- Engineer
- engineer
- Drafter/Designer

▲ 1/2 ▼



- Female
- Male
- Non-binary
- I do not wish to specify
- Non-binary, female-presenting



- Undergraduate student
- Graduate student
- postdoc
- Assistant Professor
- Associate Professor
- Professor
- Laboratory Scientist (Junior)
- Laboratory Scientist (Senior)

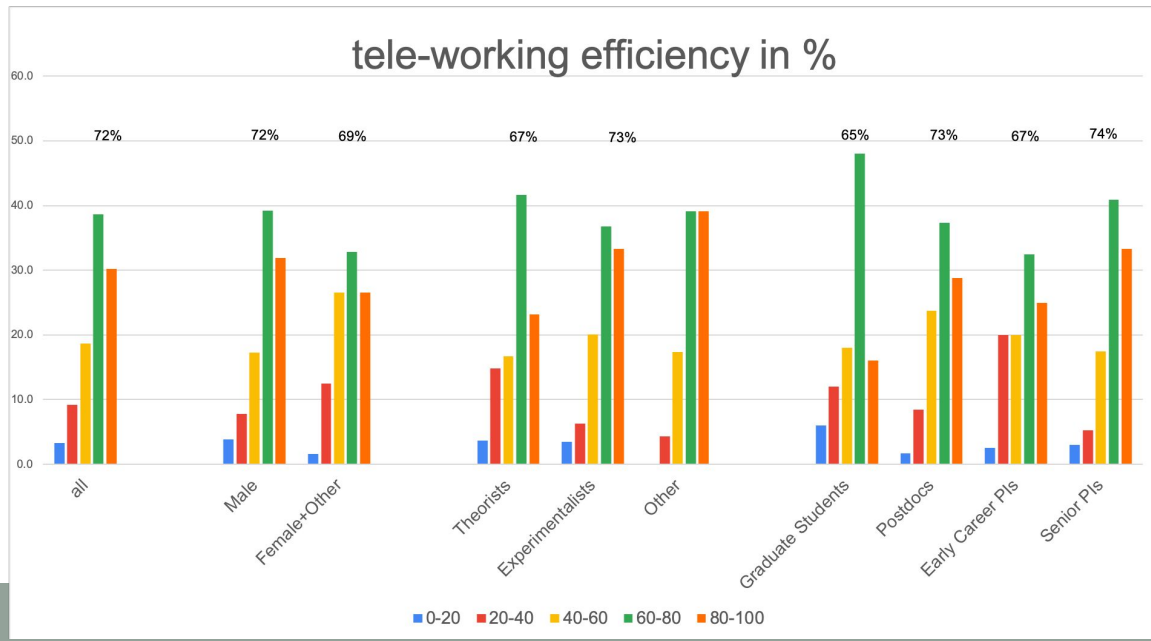
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# Impact of Teleworking

**“It is a global pandemic and we were expected to do work as usual, just from home”**

- Efficiency of working from home-office is lower ~72%
- Graduate students, theorists and Early Career PIs report ~ 65-67%
- Male vs Female+Others: 72% vs 69%
- A handful are very productive: ~100-120% !

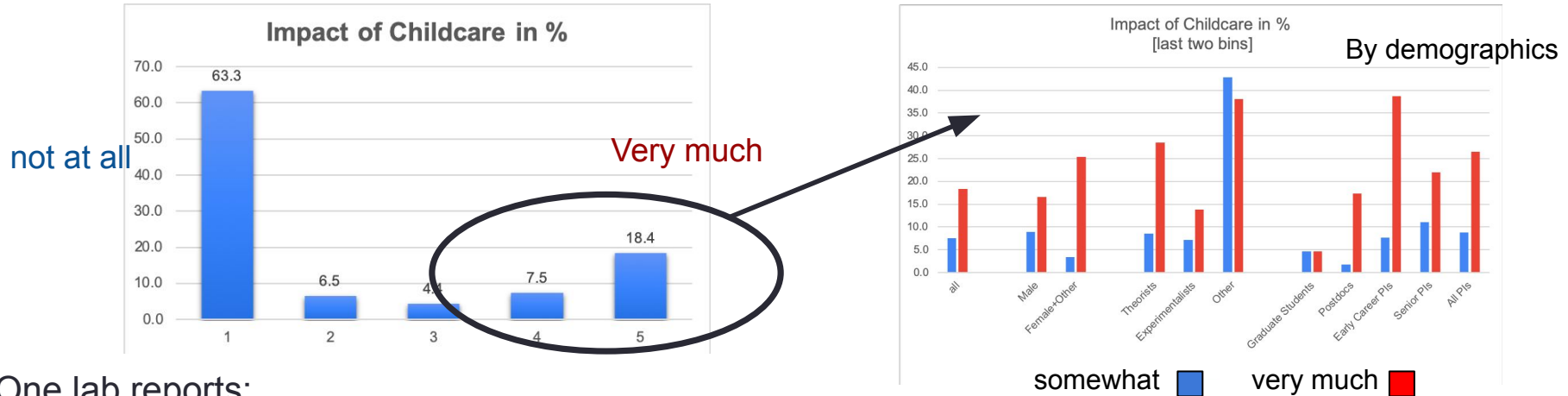
**Widespread and uneven  
loss of productivity  
across the field**



# Impact of Childcare

“The burden is **MUCH** more on those with young children, and this does not seem to be appreciated by everyone else”

- Impact on research due to childcare felt by ~30% of the respondents
- Higher impact groups: Female, Theorists, Early Career PIs, Postdocs



One lab reports:

- We have a large number of people whose job duties allow for remote work, yet they share responsibility for childcare and are unable to be fully productive. If they are called back to the lab to work and cannot due to childcare responsibilities, current DOE guidance is that they must use vacation time or take unpaid leave.

# Virtual Conferences & Peer Interactions

- In terms of visibility and interaction with peers effectiveness of
  - virtual conferences : ~44% report not effective
  - virtual collaboration meetings : ~39% report not effective
- Social isolation and zoom fatigue reported by >60%.
  - Demographics affected more that others: female+other, graduate students, theorists

Respondents	Usefulness of and Visibility at Conferences	Effectiveness of virtual meetings	Impact of social isolation	Experience zoom fatigue
	negative impact (%)	negative (%)	negative (%)	significant (%)
All	44	39	63	67
Theorists	38	40	68	71
Experimentalists	48	38	59	65
Male	41	37	62	65
Female+Other	52	42	65	72
Graduate Students	44	46	85	83
Postdocs	43	49	70	68
Early Career PIs	61	38	48	67
Senior PIs	42	34	60	65

Please feel free to share any impacts due to COVID-19 on research we should bring to the attention of HEPAP.

## Emergent Themes from **General Survey** answers

- **Impact on research from:**
  - child/parent care responsibilities, especially impacting women
  - Increased time spent on teaching
  - Increased administrative responsibilities
  - Increased demands for mentoring
- **Delays**
  - In student graduation times
  - Project delays - will translate into increased costs
- **Job futures**
  - Cancelled searches/offers
  - Fewer positions due to delayed projects
- **Travel restrictions impeding training/participation/data collection**
- **Overall stress level, uncertainty, mental health, etc.**
- **Xenophobia, Visa issues**
- **Pressures from PIs or colleagues to be productive and be “normal”**

# PI Survey: Results

- 5 Questions: Impacts on Budget, Operations, Schedule, Personnel, & Visa Restrictions;
- Personnel Outlook: What impact do you estimate the interruptions from COVID-19 will have on your personnel?\*

Experimental Category	Negative Impact (% respondents)
LHC	85
Neutrinos	81
Astrophysics	95
Mu2e	100
Muon g-2	100
Dark Matter	100

Common issues raised were: the difficulty of training outside the lab environment; dearth of undergraduate opportunities; losses in hiring opportunities; the running “postdoc clock” and the threat of lost productivity.

Approximately 33% of respondents said their graduate students would have longer time to degree. Difficulty in communication and low morale were also mentioned.

\*Please comment on training of undergraduates, student time-to-graduation, postdoc and technical staff appointments and productivity, etc.



# PI Survey: Results

- Visa Impacts: What impact do you estimate the recent visa restrictions will have on your group?

Experimental Category	Negative Impact (% respondents)
LHC	67
Neutrinos	33
Astrophysics	58
Mu2e	100
Muon g-2	60
Dark Matter	22

Even if they are not currently affected by the new visa restrictions, approximately 80% of all respondents expressed worries about the future if these new restrictions persist.

Worries expressed include the ability to recruit students, postdocs, and faculty from abroad, as well as the standing of the US as a leader in international science.

- Answer table in the backup slides for:
- **Budget Impact**, **Operations Impact**, **Schedule Impact**



# Additional Information

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# The Surveys

We administered two surveys :

- A **General Survey**, advertised widely and on the US Snowmass 2021 Study Slack Channels
- A survey specifically for **PIs**, disseminated through the Collaboration Boards and/or spokespeople of the major experimental efforts

The **General Survey** focused on personal and productivity issues, with an opportunity for general responses. **The PI Survey** focused on programmatic and budget issues, where they were asked to speak for their groups. The same questions as the PI survey were posed to the Labs and experimental management.

# Concerns about Career Impacts

- **Career impacts are quite substantial.**
- **Everyone is anxious about lay-offs.**
- A challenging time for those looking for **faculty positions**, with many universities announcing hiring freezes.
- Opportunities for junior faculty positions have fallen through (including a withdrawn offer for an assistant professorship).
- **Postdoc market** may be very difficult in the coming years and it would be good to find a way to support the junior people who get caught in this.
- The postdoc market is in dire need of attention.
  - Will those at the end of a postdoc term find a healthy market?
  - If many postdocs terms are extended for one year, where will finishing graduate students go?
  - For theory postdocs, this issue requires global coordination, otherwise a collection of local decisions could be disastrous for this year's applicants, with repercussions for years to come.
- There is limited funding for postdocs and many may end up leaving the field.
- Delay of **graduation for students** supported on grants.
- Reduced opportunities for graduating students is a real concern, and will delay many planned graduations.
  - This has the ripple effect of not being able to take on new students.
- Reduced ability to include undergraduate students in our research labs will have negative impact on both.

# Backup: Comments relating to impact of childcare

- Having more online conferences that everyone can attend can actually negatively affect those of us with increased childcare responsibilities (and those of us in the "wrong" timezone.) There are more opportunities for my colleagues to network because they can "go" to all the virtual conferences, but there is less opportunity for me to join due to lack of childcare.
- The child-care issue is a tremendously important one. I have two children under the age of 5 at home. They wake up at 6 AM and require near-continuous care. What time I do have available during the work day is taken up almost entirely by near-pointless, but mandatory, project-management meetings, during which I can't even pay full attention. By the time the kids go to sleep around 9, I am exhausted, and what little I manage to accomplish before sleep is of extremely low quality. Going to conferences, even virtual ones, is just an impossibility. Every scientist I know with small children is facing a complete breakdown of their ability to accomplish anything, all of our work is low-quality, and despite being exhausted beyond anything I have ever experienced in my life, I am slipping ever-further behind my peers.
- I'm troubled by the increasing disparity between those who have caregiving obligations and those who don't or have substantial local support. There may also be a growing geographical disparity between locations where infections peaked early and are starting to reopen (specifically, childcare and schools are reopening) and locations where it won't be safe for, potentially, a very long time, to return to a somewhat normal work environment.

# Backup: Comments relating to impact of childcare

- Physicist parent(s) of children who have been unable to go to childcare and/or in-person school have been, and in many cases continue to be, significantly impacted by COVID-19. Looking ahead to the fall 2020 and the school year 2020-21, many school districts are contemplating children going to in-person school only 1/2 or 1/3 of the time (if they open at all to in-person instruction), and so the remainder 1/2 or 2/3 of the time the children are remote schooling at home is a major burden on parents. There are no perfect solutions, but certainly some accommodation in grant applications and renewals to take into account the reduced productivity of those who have these added responsibilities is absolutely warranted.
- Physicists with dependent children have been essentially zeroed out by the elimination of child care, to the point that they are unable to remain competitive with the rest of the field.
- Since usually women do more work regarding childcare, female scientist are effected more and this should be taken into account
- While I have been largely unaffected...the impact on child care and the resulting demands this creates across all professionals should be highlighted and made clear that there is no shame and our field should be accommodating of this

# Backup: Comments relating to supervision/interaction

- Difficult to supervise students and postdocs virtually
- Spontaneous, ad hoc discussions and interactions are lacking.
- Supervising postdocs and students is more efficient when done face-to-face. In retrospect research projects could have moved a bit faster if collaboration was done through in-person discussions.
- Several research projects for undergraduates were canceled this summer which will leave a gap in their training.
- The biggest impact is on work with junior scientists. It is much harder to work with undergraduates and junior graduate students, where frequent hand check-ins are very effective and one can also just observe how things are going by walking by and a quick chat that doesn't interrupt progress as much as a Zoom meeting.
- Also, in order to make sure my team (undergrads, grads, postdocs, and junior faculty I mentor) are well, I spend much more time on mentoring than I ever did before. This is more service than science, and it's draining and probably not sustainable.
- Continuing something is not as bad, but I am in a stage of learning things from scratch. Slack, emails and Zoom are nothing like having peers sitting next to you to give you that "fresh start".



# Backup: Travel & Visa

- Travel restriction both domestically and internationally is a serious impact
- I worry that it will be a long time before US scientists are able to travel to Europe.
- My biggest impact was restrictions of interstate travel early into the quarantine phase
- Concerned about the impact of visa restrictions on ability to attract postdocs during the hiring season this fall. Even if the restrictions end as scheduled later this year, they have made a strong negative impression.
- One postdoc was unable to renew his visa since the consulates are closed and was forced to return to Switzerland when it expired. He had to undergo a 14-day quarantine.
- I just hired a postdoc and the visa restriction up and downs put his ability to join my group at risk
- We have two newly hired staff members (international) that were scheduled to start work April 1 and July 1. They got caught in CountryA when the pandemic started and were unable to leave. The paperwork for their H1-B's was completed except for the stamp. They are allowed to work for us (so they will have health insurance) while being in CountryA for a period of time. Nobody knows what that period of time is, or how they can get the stamp so they can come to the US since consulates are closed, or whether they can even get the stamp now that there are no new H1-B's

# Backup: Issues relating to CERN stay/travel

- Some personnel, who are back in the US, still have apartments near CERN, with leases ending in summer, no help on how to pack and move out. Can USLUA help?
- We have one graduate student who chose to leave Geneva and stay with their parents in the U.S. during the Shelter-in-place. Now the lease on their apartment is expired, yet they can't enter Geneva to pick up their stuff. Could the USLUA could help with these situations?
- The problem that the US is doing such a bad job of managing COVID-19 that physicists cannot go from the US to Europe to work at CERN or with anyone in Europe directly
- 
- Recent EU travel restrictions. US researchers are going to be severely disadvantaged if conferences in Europe move back to in-person. (To be clear, I am a US citizen, and I'm not blaming the EU for this; I'm blaming the US.)
- Folks who live alone are particularly impacted. We have one associate staff who is returning to Ireland to stay with their parents. No idea if they will be able to get back into the U.S. when the time comes.
-

# Backup: Issues relating to international stay/travel

- Our student is a Chinese national and she is at CERN. She was supposed to come back early this year so she can finish her analysis with her supervisor's guidance and write her thesis and graduate. She had been at CERN working on the muon detector upgrades. Now she is stuck at CERN and cannot come back until who knows when, and it will delay her time to graduation and analysis completion.
- 
- My postdoc was hired in January and moved to CERN at the beginning of March. He began training for access to CMS so he can work on the upgrades and obtain authorship (he was on ATLAS) and also the plan was for him to get visibility at CERN at the physics meetings. Now he is stuck working from home with no chance to get hands-on detector experience, AND he is not attending meetings and meeting his new colleagues on CMS, so none of it is working out.
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- One staff scientist and his entire family are stationed in XYZ and chose to stay there during the pandemic. Another staff scientists decided they wanted to be in the U.S. and we got them out on the last commercial flight to leave XYZ for the U.S. – however they were expected to be stationed for a couple years in XYZ, and so had previously given up their apartment in the localArea. They've been living with a friend since end of March now they want to go back to XYZ. We are attempting to get permission from the DOE, but it doesn't look good. This person literally has no place to live – and it's the localArea where everything is overly expensive.

# Backup: Comments relating to conferences

- Postpone workshops and conferences - don't cancel them or make them virtual
- Virtual seminars like the PANDEMIC series seem to work pretty well. After some time, lack of face to face interaction opportunities (Aspen, Munich MIAPP, Les Houches,...) will hold back progress.
- Missing socio-cultural aspects of cancelled business trips, uniformity and indistinguishability of virtual meetings ("talk by Nobel prize winners seem identical to canteen regulation meetings"), missing opportunities of private physics discussions
- Even though lockdown conditions took a toll on personal efficiency of most academic researchers, several conferences, like Neutrino 2020, stuck to virtually the same schedule and deadlines, increasing pressure on those involved to produce the same level of results while working at a lower efficiency and with new challenging conditions.
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- **As a junior female theorist**, what I am worried about most at the moment is the visibility of my research and its impact on my future funding application. **For example, while there are still several seminar series going on, I basically get no invitation.** This is understandable: due to COVID-19, there are significantly fewer seminars, workshops and conferences this year and the choices of speakers are pretty much up to a few organizers. Unfortunately one important measure for funding allocation is visibility, which already imposes a challenge for researchers like me with an introverted personality even before COVID-19. COVID-19 makes the situation even worse.

# Concerns about Career Impacts

- Everyone is anxious about lay-offs.
- A challenging time for those looking for faculty positions, with many universities announcing hire freezes.
- Career impacts have been substantial. Opportunities for junior faculty positions have been fallen through (including a withdrawn offer for an assistant professorship).
- Postdoc market may be very difficult in the coming years and it would be good to find a way to support the junior people who get caught in this.
- The postdoc market, especially for young theorists, is in dire need of attention.
  - Will those at the end of a postdoc term find a healthy market?
  - If many postdocs terms are extended for one year, where will finishing graduate students go?
  - This issue requires global coordination, otherwise a collection of local decisions could be disastrous for this year's applicants, with repercussions for years to come.
- There is limited funding for postdocs and many may end up leaving the field.
- Delay of graduation for students supported on grants!
- Reduced opportunities for graduating students is a real concern, and will delay many planned graduations.
  - This has the ripple effect of not being to take on new students.
- Reduced ability to include undergraduate students in our research labs will have negative impact on both.

# Backup: Concerns about Career Impacts

- **Everyone is anxious about lay-offs.**
- I have had a faculty job offer cancelled because of COVID-19 and I am very worried about the availability of faculty positions in the next year.
- It will be a challenging time for those looking for faculty positions in the coming years, with many universities announcing hire freezes. At the same time, there is limited funding for postdocs and many may end of leaving the field. Universities tend to allow us to spend university funds to support graduate students, but we have freezes on hires of new postdocs (does not apply to existing contracts or positions covered fully by sponsored funds). It means that the postdoc market may be very difficult in the coming years and it would be good to find a way to support the junior people who get caught in this.
- Find some way of supporting families with young children. IMO, we definitely do not need anymore zoom-workshops on time-management or zoom support groups, \*we just need time\*, time to work and focus and catch up. This may be time to catch up, some leniency when evaluating proposals (not just bean-counting papers in recent years etc).
- Career impacts have been substantial. Opportunities for junior faculty positions have been fallen through (including a withdrawn offer for an assistant professorship).
- Freezing hires halts career progression for the junior people who might have to leave the field. Who is able to stay will most likely be a function of connections, perceived excellence, etc, the full intersectional privilege ladder. A radical idea would be to retire professors a year early and thus afford to hire (up to) two junior people instead. This could also help with, much-needed, diversifying of physics. If academia is real about redistributing privilege, looking into how to legally/consensually do this would be doing some real footwork and not just talking.
- 
- **Some students were unable to search for a job this Spring/Summer due to the pandemic and will be delaying graduation and staying on the grant longer. This has the ripple effect of not being to take on new students.**

# Backup: Concerns about Career Impacts - Postdocs

- I'm concerned about availability of positions for young colleagues.
- Increased insecurity for young researchers due to hire freezes, travel and visa restrictions, etc.
- **Postdocs:**
- **I think the theory postdoc deadline be moved to later than Jan 7th.**
- I'm concerned about the impact of visa restrictions on ability to attract postdocs during the hiring season this fall. Even if the restrictions end as scheduled later this year, they have made a strong negative impression.
- Postdocs with children have been extremely impacted by the pandemic. As postdoc hiring season (hopefully) approaches the field needs to be very cognizant of PD family situations and how this impacts productivity etc
- The postdoc market, especially for young theorists, is in dire need of attention. Will those at the end of a postdoc term find a healthy market? If many postdocs terms are extended for one year, where will finishing graduate students go? This issue requires global coordination, otherwise a collection of local decisions could be disastrous for this year's applicants, with repercussions for years to come. The uncertainty is hugely (bigly?) weighing on postdocs.
- I just hired a postdoc and the visa restriction up and downs put his ability to join my group at risk
  
- **Graduate Students**
- Delay of graduation for students supported on grants
- Reduced opportunities for graduating students is a real concern, and will delay many planned graduations. Reduced ability to include undergraduate students in our research labs will have negative impact on both.
- **Some students and postdocs will not be able to complete their tasks before their term was scheduled to end and will thus need to stay at the lab longer than anticipated. This will result in a delay in a new hire in some cases, or a budget issue in other cases where a new hire had already been made.**

# Pressure to perform as in normal circumstances!

- It is hard to have time participate in so many activities going on or being planned for the near future. It seems to me that the general thinking is we do have more time to engage to webinars and that kind of things. At some point, I'm starting to feel I'm not putting enough effort to take that many opportunities to talk and listen to others. Are we possibly asking/expecting way too much to/from ourselves?
- The pressure to behave like everything is normal is exhausting. I have no idea what my students are going through, since I now have to schedule video meetings with them. While I'd like to think that this experience will finally kill off the culture of the experiment requiring management to be physically at the lab in order to hold important positions (no matter how much they deny it), I have no confidence that anything of consequence will be learned.
- People from upper management ignore the potential impact on health by asking people keep working in the lab
- Pressure from PI to return to lab work while the COVID-19 pandemic situation has not improved. Postdocs are in a vulnerable position because it is difficult to contradict their PI and there are real safety concerns from COVID-19 pandemic.
- The pressure to behave like everything is normal is exhausting. I have no idea what my students are going through, since I now have to schedule video meetings with them. While I'd like to think that this experience will finally kill off the culture of the experiment requiring management to be physically at the lab in order to hold important positions (no matter how much they deny it), I have no confidence that anything of consequence will be learned.
- Lots of deadlines seem to be proceeding as normal, ignoring the fact that life and productivity has not been / is not as normal. Some groups are more understanding than others, but when pressure from the top is to pretend all is fine it is difficult. Of course, one probably has to keep up pretences to keep funding agencies happy, but it's not a virtuous circle.

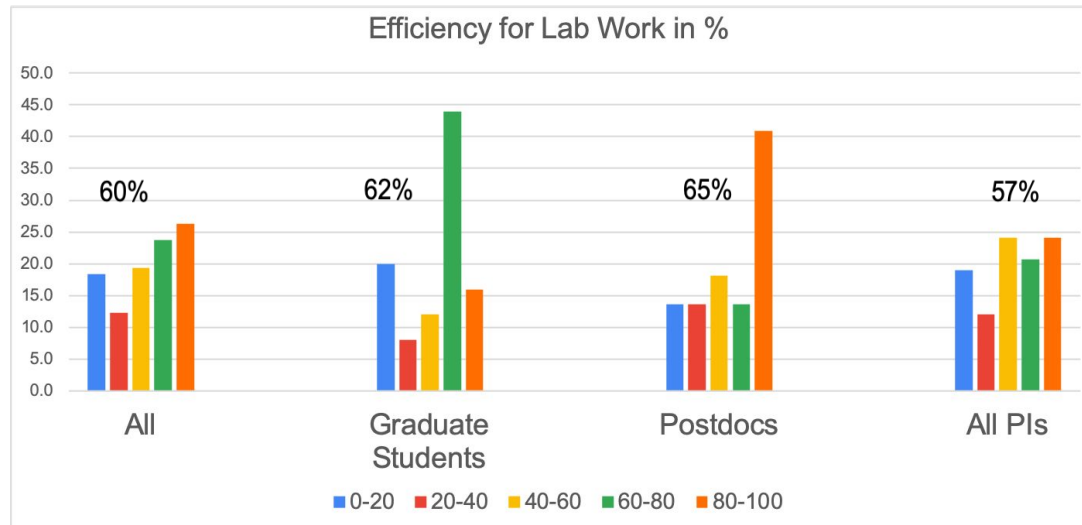


# Mental Health Issues

- Major (6month) delays in research objectives relating to lab work; Morale challenges for both me and my group slow down progress even on remote tasks; Anxiety issues for group members who to support are difficult to effectively address remotely; Online teaching and learning reduce effectiveness at both learning and research.
- Please consider the significant mental health effects of this crisis, on similar footing with the major physical health impacts (basic food, shelter, healthcare, etc.). These are hard to quantify, but many are struggling with these, and many of the adverse changes to our work contribute to adverse mental health outcomes. The community needs to keep this in mind.
- Social isolation leads to depression which leads to a lower productivity, even if supplies are available to work entirely from home. This should be taken into account for comparing if things should be virtual in the future.
- Anxiety and stress caused by the pandemic evolution and the failure to consistently implement mitigating measures will necessarily have deleterious effects in research productivity, so research productivity evaluation mechanisms should be modified to take these factors into account.
- As an international student who cannot travel back home, it's been very difficult to cope with loneliness, isolation, constant anxiety and concern about my family. It's been the worst 4 months of my life.

# Impact on Lab based Research

- Opening slowly
- Essential personnel only allowed to work in lab, with safety precautions
- Cannot send people to CERN [summer is generally the transition time to bring in new members from US]
- Efficiency plot for work in local labs, IF open:



# PI Survey: Results

- Budget Outlook: What impact do you estimate the interruptions from COVID-19 will have on your group's operating budget for this and next fiscal year?

Experimental Category	Negative Impact (% respondents)
LHC	26
Neutrinos	10
Astrophysics	32
Mu2e	100
Muon g-2	0
Dark Matter	33

Many PIs commented that they had saved money on travel and were rebudgeting to support personnel. Of those who estimated negative budget impacts, almost all were said to be due to less productivity and schedule delays that will increase costs.

# PI Survey: Results

- Operations Outlook: What impact do you estimate the interruptions from COVID-19 will have on tasks related to operations of your experiment?

Experimental Category	Negative Impact (% respondents)
LHC	56
Neutrinos	71
Astrophysics	68
Mu2e	100
Muon g-2	80
Dark Matter	89

The majority of PIs worried that interruptions would have a negative impact on their operations or schedule. Other concerns frequently mentioned were delays from lack of access to laboratory facilities and less productivity. Since the LHC is in a shutdown, many PIs seemed less concerned about day-to-day operations.

# PI Survey: Results

- Schedule Outlook: What impact do you estimate the interruptions from COVID-19 will have on project scheduling related to your experiment?\*

Experimental Category	Schedule Delays (% respondents)
LHC	85
Neutrinos	95
Astrophysics	79
Mu2e	100
Muon g-2	80
Dark Matter	89

The vast majority of PIs worried that interruptions would have a negative impact on their construction, R&D, or experiment schedule. Delays of 6 months to a year were mentioned for some projects.

\*Please comment on R&D, construction, and other central tasks.