

The Surveys

We administered two surveys:

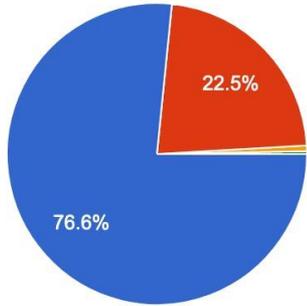
- A **General Survey**, advertised widely and on the Snowmass Slack Channels
- A survey specifically for **PIs**, disseminated through the Collaboration Boards and/or spokespeople of the major experimental efforts

We also contacted LHC and DUNE/LBNF Program/Operations managers and the Associate Directors (or the equivalent) at all of the DOE Laboratories

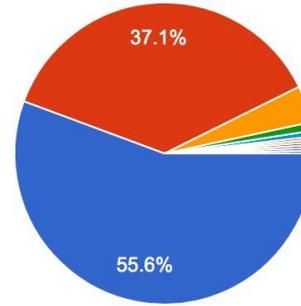
The **General Survey** focused on personal and productivity issues, with an opportunity for general responses. **The PI Survey** focused on programmatic and budget issues, where they were asked to speak for their groups. The same questions as the PI survey were posed to the Labs and experimental management.

Demographics

General Survey: 329 Responses

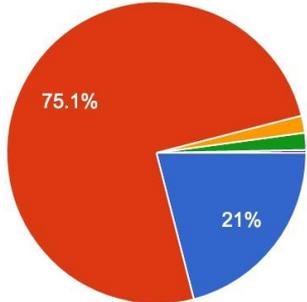


- University
- National Lab
- CERN
- University AND National Lab

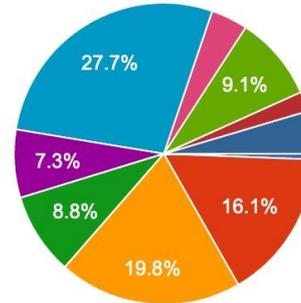


- an Experimentalist
- a Theorist
- a Computational Scientist
- an Accelerator Physicist
- an administrator
- Engineer
- engineer
- Drafter/Designer

▲ 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)

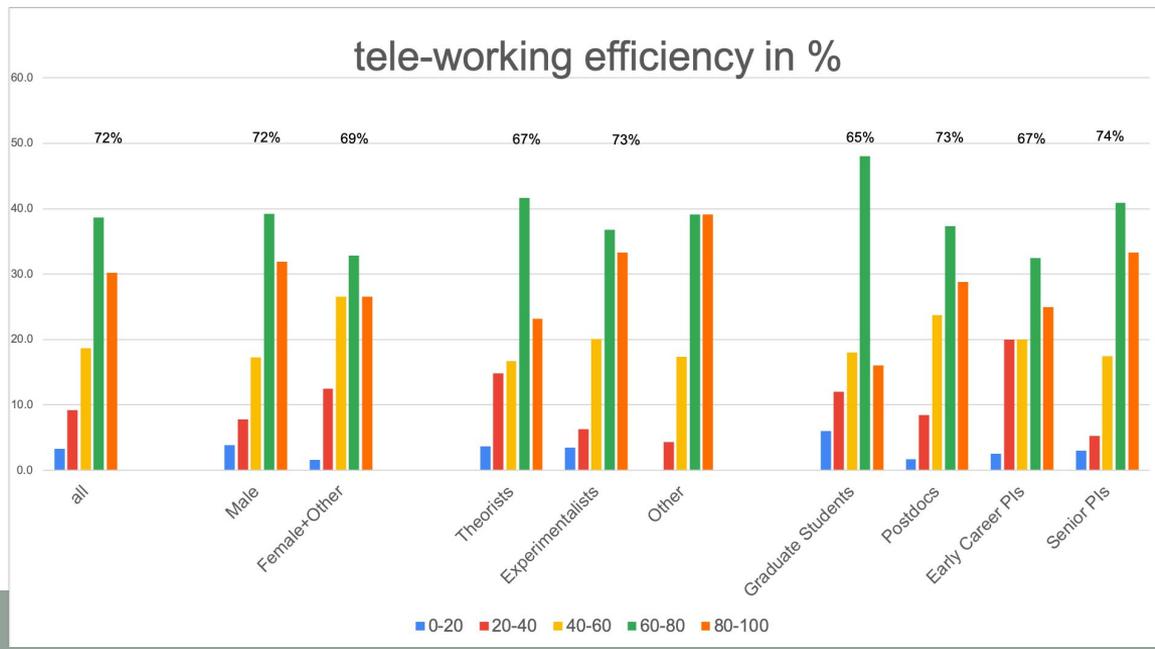
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Impact of Teleworking

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

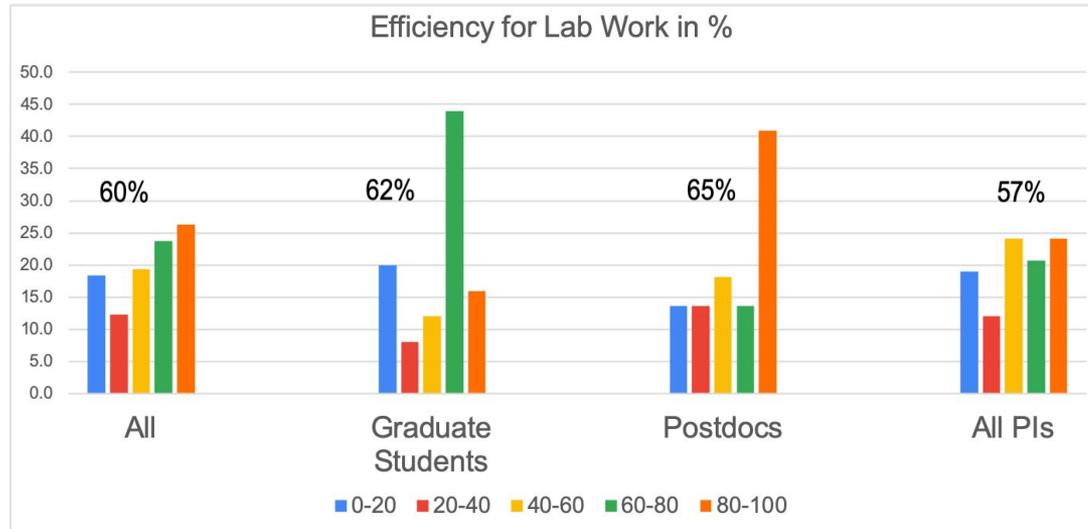
- Efficiency of working from home-office is lower ~72%
- Graduate students, theorists and Early Career PIs report ~ 65-67%
- Male vs Female+Others: 72% vs 69%
- A handful are very productive: ~100-120% !

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



Impact on Lab based Research

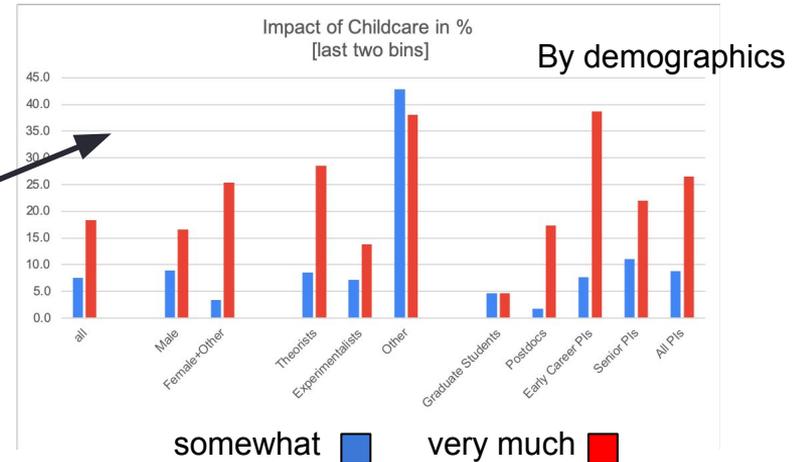
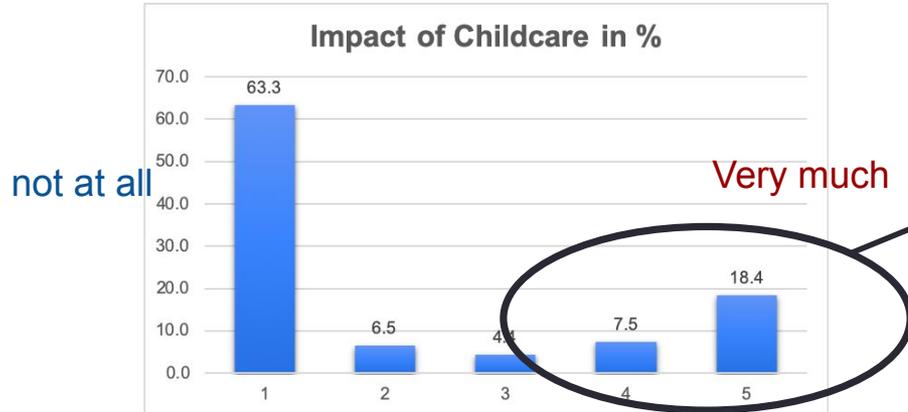
- Opening slowly
- Essential personnel only allowed to work in lab, with safety precautions
- Cannot send people to CERN [summer is generally the transition time to bring in new members from US]
- Efficiency plot for work in local labs, IF open:



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 |

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.

What impacts do you estimate the interruptions from COVID-19 will have on tasks related to your work?



General survey

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-only Survey

- 5 Questions: Budget Impact, Operations Impact, Schedule Impact, Personnel Impact, Impact of Visa Restrictions; One “Concerns to send to HEPAP” Question
- 97 Respondents, separated into categories:
 - LHC program
 - Neutrino program
 - Astrophysics (DES/DESI/DESC/Rubin-LSST/etc.)
 - Mu2e
 - Muon g-2
 - Dark Matter Experiments

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.

PI Survey: Results

- 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.

U.S. ATLAS and U.S. CMS Operations

- Continue to successfully deliver on ongoing activities despite shutdowns at CERN and US institutions, and tele-working.
 - Includes detector upgrades, installation and commissioning in preparation for Run 3, computing (incl. HL-LHC R&D), data production, software and firmware development, trigger developments etc.
 - Providing technical support to allow U.S. physicists to play leading role in physics analysis
- **Lab closures, in particular at CERN, cause significant schedule delays in the LS2 work plan.**
 - ATLAS: Most of the detector consolidation effort had already made good progress and are not in the critical path for Run 3 startup.
 - CMS: All work planned for LS2 continues, no de-scoping of existing plans is foreseen (yet), although everything happens on a delayed schedule.
- ATLAS: Sufficient float in the system to absorb delays caused by restrictions to on-site access.
- CMS: possible impacts which have not yet been estimated are e.g. travel support for teams at CERN; M&O-A cost contributions to cover increased shutdown ongoing cost at CERN; cost related to remote operations and limited access to remote-operated facilities, including computing

With the ongoing nature of operations work, cost impact is estimated to be minor where schedule delays do not directly translate into increased cost, as long as they rely on a constant workforce.

U.S. ATLAS and U.S. CMS Operations

- **U.S. ATLAS: major impact on ATLAS is installation and commissioning of the New Small Wheel.**
 - This remains on the critical path and directly impacts US ATLAS ability to be ready for Run 3 at the beginning of February 2022.
 - The U.S. is playing a major role in the integration and commissioning of NSW. Delays imply keeping the engineers and technicians for a longer period of time to complete the NSW integration. In addition, if the second side of NSW cannot be installed due to continued delays due to the pandemic, then ATLAS would operate with an asymmetric detector during Run 3, leading to increased effort during Run 3 data operations, and need for funding, to support both the NSW and the current Cathode Strip Chambers (CSC).
 - Current significant travel restrictions and immigration visas restrictions will add further delays due to lack of adequate on-site resources at CERN to complete the integration of the NSW, increasing the risk that the NSW may not be complete on time.
 - Each month of delay in the completion of the NSW has a financial impact of ~\$100k for U.S. ATLAS until both sides are integrated and commissioned on the surface. Operating both NSW and the CSC during Run 3, will add and extra ~3 FTE support.
- **U.S.CMS impact on schedule: significant and reasonably well-understood**
 - A major US deliverable, the installation of upgraded muon-chamber frontend electronics for the innermost layers of the Endcap Muon chambers, continues to be on the critical path. This work has now restarted, with about 3 months delay, and is expected to incur further delays due to COVID-19 safety needs that impact the work of installation and refurbishment teams. The updated plan was used as input to the updated CERN schedule, which has start of LHC beam operation in Feb 2022.

U.S. CMS Operations

- Impact due to Travel restrictions cause major concerns.
 - **US CMS has a significant work force stationed at CERN, about 180 individuals during the COVID-19 shutdown period.**
 - Travel to and from Europe continues to be restricted, teams stay in place. This becomes more problematic while CMS starts into commissioning mode.
 - In the absence of travel US teams rely on people stationed at CERN to contribute to the increasing needs for staffing shifts, starting commissioning activities. Depending how this develops we might have to consider hiring local personnel to augment existing teams, which would lead to cost increases.
 - This is not well understood yet, and the uncertainties remain large.
- The LPC is instrumental for training and it has adapted well to the new conditions. The program was adapted, and participation in e.g. tutorials and other events is very high.

HL-LHC Upgrade Programs

- Estimates of schedule and cost impacts made based on three scenarios of lockdown/resurgence/reopening potentially extending through 2022
 - corresponds to 4 months (lower cost) up to a one year (high cost) delay in the program
 - assumes various recovery/ramp-up efficiencies after each pandemic shutdown
 - **very preliminary, and very difficult to predict**
- Major impacts:
 - Vendors: some higher prices or delays
 - Work Efficiency: has been lower, will not return to pre-pandemic levels without vaccine
 - workflows interrupted, causing schedule shuffling
 - Personnel Support: “standing army” costs, project delays will necessitate extended or supplemental support for technical staff, students and postdocs
 - “existential threat to the skilled technical workforce”
- Overall current estimates: DOE + NSF scope
 - range from a low of ~\$10M to a high of ~\$40M per experiment
 - depending on length and frequency of pandemic shutdowns, project assumptions
 - **Highly preliminary**

DUNE/LBNF

LBNF/DUNE has been fortunate so far due to the relative continuity of civil construction and the relatively smaller level of lab- and university-based activities.

Through a **preliminary** risk assessment of possible scenarios, the project has estimated potential impacts at three levels

- High: \$52M and 6 months delay
- Medium: \$32M and 4 months delay
- Low: \$27M and 2 months delay

(Note: not including PIP-II)

PI Survey - [some national labs]

• Interruptions on your Lab/group's operating budget for this and next fiscal year?

- Instituted a charge code for unproductive time for workers whose job duties prevented them from being able to telework. We have many construction and R&D projects, and so this component of the workforce was significant.
- The anticipated cost of this unproductive charge for FY20 is \$2M across the suite of HEP programs at our lab. Scales if pandemic impact stretches into FY21
- Projects (currently progressing or actively starting) will be more expensive. In % by number of COVID months/duration of the project; Situation will be even worse as efficiency soon after COVID will be lower.
- We expect a reduction of travel costs.
- The laboratory still allows on boarding, so the group continues to hire RAs. Current personnel with expiring contracts have been offered the opportunity to remain employed at the lab, leading to an increase of costs.
- There are budget implications for students and postdocs who must stay past their nominal fixed-term due to being unable to complete their tasks or unable to search for a job in the industrial sector.

• Interruptions on tasks related to operations of your experiments?

- Operations of the Fermi-LAT satellite have continued smoothly remotely.
- Our planning for future experimental operations has continued full speed ahead.
- Operations will take longer by at least the number of covid months (for now 4).

• Interruptions on project scheduling related to your experiments?

- As everything will become more expensive/slower, funds for “new starts” will be delayed/reduced.
- Some MIE projects are closing out early and some will be re-baselined.
- R&D for projects has stopped and will impact projects that have not yet reached CD-2.
- The scope for Early Career Award efforts that involve laboratory work will not be completed within their timeframe

PI Survey - [some national labs]

• Impact on personnel:

- The career progression of RAs is significantly impacted. The research programs have to be adapted; the opportunity to invest significant effort in hardware projects is reduced. Senior RAs have fewer opportunities for exposure, networking.
- May need to have Reduction In Force in FY21 and considering freezing new hires. We are considering freezing new student and postdoc hires for FY21. We may need to reduce the size of our engineering shop. This has most impact on the engineers rolling off of recently, or soon to be, completed projects.
- Folks who are stationed overseas to construct and operate HEP experiments are suffering personal consequences.

• Impact from visa restrictions:

- Significant impact. A large fraction of the RAs and several scientists are on H1B. This implies that they cannot leave the country. This jeopardize our capability to deliver on commitments and impacts negatively the research program of the VISA holder.
- One postdoc was unable to renew their visa since the consulates are closed and was forced to return to Switzerland when it expired. They had to undergo a 14-day quarantine.
- Impact due to closed US consulates, cannot get H1B stamps, even after paperwork completed. They are allowed to work for us (so they will have health insurance) while being in CountryA for a period of time, though their arrival time to the US is highly uncertain.

PI Survey: Mu2e

- **Interruptions on your group's operating budget for this and next fiscal year?**
 - The primary budget impact is to decrease working efficiency. We estimate, that over this and the next fiscal year **it will cause our budget to increase by 25% in salaries** and a minor amount in materials and equipment needed to replicate operating stations needed to keep social distancing in the laboratory.
- **Interruptions on tasks related to operations of your experiment?**
 - So far, the time to complete our tasks for the experiment have **increased by an estimated 6 months.**
 - Project delays that will be damaging in every respect - especially in sensitivity
- **Interruptions on project scheduling related to your experiment?**
 - Equipment construction for the experiment will be delayed more than 6 months. Serious consequences for the experiment's scheduling since its will be impacted by scheduled accelerator shutdowns for major upgrades.
 - This could be a disaster - if the first run of Mu2e slips to the DUNE shutdown graduate students will need to find another thesis topic.

PI Survey: Muon g-2

- **Interruptions on tasks related to operations of your experiment?**
 - Local members might have to take a larger share of shifts.
 - **COVID-19 shutdown on-site accelerator operations at Fermilab and stopped a very productive Run-3 of the experiment.** Most operations have stopped, apart from limited work with our magnet mapping that can be done remotely without beam
 - It is more difficult (essentially impossible) to maintain hardware, and conduct operations with restrictions on access to the lab. Data analysis continues, but some issues are sufficiently complicated that in-person meetings would be much more effective. There is a reduction in quality and quantity of analysis work too.
- **Interruptions on project scheduling related to your experiment?**
 - *Might delay consideration of a future negative muon run.*
 - Estimate a year delay to final publications
 - **Most g-2 hardware is mature and stable, so most worried about reductions in operations/reduced run-time.** We do have hardware initiatives that should improve the sensitivity of the experiment that we simply can't make progress on currently.

PI Survey - Rubin Observatory/LSST-DESC

- **Interruptions on your group's operating budget for this and next fiscal year?**
 - *Rubin Observatory/LSST*: **Of order 6 mos to 1 year delay, requiring several M\$ additional to complete construction.**
 - *Rubin/LSST-DESC*: Effectively none: expect DOE and NSF to maintain funding to Rubin from construction through operations.
- **Interruptions on tasks related to operations of your experiment?**
 - *Rubin Observatory/LSST*: We are not yet operating, but there are pre-ops costs for the collaboration. There will be delays requiring more money.
 - *Rubin/LSST-DESC*: **LSST-DESC can proceed without delay with pipeline design and simulations needed to be able to handle the Rubin data, so expect little effect on DESC operations.**
- **Interruptions on project scheduling related to your experiment?**
 - *Rubin Observatory/LSST*: **6 mos to 1 year delay in the completion of construction.**
 - *Rubin/LSST-DESC*: For Rubin Obs. major delays are expected. For LSST-DESC R&D and pipeline construction, no significant delays are expected. This should help DESC recover some schedule in terms of being ready for the start of LSST operations; we have been behind schedule due to insufficient DOE operations funding.

PI Survey - LSST-DESC

- **Interruptions on your group's operating budget for this and next fiscal year?**
 - **The majority of DESC costs (both for operations and R&D at universities and labs) are for personnel. Stable operations and R&D budgets are essential to ensuring continuity of personnel and continued progress in the coming years.**
- **Interruptions on tasks related to operations of your experiment?**
 - LSST-DESC has responsibility for substantial simulation, analysis, and reprocessing software infrastructure that must be developed to enable robust and timely dark energy constraints
 - Additional costs are likely to be for a longer period of operating budget stability to maintain ops staffing.
 - Also sensitive to delays and descopes in the Rubin Observatory Project. Additional costs for more operations staffing if the construction project descopes, or delays development of software infrastructure which may require more software development to achieve our science requirements.
- **Impact on your personnel:** [which may lead to additional R&D funds for those groups.]
 - Individual research groups may experience a need for additional support due to increases in student time-to-completion or difficulties in students/postdocs finding jobs in this climate (for which a contract extension could be the solution)
 - Reduced productivity due to pandemic (e.g., increased child- or household-related responsibilities, fewer interactions outside formal meetings, increased time commitment due to telework and pandemic-related strategic planning, etc)

PI Survey - SuperK

- **Interruptions on your group's operating budget for this and next fiscal year?**
 - **We have lots of shift taking and hardware responsibilities on the experiment in Japan.**
 - Have had to find and hire local (in Japan) engineering companies and remotely instruct them to mostly keep things working. (use savings in travel budget to cover the temporary(?) expenses)
- **Interruptions on tasks related to operations of your experiment?**
 - Each Super-K author has a data-taking shift responsibility for which they must be present onsite. While travel was fully restricted (even for Japanese collaborators), moved to fully remote shifts.
 - Some on-site in-person work is absolutely necessary and our local Japanese collaborators completely took over that responsibility.
- **Interruptions on project scheduling related to your experiment?**
 - Our major task this year is the introduction of gadolinium into the detector (requires extensive on site operations). During travel restriction, no one could not travel to the site. As of a week or so ago, the Japanese can now travel inside the country, so the operation is now rescheduled for later this month, and since US cannot travel, the Japanese collaborators have to shoulder this burden . **So far, lost about three months.**
- **Impact on personnel:**
 - The impact on personnel has been minimal. A big exception is the demands put on our on-sight research physicist, who has had to try and deal with work that would ordinarily be done by the rest of us.
 - We have also lost the ability to send undergraduates to Japan over the summer.

PI-Survey - ICARUS

- **Interruptions on your group's operating budget for this and next fiscal year?**
 - Generally reduced travel costs for meetings at Fermilab, conferences, CERN.
 - Increased housing costs during current installation/commissioning phase since on site housing is unavailable.
- **Interruptions on tasks related to operations of your experiment?**
 - Capability of remote monitoring for cryogenic systems may exceed capabilities of laptops.
- **Interruptions on project scheduling related to your experiment?**
 - **We project a delay in completion of commissioning by about 4 months**, with the impact that we will not be ready for full operation when the Fermilab Booster neutrino beam comes back online in October. If the lab opens up we may need a surge of activity. Depending on international travel restrictions, more of the burden may fall on domestic or even on site collaborators. Safe operation of the experiment is a concern if on site access is restricted. Longer term, with the delayed start of data taking, we are concerned about being able to collect the full approved dataset before other FNAL projects (e.g. LBNF) impact beam delivery.
- **Impact on personnel:**
 - Physical presence of students and postdocs at Fermilab is an essential part of their training. Even travel for shifts and collaboration meetings is very important for building the experience and personal connections that are needed to sustain multi-year/decade projects and the health of the field. The delay in operating ICARUS will likely delay the completion of PhD research for several of our students by about one year (currently).

PI Survey

- SuperCDMS, ADMX, OSCURA, US-Japan Targetry, Belle/Belle-II, Advanced Detector R&D, QuantISED, AI/ML:
- **Interruptions on your group's operating budget for this and next fiscal year?**
 - No absolute change to budget, but tasks are being shifted to next year as a result of access delays due to COVID-19, resulting in larger carryover into FY21.
- **Interruptions on tasks related to operations of your experiment?**
 - Laboratory intensive work is the predominantly impacted activities.
- **Interruptions on project scheduling related to your experiment?**
 - **3-6 month delays in construction activities, so far.**
- **Impact on your personnel:** Personnel expecting to transition to other employers have had delays due to access to visa-related services.
- **Impact from visa restrictions :** Currently no impact, but with hiring expected, we also expect visa restrictions to hinder bringing new staff on board.

PI Survey

Note: PI affiliations in italics

- **Interruptions on your group's operating budget for this and next fiscal year?**
- *MiniBooNE, MicroBooNE, SBND*: **budget will be strained due to delays in SBND.**
- **Interruptions on tasks related to operations of your experiment?**
- *MiniBooNE, MicroBooNE, SBND*: delayed construction of SBND and reduced MicroBooNE data taking.
- *MicroBooNE, SBND, DUNE*: Substantial, with beams and detectors down, and construction activities largely halted.
- *DUNE, NOvA, MicroBooNE, SBND*: FNAL has shut off beams, which is the obvious interruption on data collection. Construction on SBND was halted, which delays timeline to operations there.
- **Interruptions on project scheduling related to your experiment?**
- *MiniBooNE, MicroBooNE, SBND*: 6 month delay on SBND.
- *MicroBooNE, ICARUS, T2K, NOvA, MINERvA, DUNE*: Most scheduled tasks have been delayed by about a factor of 2
- *MicroBooNE, SBND, DUNE*: Delays in procurement, lack of access to labs, limited personnel availability continues to slow down instrumentation R&D & construction efforts.

Summary

- **Concerns about**
 - Career impacts may become severe: jobs for postdocs, graduate students and faculty hires/promotions; lack of opportunities for peer interactions and visibility.
 - Anxiety about layoffs, pressure to be “productive and normal”
 - The impact on child care and the resulting demands this creates across all professionals should be acknowledged.
- **Cost and Schedule impacts are accumulating and will scale with the length of the pandemic.**
 - **Research budgets (labs and universities) need relief!** They are already constrained and will continue to be severely stretched, due to - delay in graduations, term extensions to staff, postdocs, lab support; lack of flexibility by projects to train graduates instead of undergrads etc.
 - **Operations will “take longer”:** has cost impacts due to providing level of effort through the delays; hiring substitute personnel to deliver on obligations at experimental locations due to travel restrictions; possible computing and development costs etc.
 - Impact on Projects costs may become substantial. A range of estimates are available.
- It is very important to develop “metrics” on how to measure the continued impact!

Additional Information

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
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- 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.
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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.
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- 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.
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- **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.**

Backup: Concerns about Funding

- Delays in funding decisions
- Grant proposal deadlines have been very difficult in the current environment.
- Minimal or no discussion between lab scientists and DOE managers
- Postdocs not being able to take up their next position means existing supervisors need to pay them longer.
- Outgoing and incoming postdocs can be delayed by different amounts of time, leading to funding crunches.
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- Cuts to education and research funding are currently my main concern...there are draconian cuts discussed and I fear for the research capabilities at my and many other universities. Education and research should be the last item to cut and it appears to me to be among the first - our community should strongly lobby to increase funds across all areas (public spending in general) now in order to offset effects of the virus situation. Public and social life will be largely impacted in the US in already "dead" downtowns at times - this will negatively impact the well-being of the general public. Especially given that the situation is not getting under control in the country. There is not even a federally enforced tracking, any and all of these will impact research in a very significant way for months / years to come even if a vaccine is found in the next 1 year.
- Faculty at smaller institutions are being defunded at an increasing rate despite strong track records of work. Combined with reduced ability to connect with the community is a death sentence for many theorists.
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- Recruiting of graduate students, postdoctoral scholars, and faculty will be strongly negatively impacted by financial duress at universities caused by the pandemic and negative impressions of the US response to the pandemic, allied to implementation of measures increasingly restricting the ability to recruit foreign scholars. The almost complete disruption of networking at conferences will compound these problems.

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.