

1. The calculator was definitely easy to use, but I feel as though it is still pretty limited in its functionality. It is only applicable to one kind of calculation, so I think having more modes would make it more marketable. I would genuinely forget it existed if I could only use it for one kind of problem. Another enhancement would be to maybe enhance the aesthetic a bit if at all possible. While it is supposed to be new technology, it looks as though it is quite old which makes it unappealing and I would not have clicked out thinking it was outdated and unreliable.

In all honesty (sorry Dr. Sahli), I think the majority of MPH students are simply trying to get through the program and learn as much as they can in order to enhance their own marketability towards employers in the field. I like that the second question implies that more functions will be introduced. I don't think any currently working epidemiologist is calculating these things by hand anymore, and it may be a bit unfair to expect students to remember how to do it. I have to reteach myself each problem even while trying to get through the exam, because they tend to blend together in my head. It may not deepen their understanding, but using a graphing calculator in Algebra instead of graphing everything by hand didn't deepen my understanding either. It did, however, save my sanity to know that as long as I understood what I was telling it to do and filled it in correctly, I could rely on the right answer.

I think that they can learn manual calculations and still be given this tool as an option. The best way I can explain this is using an example. The very first stats class I took in undergrad in AA, the professor allowed us to use a similar tool which I can link here: <https://shiny.stat.lsa.umich.edu/> directly after teaching us how to do the calculations by hand. This calculator looks at confidence intervals and p-values, and it really helped all

of us visualize what was going on. I still picture this calculator whenever I do those calculations in another class. I should have said this in the first paragraph, but the use of the visualization on the side is helpful to make the concepts stick. Maybe this calculator could have a graphical representation component? Don't ask how it would work – no idea.

2. Programmed calculators like the incidence proportion one provided have both positive and negative components when used in a learning environment. I think the calculator was easy to use when using it for a simplistic word-problem. For a problem that is calculating cumulative incidence alone, you can easily type in the components of the problem to get an answer. I think adding a few more variables to the calculator to enhance it to compute more than just cumulative incidence would help improve the calculator. If the calculator could be programmed to calculate other epidemiological statistics it would be more useful.

When looking at the content we learned in the first few weeks of the course, I truly think it would depend on the type of student to determine if the calculator would help on a deeper level. Some students learn better by taking apart the scenario into components, which this calculator allows. I think having this available during week 1 would help those students, but I think it could also have limitations because once the scenarios become more complex they cannot rely on a calculator to dissect the components. I would recommend using the program after learning the manual calculations because learning the manual calculations helps us students grasp the different components of the scenario. The calculator can then be used as a practice tool to enhance the understanding further. I think manual calculations should be the main

source of learning methods, and the programs can be provided for study tools after the lessons are fully completed. Learning manually helps us students comprehend each part of the calculation and why we use certain numbers. The program can help with this, but it doesn't explain why each number goes in the different parts of the calculation. Relying on programming tools does not help students fully grasp the reasoning. When thinking about programs and tools that are useful for students, I think statistical programs like SPSS and R studio would also be helpful in epidemiology. I think this would be helpful towards the end of the course to analyze case studies and provide further report and understanding.

3. The incidence calculator was quite easy to use, but calculating cumulative incidence is a pretty simple calculation anyway. Increasing the versatility of the calculator to make it useful for calculating odds ratios or relative risk would probably be more useful.

I think introducing a tool like this early on in the learning process would probably be detrimental to understanding the purpose of the calculations. Students will likely just learn where to plug in numbers and regurgitate the answer the calculator gives them, without really learning what the calculation actually is, and what it really means. By following the math you reinforce your understanding of the purpose of it as well.

I do think that after some time doing the math by themselves, a tool like this could be helpful. First you make sure that the student actually knows what the calculator is doing, but then you can give them access just to save time, and could potentially decrease the frequency of mathematical errors that can sometimes occur during the multi-step processes we have to use. It would probably be tricky to balance the use of tools like this with manual calculations. As soon as the option is presented people are going to probably use it all the time.

Tools that could be used to calculate cumulative survival probability would likely be the most useful, as those calculations are the longest, involve a lot of steps, and the cumulative nature means any mistake gets carried forward to the next step.

4. Was the calculator easy to use? What improvements could be made to improve or enhance the calculator?

The calculator is very user friendly. Maybe adding different functions in the future (if it is implemented) would be helpful. But, as it is right now, I think it is easy to work and simple. It effectively performs simple calculations and I could see myself using it.

Do you think using a calculator such as this (with functionality to calculate all the measures learned in weeks 1 to 3) in future classes would help students develop a deeper understanding of epidemiology, or limit their learning? Explain your thoughts.

I think that this would aid a student's development in the early stages. I like the demonstration of exactly where the numbers go during the calculation, I think it would be helpful to students who are just starting in your class. Instructing how to factually do a problem with the formula is one thing, however I find that when I am struggling it is important to look back at the zooms of the professor actually doing the problem. I think that this could serve in a similar way.

Would you recommend using this program for future students before or after they have learned manual calculations? Why would you make this recommendation?

I would introduce it after the lecture to provide as a reminder and to not confuse students.

Learning how to actually do the calculations through manual practice is important, then after this could be introduced. Introducing a program such as this before the students have learned the material and formulas may be overwhelming or confusing for some.

How do you think the balance between manual calculations and using a program should be handled in future classes? Please provide details on your reasoning.

I think that manual calculations should be prioritized as the first step in the student's learning, after which the program could be provided to them. Technology should be used as an aid, not as a replacement. It is helpful, but I think knowing how to do the actual calculations is necessary.

Besides calculation tools, what other types of computing and/or technology do you think could enhance learning basic epidemiology?

Some way to input the information that you have, which results you are looking for, and a program that can suggest a formula for your use. This would be insanely helpful, not only in learning basic epidemiology, but also in the field. When stuck on a problem, I have wished for something similar to use for myself, just even as a nudge in the right direction to confirm that I am performing the right actions.

5. I think that the Incidence Proportion Calculator was really easy to use! The only thing that I think could be improved would be instructions on how time should be measured. For example, I know that I should use person months but if I were a stranger to this I would probably try other intervals of time as well. I think it is a good tool to have after learning how to calculate on your own. I think if the calculator was introduced after learning how to calculate properly, students should be able to use this tool after they understand the concept so they can get through work faster. If you introduced the calculator before they knew how to actually calculate it by hand they might not fully understand what they are trying to find. I would recommend this is used after manual calculations are learned because it also makes sure that students are paying attention to the material they are learning and not just learning and dropping the information. As I explained earlier on I think that the calculator should be used after introduction to the math and it should be allowed to be used for homework and test after manual calculations are mastered. This would mock how people would do the calculations in a real world situation. I think other technology that would be helpful would be a graphing tool to graph some of the information that

we are comparing, and I think that an all in one epidemiology 'cheat sheet' would be great for refreshers on information that people may have forgotten. Overall, I really like this tool and think that it will be very helpful throughout the rest of the semester. I think that knowing this tool is here now, it will help me understand and break down bigger word problems easier and it will be useful when trying to pick out key data.

6. Having an incidence proportion calculator that was created as a tool for future students in epidemiology is very useful in my opinion. When I first used it, I was impressed how easily I can use the calculator because I was just able to enter the required information into the blank fields and the proportion was calculated immediately. I think the tool can be used in future classes for students check their homework if they're doing their questions right or not, but it should be limited for that purpose only. This is because students can often misuse such a useful tool to just plug in numbers and get their answers and then be done with the assignment, but they won't learn the equations and interpretations of incidence proportion calculations which will do more harm than good for their education. I think that the tool can be broadened so that incidence density rates, population attributable risks, and other more complex equations can be coded into the software so that students can cross-check their answers. I would recommend this program for future students but with a caveat that, as mentioned above, they should only use the tool as a reference and not as a solution to their assignments because it defeats the purpose of them learning anything from the calculations. The balance between using manual calculations and tools like this one lies in the student making the right choice. I think that students should strive to get the answer on their own before using technology to help them with it. Technology is like a great power that can be used to our advantages but if used improperly, it causes more harm than good, and this theory holds true in this case as well. Besides calculation tools, I think that having data representations in different visual formats like charts and graphs and students utilizing Excel to make these charts can help them better understand the

relationships because cause and effect can be clearly visualized better. They can also interpret those results better so that they are not just relying on Math for all their understanding of epidemiology.

7. I thought the calculator was very simple and easy to use. Honestly, I found that it was easier to use than my TI-84 calculator. I didn't really see any areas where you would need to make any improvements to enhance the calculator. Possibly the only thing that would make it similar to some of the math problem calculators/apps is if you were able to take a picture of the story problem and the calculator was able to do the calculations based on the picture.

I think there's a benefit with this calculator, such as checking your answer and making sure it's correct and you understand how to solve the problem and what all the numbers mean. However, I think it can limit students' ability to learn the material as well as develop a deeper understanding of epidemiology. I remember going to high school and we were given a series of questions to complete from a textbook and my teacher had the book with all the answers and how to solve them. I would try very hard to work the problem out myself and then check my answers. I would always remember what I got wrong and then it would help me with future problems. As technology has gotten more advanced and there's more ways to receive answers to homework questions via the internet I see a downward spiral of students relying on just getting the answer then actually problem solving. For instance, I watched as my middle school cousin would use an app, where she would take a picture of one of her math problems and it would solve it for her, and then she would just submit the answer into whatever platform her teacher was using and she would move onto the next question. The problem with this is she wasn't learning and she wasn't able to do the math on her own. In fact, one of the problems was wrong and the platform wouldn't let her submit the wrong answer. I got a pencil and paper out and worked the problem out and tried to explain it to her but since she was so reliant on the

app, she had no clue what I was talking about. I feel like this program could lead to the same problem.

I would definitely recommend using this program for future students after they have learned the manual calculation so they can utilize it to check their answers rather than to rely on it to give them the answers. I think the best way to utilize this program for future classes would be using it to check their answers, kind of like how my teacher did in high school. It's really the best way to check yourself and learn from your own mistakes.

Besides the calculation tool, I'm not really sure what other types of computing and/or technology would enhance learning basic epidemiology. This program is really nice, especially since there will be a lot more calculations you'll be able to do on it as well. Other than that, I think learning the good old fashioned way is the best!

8. When using the cumulative incidence calculator, I did think it was very user friendly and easy to use. Off my first impression, I can't think of any immediate improvements. Being that I have grown accustomed to doing these calculations by hand, this may have an influence on my opinion that the website is easy to use. If I had no background of what incidence was, I may still think it is easy to use but not fully understand what exactly the calculation is producing. I think that if this was introduced to our course earlier in the semester it may have limited the actual learning of the concept. It would have been very easy to just use the website to plug in the calculations rather than getting the repetitions by doing it ourselves and learning. Especially with a calculation that is on the simpler side, I think it is beneficial to learn it by hand before being introduced to this tool. I would recommend the introduction of this tool around the same time that you showed it to this course, after the calculations for cumulative incidence have been taught. I think it may help speed up the process of doing some work for students, but it does not jeopardize their learning of the necessary concepts. From my experience as a student, I have come to really appreciate having automated formulas where I don't have to spend the time

writing out problems and calculating things by hand. For classes like Bio-stats, it was immensely helpful to use SPSS and have automated formulas. However, for future classes, when the formulas are more simplified, I think students do find value from crunching the numbers first by hand, before moving on to having them automated. Other technology that I think could enhance the learning of basic epidemiology is the development and use of online simulations, putting epidemiological scenarios into practice. Applying concepts that are being taught in class to a situation that manifests via simulation would be a helpful and interactive tool to practice these concepts. If these types of simulations exist for students to access, I think it may help bridge the gap between concepts we are learning in class and real life application.

9. The incidence proportion calculator was very easy to use, with the instructions clear, concise, and straight to the point. This calculator makes it easy to quickly get the result we are searching for, making sure we are inputting our data where it should be instead of incorrectly applying the formula. This reduces the likelihood of errors that may arise from incorrectly applying the formula.

This approach to incidence proportion may be very helpful for students who are beginners to epidemiology and could use some guidance while learning such a new concept. However, an enhancement to the calculator would be adding a brief explanation of the significance of each input parameter to deepen the user's comprehension of the epidemiological concepts involved. Although the output formulates the answer into a sentence, it does not really explain the epidemiological significance of the result.

I would recommend using this program for future students after they have learned manual calculations because this would ensure that they understood the meaning of the calculation and that using the calculator would only provide them with quicker and less error-prone answers. If the calculator is introduced as soon as the concepts of incidence and prevalence are introduced, they could rely on it more than they should and they would struggle to grasp the

concepts as well as they should. I think the calculator should only act as an enhancer to validate students' calculations quickly and efficiently.

This balance between manual calculations and using a program should be carefully considered in future classes. Once the students have a solid understanding of the epidemiological concepts, they can engage with the material actively by doing the calculations manually, while solving the initial simple problems. For complex scenarios, after everyone is on the same page about the significance of the calculations, students can utilize the calculator to streamline the calculation process and focus more on interpreting the results rather than getting slowed down by manual computations.

Beyond calculation tools, technology can enhance the learning of basic epidemiology. I would imagine that data visualization tools that illustrate epidemiological data through maps, charts, and graphs can help visualize patterns and trends like disease outbreaks, making abstract concepts more concrete. I would imagine that simulation programs that can model real-world disease outbreaks would also be beneficial. They would allow students to interact with different epidemiological scenarios, through adjusting parameters like transmission rates or population density so they can better grasp the complexities of disease dynamics. These tools help students apply theoretical knowledge in practical ways, enhancing their preparedness for real-world public health challenges.

10. The incidence proportion calculator was very simple to use. It is nice that the calculator allows the person using it to plug in the appropriate numbers to view the output as it should be. I don't think there are any changes that need to be made because it is very straightforward with what information is needed and even goes so far as to provide the explanation of what an incidence proportion is and the appropriate formula to use to determine the output. This calculator could definitely be a valuable tool for students to help them better understand how the information should be calculated because they could use it as a way to check their work. As far

as if using the calculator would help students develop a deeper understanding of epidemiology, I do not think that it would necessarily enhance their understanding, but it would be beneficial. Ultimately, it would be more beneficial for students to learn manual calculation before having the opportunity to use the program because when you have to do it manually, you have no choice but to develop a deeper understanding of what you are doing. If students are able to immediately use the program to plug in numbers and get the answer they are looking for, they might be less likely to retain any of the information. I think that it would be best to introduce the program to students at a certain point in the semester, potentially the halfway point, because by then they would already have a good understanding of how to do the manual calculations and the program would just be a useful tool to make the work quicker. Besides calculation tools, I think that it would be both useful and interesting to introduce a program where students can perform basic epidemiological duties. Just by doing a little research, I discovered one specific program that is used as a learning tool for the principles of epidemiology. It has many modules that provide an immersive experience for students, which may be helpful. Overall, the calculator and other programs of the like would be useful tools for students who are learning the basics of epidemiology.

11. The Incidence Proportion Calculator provided on the link is relatively easy to use, with a straightforward interface where users input necessary data like the number of new cases and the population at risk. It delivers results quickly, which makes it convenient for those needing to calculate incidence proportions efficiently. However, there is room for improvement. One possible enhancement could be providing more contextual explanations alongside the input fields. For instance, a feature explaining each term—like what constitutes “new cases” or “population at risk”—would guide users who may be less familiar with epidemiological jargon. Moreover, expanding the tool to allow for other epidemiological measures, such as prevalence or risk ratios, could increase its versatility and appeal.

Incorporating this type of calculator into future epidemiology courses would likely have mixed effects on students' learning. On the one hand, it could accelerate their understanding of how to derive and interpret epidemiological metrics, particularly for students who struggle with math calculations. By making computation faster and more accessible, it frees up cognitive resources for interpreting and applying these results in real-world scenarios, which is a valuable skill in public health. However, over-reliance on such calculators could limit the depth of learning, particularly if students bypass the critical thinking required to understand the underlying principles of manual calculations.

I would recommend using this tool after students have learned manual calculations. Learning the manual process fosters a deeper understanding of the mathematical logic behind epidemiological measures. Once students have mastered this, the calculator can serve as a supplementary tool to enhance their speed and efficiency in solving problems, much like how calculators are introduced after students learn arithmetic by hand.

The balance between manual calculations and using a program should be carefully managed. Manual calculations should be prioritized in the early stages to build a foundational understanding of epidemiology. Once students have demonstrated competency, using a calculator can then be introduced to facilitate more complex or repetitive calculations. This ensures that students understand the “why” behind the numbers before automating the process. Beyond calculators, other forms of technology could be valuable in teaching epidemiology. For instance, interactive simulations that model disease outbreaks or the impact of interventions could provide students with a more immersive learning experience. Additionally, data visualization tools could help students better understand epidemiological trends and relationships by representing data graphically rather than in raw numerical form, further enhancing comprehension.

12. The calculator was very easy to use, with clear fields for entering both the numerator (the number of new cases) and the denominator (the population at risk). It really simplified the method of calculating incidence proportions and made the math feel less intimidating. I think using a tool like this in future classes could help students focus more on understanding and interpreting epidemiological/ biostatistics data instead of worrying about making mistakes in the calculations. However, I believe it's important to learn manual calculations first in class and use the software for homework. Understanding the steps is essential before moving on to software, so I'd recommend introducing the calculator after students have practiced doing it manually. That way, they get a strong grasp of the material before relying on technology to get less errors. I think the balance should be that students first learn manually, and then gradually use tools to reinforce and deepen their understanding. Other than that, I think tech tools like data calculators could also help students connect the dots, making the concepts feel more practical and relevant to real-world public health situations.

13. The calculator was user-friendly and straightforward. A recommendation I have could be the addition of a dropdown menu for selecting time intervals (days, months, years) paired with a corresponding box for numerical input. This feature would enhance usability by making it clear what type of temporal data is needed.

Using a calculator like this in future classes could deepen students' understanding of epidemiology by reducing common errors in manual calculations, a mistake I have made. To ensure comprehension of the material it could be beneficial to have students perform calculations manually first and then use the tool. This would allow them to compare their manual results with the tool's output, fostering critical thinking about the differences. This approach could even be integrated into assessments, with a test question prompting students to explain any discrepancies they observed between manual and automated calculations.

For effective learning, a hybrid approach would be ideal. Students should initially learn how to perform calculations manually, solidifying their foundational knowledge, and then use the calculator in later exercises or group activities. For instance, during the first class, students could perform calculations manually, then work in breakout rooms to apply the tool. This balance would ensure they understand the underlying concepts while becoming proficient with technology.

I would recommend introducing tools such as this in parallel with the manual calculations, like stats class. This calculator reflects a broader trend in numerous fields, where software tools are widely used to streamline analyses. By understanding manual calculations, students gain insight into what each input represents, which directly affects the output.

In addition to calculation tools, incorporating other computing resources could also support the learning of basic epidemiology. For example, a more comprehensive version of this calculator could include dropdown menus for specific calculations—like odds ratios, risk measures, and age-adjusted mortality. This would allow students to select the appropriate calculation for a given scenario. However, the tool should still require students to understand which calculation they need and why, like how SPSS functions in statistical coursework.

14. Yes, the calculator was very simple to use.

I think the drop-down menu for the multiplier should be simplified and restricted to multiples of ten.

In addition, inserting the definitions for important terms like “at risk” or “time interval” would help students remember them. These terms can simply be linked or an information icon at the end of the sentence can be placed that pops up to a dialogue box with the definition.

From my own experience, I think that, in addition to the lecture, it would be a great tool because it takes a while before one stops reverting to notes for the mathematical formula of specific calculations. It also provides a standard interpretation of the results, which are a crucial part of

understanding which formulas and variables to use. So even from the question asked, the student would be able to hypothesize the required answer, determine the type of formula to use, and then assess whether the variables present are proper and sufficient.

I think its better to practice with this calculator as they develop their proficiency. The program keeps asking for specific variables to provide specific outcomes. This process subtly integrates an understanding of which calculations are possible with specific data. Thereby, the student develops a good understanding of the process of calculation.

I think an important issue is practicality. First of all, the program allows you to play with numbers and ideas. Play is essential to learning. Second, most calculations done by statisticians are done via computer. Perhaps the only reason we do things manually is to understand the essence of the problems presented and the logical decision-making regarding which formulas to use. I think that can be learned as the student uses the calculator. Eventually, the calculator will retain its role for larger calculations because the student already has a blueprint of how to complete the calculations manually.

Considering the method of teaching, an interactive whiteboard would be a solution to easing the instruction and it also places the instructor in a better position to teach. Example of such devices: Vibe Smart Whiteboard S1 | All-In-One Collaborative Whiteboard for Business | Vibe . I think having software that transforms the findings from equations into graphs or plots helps the student visualize what has been discovered about that particular disease distribution or outcome.

15. I think the calculator in this exercise was straightforward to use and navigate. The incidence proportion was quickly and easily calculated by inputting key details such as the number of new

cases, the population at risk, the period, and selecting a multiplier. This simple procedure made gaining an accurate result easy. However, there are certain areas where improvements could be beneficial. For example, the tool could be made more flexible to fit different epidemiological scenarios by adding more options or periods related to diseases. Also, including detailed explanations of the calculation could improve its educational value, assisting users in understanding each step of the procedure.

Once students understand the concepts well, using a calculator to check incidence proportion calculations can be helpful. This can reinforce their learning and make them feel more confident. However, learning how to do the calculations by hand is essential. Once students can do that, a calculator can be used to check their answers and save time.

I think it's helpful to use both manual calculations and calculators in class to help students understand the material better. We should start by doing calculations by hand. Once students feel confident, we can introduce calculators to make things easier when the data gets more complicated. This way, students can learn the basics and use technology to help them.

Other tools, besides calculators, can also help teach epidemiology. For example, tools that show data in pictures can make complicated ideas easier to understand. Students can see patterns in the data and learn to use Geographic Information Systems (GIS) to map disease outbreaks. This gives them practical experience with real-world tools and helps them learn important things for their future jobs.

16. Was the calculator easy to use? What improvements could be made to improve or enhance the calculator?

The calculator was exceptionally user-friendly, making it easy to navigate and perform calculations. Its functionality was impressive, and I particularly appreciated its ability to calculate various measures covered in weeks 1 to 3 of our epidemiology course. However, I do think that adding a feature to display previous calculations would further enhance its utility.

Do you think using a calculator such as this (with functionality to calculate all the measures learned in weeks 1 to 3) in future classes would help students develop a deeper understanding of epidemiology, or limit their learning? Explain your thoughts.

While the calculator is an excellent tool, I believe its introduction should be strategically timed in the learning process. Using this calculator too early in the course might hinder students' ability to develop a deep understanding of epidemiological concepts. The calculations covered in the initial weeks are relatively straightforward and can be easily performed manually. Early reliance on the calculator might lead to confusion when interpreting results.

Would you recommend using this program for future students before or after they have learned manual calculations? Why would you make this recommendation?

To maximize its benefits, I recommend introducing this calculator after students have mastered manual calculations. This approach will enable them to comprehend the underlying principles and accurately interpret results. A balanced approach could be adopted, allowing students to use calculators for assignments but requiring manual calculations during exams.

How do you think the balance between manual calculations and using a program should be handled in future classes? Please provide details on your reasoning.

I think it's crucial to ensure students grasp fundamental concepts before leveraging technology.

By doing so, we can foster a comprehensive understanding of epidemiology.

Besides calculation tools, what other types of computing and/or technology do you think could enhance learning basic epidemiology?

Currently, I'm unaware of other computing or technological tools that could significantly enhance learning basic epidemiology.

In summary, the calculator is an outstanding resource, but its introduction should be carefully timed to avoid undermining the learning process. By striking a balance between manual calculations and technological aids, we can provide students with a robust foundation in epidemiology.

17. The process of using the Incidence Proportion Calculator was simple. The user-friendly interface allowed entering data quickly and getting results immediately. Still, there are a few things that could be done better. Initially, by placing informative tooltips next to every input field, users may be helped to understand what information is required, particularly if they are unfamiliar with epidemiological terminology. Furthermore, by giving numerical results a visual context, adding visual representations of the data, like graphs or charts, may improve comprehension.

In terms of using these kinds of calculators in the future, I think that if they are used carefully, they can greatly help students grasp epidemiology. Although understanding the basic principles requires human computations, a calculator can be a useful tool for understanding complex data sets and verifying results. Rather than restricting understanding, this dual method might enhance it. Pupils can gain knowledge on how to evaluate calculations within a larger epidemiological framework and know when a computation is accurate.

After learning how to perform manual calculations, I would advise future students to use this calculator. This advice is based on the notion that firsthand experience with manual calculations develops a solid foundation of knowledge. After they understand the material, using a calculator can help students work more efficiently and free up their time so they can concentrate on application and interpretation rather than tedious calculations. It helps children to understand the usefulness of the formulas they have learned and how they relate to actual situations.

Future classrooms must strike a balance between using calculators and manual calculations. A better way could be to begin the course by teaching the basic ideas through calculations by hand in the first few weeks. Students might move on to using calculators for more advanced analysis if they had a firm understanding. In addition to strengthening their knowledge, this approach gets them ready for situations where technology is frequently used in the real world. Various technologies can improve learning in basic epidemiology in addition to calculating tools. For example, students can see how disease spreads through communities in various settings

with the use of simulation software. Online learning environments that promote debate and cooperation can also improve student learning by enabling them to interact with classmates and exchange ideas. Incorporating data visualization tools can also assist students in better understanding the importance of their computations by facilitating their interpretation and presentation of epidemiological data.

In summary, although the Incidence Proportion Calculator is a useful tool, manual calculation methods should still be used in addition to it in epidemiology teaching. If both approaches are balanced, students will gain a thorough understanding of the subject and the abilities necessary to succeed in the profession.

18. The 'Incidence Proportion Calculator' is a rather user-friendly tool that seems to be designed to aid in the computation of key epidemiological measures. It really seems to provide accurate calculations including for student-level utilization. Upon using the calculator, I found the interface intuitive and straightforward. Input fields were clearly labeled, making it easy to enter the necessary data. However, to enhance its functionality, a few improvements could be made. For instance, incorporating example values or brief descriptions for each input field would guide users in understanding what data is needed. Additionally, a short tutorial video or an FAQ section could further assist users, particularly those new to epidemiological calculations.

In terms of educational impact, incorporating a calculator like this in future classes could significantly deepen students' comprehension of epidemiology. The efficiency of the calculator allows students to focus on interpreting data rather than getting lost in manual calculations.

However, there is a potential downside: if students rely too heavily on such tools, they might miss out on grasping foundational concepts. Therefore, it is crucial that these calculators are integrated alongside traditional methods to ensure a well-rounded educational experience.

I recommend that other students engage with this calculator only after they have learned manual calculations. Understanding the fundamental concepts and calculations first allows

students to appreciate the results produced by the calculator. When students are familiar with the manual processes, they will be better equipped to critically analyze the outcomes generated by the calculator, making the tool a complementary resource rather than a crutch.

Balancing manual calculations with the use of technological tools in future classes is essential for effective learning. I propose that the curriculum initially focus on manual calculations to establish a strong foundational understanding of epidemiological concepts. Once students demonstrate proficiency in manual calculations, the integration of calculators can enhance their learning experience. This approach ensures that students understand not only how to arrive at answers but also the significance of the data they are working with.

Paired with calculation tools, various technologies could enhance the learning of basic epidemiology. For example, interactive data visualization tools can help students grasp complex epidemiological concepts by providing visual representations of trends and patterns. Online simulations that mimic real-world epidemiological scenarios can also enhance critical thinking and application skills. Furthermore, collaborative platforms, such as discussion forums or group projects, encourage peer interaction, allowing students to share insights and broaden their understanding through collective learning. Overall, while the 'Incidence Proportion Calculator' currently might serve as a valuable tool for facilitating calculations, it should be used judiciously within an educational framework that prioritizes foundational knowledge. I believe this resource has ample potential to be rather engaging for students moving forward especially with further improvements.

19. After playing around with the calculation program, I thought that it was fairly easy to use.

One way to potentially improve the calculation program would be adding more details to the prompts for filling in details would make it a bit easier to use.

I think it would limit their learning if this were available to them when they are learning the material in the first 3 weeks. Learning how to do it yourself forces you to understand what you

are doing and why you are getting certain answers. If they have this tool right away and never learn how to do it the long way, I believe they would not fully understand what they are doing/learning.

I would recommend using this program after they have learned how to do the manual calculator for future students. This is because, learning how to do these calculations gives you an understanding of the material you are learning and not just plugging the numbers in and letting it generate the answer for you. Being able to do it manually, even if it is long and annoying, gives you a better understanding on why you get the answers you do.

The balance between manual calculations and using a program should be split up. When first learning the calculations at the beginning of the semester in the first few weeks, learn how to do it manually. This will give them the knowledge and understanding of what they are doing and looking at. After learning the manual calculator, having access to the program would be beneficial. The program will give them more time to focus on everything else they are learning and still be able to get the calculations needed throughout the semester. The program will give them more time on everything else and less time manually doing the calculations all semester. I think having more videos breaking down certain topics would be beneficial in the class. Some topics are harder and having another point of view to break things down even more would be beneficial in the long run.

20. As a middle-aged adult returning to college after being out for 20 years, this application has proven to be most helpful. You asked: “do you think using a calculator such as this (with functionality to calculate all the measures learned in weeks 1 to 3) in future classes would help students develop a deeper understanding of epidemiology or limit their learning”, and I would say: it would aid in developing a deeper understanding of epidemiology. Being able to plug in the numbers and have an analysis ran for you, slightly reminds me of using SPSS in biostatistics. I fully agree with you Dr. Sahli, that the student should still know how to do these

equations and know “what goes where.” This application may be most helpful when you are beginning to study and try to understand epidemiology, since there are many equations. Even though this is “simple math” for some, it can be a bit intimidating for others. This application will remove some barriers for learning. As with any tool, it is just that, a tool. You still must know how to interpret your findings and know what everything means.

The development of this application should prove to give more pros than cons from a student’s standpoint. The calculator is easy to use. At this point, I would not change anything to improve or enhance the calculator, it is straight-forward and user-friendly, as is. I would recommend using this program for future students after they have learned manual calculations because what I have found is that you should know how to do things with your brain and by hand before you learn an easier way. For instance, when I learned how to work with fractions, long division, and multiplication, I was taught with pencil and paper, then my teacher let us a calculator. However, if you do not have “tools” per se, you should still know how to calculate to get the answer.

Moreover, the way to balance between manual calculations and using a program should be overseen in future classes should be an individualized approach. As a professor, you can always “read the room” and tell “who needs what.”

With me being a “middle-aged student, and not being very tech savvy, it would be difficult to comment on: “besides calculation tools, what other types of computing and/or technology do you think could enhance learning basic epidemiology.” Yet, what has been most helpful are your office hours and study sessions, as there is nothing like learning from the professor.

21. My calculations for this assignment were simple to utilize. This was done quite easily and quickly using the key entries for new cases, population at risk, time and multiplier selection. This was easy to use, no problem in finding the right answer. Still, there are a few places where a few tweaks might be helpful. For instance, they might be enhanced by adding more options or

periods related to illnesses, or by making the tool more adaptable for a variety of epidemiological settings. Likewise, thorough justifications of the computation might augment its pedagogical worth by guiding the user through every phase of the process. It is helpful when students who understand the principles verify the frequency and proportion estimates using a calculator. In this instance, it may strengthen the educational process and give to the students more self-assurance. However, it's crucial to understand how to perform the computations by hand. Once it is completed, you can spare time by checking the result using a math tool. I think that using calculators and manual computations in the classroom might help the students comprehend the material better. We must start with the manual computations. We will introduce calculators to the class after they are at ease so that they can make complicated data easier to understand. Through this approach, children might benefit from technology while learning the basics.

There are several tools available that are used in epidemiology education other than calculators. Epidemiology tracks, analyzes, and regulates illness patterns in communities using technologies including laboratory testing, GIS mapping, epidemiologic research, surveillance systems, and biostatistics. But one of the tools that could be helpful for students to understand complicated concepts is by using picture-drawing. Through this, students may learn how to map disease outbreaks using Geographic Information Systems and understand data trends. Through hands-on practice with actual tools, they learn about things that will be useful in their future careers.

22. I thought the calculator was extremely easy to use. I like that the formula is at the top so it reinforces what you have learned, and the calculator makes it easy to plug in the numbers. I think for the “suitable multiplier” portion it could have suggestions or an info popup since I did not remember that the multiplier would be “per ____” people. I used 100 but 1000 would have

made more sense. I really like that it interprets the answer for you as well, as that is something I personally struggle with as well.

I have mixed feelings about whether this would enhance learning. In my case, I really struggle to remember the application of certain formulas, like which should be used for which situation. I don't think the calculator would help me in that case because I would first need to choose the measure. I don't think at the graduate level remembering the formulas is important, but I do believe that remembering the applications is. I am a healthcare administration student therefore I will not be using epidemiological measures in my everyday career, so I do think that the calculator would be more efficient for me, but I do not think that it would drive a deeper understanding of epidemiology.

I would not recommend this be introduced prior to learning manual calculations. I think this can be a great resource for exams, homework, etc., but I do think that students should learn to do the manual calculations first to assure they are getting the correct answers. But the most important part to me is to remember and understand the applicability of the formulas.

I think that the calculator would be nice to have for exams and homework to double check answers. I do think you can gauge a student's understanding based on picking the correct measure to use. I think in the future if you added other measures, having a graphing function to compare 2 measures would be neat. I am not sure if this would help in understanding, but sometimes I think it is interesting to see different measures compared with each other. Overall, I think the calculator is a great tool and was very user friendly. I do not think it should replace learning the manual calculations but can be a great resource to check your answers.

23. I found the calculator very easy to use. With one cycle of input and output, I was better able to understand the calculation of incidence proportion. If the tool included all of the measures of disease frequency we have learned, I would have a clearer understanding of the material.

Including this calculator earlier in the course would help me to comprehend the material more easily by reducing visual noise. Its simplicity of input and output provides organizational clarity. Learning from slides during a lecture can be difficult for me. There is so much to see on a slide. Charts require a lot of concentration for me to decode. I need a minute and then I am left behind.

If this tool could be designed to be built by the student, it would enhance understanding greatly! It could include a library of questions like “How many were at risk at beginning of time interval?” or “How many new disease cases occurred during the time interval?” or “how many cases of disease are present in the community?” or “what is the size of the study population” etc. they could be chosen and assembled by the student to create the correct measure of frequency.

If that is too difficult to program, then maybe the tool could be designed for the student to have to answer a series of questions correctly to be able to access the calculator. If they answer incorrectly, there could be information provided to understand the mistake. Making one’s way through the program would help teach the material. This could be a self-correcting learning system that would offer additional support for all types of learners. This would limit frustration while supporting deeper understanding.

If the calculator could be designed to be buildable by the student, it could be presented at the same time as the as the student learns the material. Alternatively, if it is not buildable, it would still be very useful to provide after the student first learns how to choose the correct measure of frequency. I think it could be limiting to present the calculator fully assembled before the student understands under what circumstances to use each formula. I do not think that practicing manual calculations provides any important learning. It is more important to know which measure of frequency to use under which circumstance and which formula is needed to provide the measure. A manual calculation only shows that you can type in the numbers correctly.

To further enhance my own learning, it would be nice to have clickable flash cards that define terms and show appropriate calculations. I learn better when I do not have to sift through reference material and flash cards would help me organize the information and retrieve it more reliably. I would find it especially helpful as a student to build this tool as part of the learning process. Kind of like how Dr Sahli is having us build our own study design chart to help us integrate that knowledge.