The face shield concept presented here is a work in progress aiming to provide basic functionality and is not a replacement for “real” PPE. It is intended as a temporary item for midwives performing homebirths in Vancouver, BC who otherwise have not been able to acquire adequate supplies of official PPE during the current shortages due to COVID-19. While a small number have already been made and provided to local midwives, they have not been fully tested nor remotely certified for use by any regulatory body. The assumption here is that whoever is using this design will try it out before using it in the field to make sure they know how to put it together and to understand its limitations.*

It is, however, a simple design requiring little in terms of cost, special materials, tools, machinery, and ultimately time to make - the goal is that one should be able to quickly and easily source the materials needed to try it out and make the final judgement call as to whether it meets their needs. If you need a face shield today and have a few minutes, our hope is you can make one yourself with items you might have at home or can get from your local stationery and hardware stores.

Many creative designs have popped up on social media for providing frontline medical staff with temporary equipment they are lacking. We initially explored some of the 3D printed ideas for face shields that have been widely shared, and were able to print a few to test out. However we felt they took too much time to fabricate, and for what they were we felt they would end up too expensive. We were also uncomfortable with moving forward with a design that relied on such specialized equipment, materials, and expertise, and at the same time unable to verify the suitability of typical 3D printed materials in terms of their cleanability and durability in midwifery applications.

We have no doubt others have successfully improvised similar face shields for the same purpose; we’re just sharing steps for anyone to make a low-tech version in about 5 minutes. We’d welcome any feedback and suggestions for improvements and wish everyone the best of luck.
**What you need**
Below is a list of things and tools we used. You can likely substitute other materials and tools that perform the same function as thin flexible plastic sheets for the headband, depending on what’s available in the area, eg. just use a milk jug. For the screws, we used low profile screws from what Home Depot calls “Chicago Screws”, McMaster-Carr calls “Binding Barrels and Screws” so they would be comfortable but substitute with whatever is available - part numbers are provided and searchable on the respective store websites.

<table>
<thead>
<tr>
<th>Components</th>
<th>Materials Used In Our Concept</th>
<th>Where to buy if needed (CAN/US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>transparent sheet for shield</td>
<td>8.5” x 11” overhead projectory transparency</td>
<td>office / stationery stores</td>
</tr>
<tr>
<td>more durable but still flexible plastic strip for headband</td>
<td>0.055” / 1.4mm thick HDPE sheet or 4L plastic milk jug</td>
<td>plastic supply / hardware stores</td>
</tr>
</tbody>
</table>
| fasteners to attach shield to headband          | 8-32 aluminum low profile screws 8-32 brass flanged knurled-head thumb nuts (or equivalent screws & nuts) | Home Depot #: 135118, 129085  
McMaster-Carr #: 93121A342, 92741A120 |
| elastic tie                                     | sewing elastic or equivalent stretch cord | sewing / hardware stores                         |

**Suggested Tools**
- utility knife, scissors for cutting headband, visor, elastic
- swiss army knife - reamer tool hand reaming smooth holes in headband
- paper hole puncher, soldering iron, or steel punches optional - alternate hole making tools
- straight edge metal ruler works well to make straight cuts

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[Diagram showing materials and tools used in the construction of the face shield, including a 8.5” x 11” overhead transparency, elastic, 2 x low profile screws, 2 x knurled thumb nuts, and a flexible plastic strip.]
Instructions
Once you’ve gathered your materials, it should take you about 5 minutes or less to make your face shield.

Make the headband
You can make this with just one knife if that’s all you have. It’s just easier and potentially safer cutting with the tools suggested. We used HDPE sheeting (0.055” / 1.4mm thick) from our local plastics supplier, which is flexible but durable, easy to cut, ream holes in, and easy to clean,

1. Cut a thin strip 18” long and 1” wide.
2. Mark the centre.
3. Mark the strip at 4.25” and again at 8.5” on either side of the centre point.
4. Use the reamer to hand drill holes large enough to fit the screws you are using at the 4.25” marks
5. Use the reamer to hand drill 0.25” holes at the 8.5” marks

If you have access to a 24” x 24” sheet of HDPE plastic, you can easily make 24 headbands in about 30 minutes. Pictured below are longer versions of the headbands with more adjustment holes for more adjustability (not always needed).
**Make the transparent shield**
We used 8.5” x 11” overhead projector transparency sheets.

1. Mark a dot 0.5” in from the sides on two corners along the long edge of the sheet
2. Use the reamer to carefully make holes at your markings large enough to fit the screws you are using
   
   Optional - use a paper hole puncher to make the holes, carpentry steel punches, or melt holes using a soldering iron
Putting it together and wearing

1. Put screws into the middle holes and attach the transparent shield with the thumb nuts.
2. Tie elastic to rear holes
3. Test fit and adjust elastic length and angle of shield to allow for some space from wearer's face to reduce fogging
4. Headband should sit above brow line - note the shield is open at the top, also to reduce fogging
5. To adjust or take off - grasp the bottom corners of the visor and move head downwards and back out of the headband without touching face
Cleaning
1. Disassemble all parts and clean with alcohol or wash
2. Discard transparency and elastic if necessary and replace with new

Storage
1. The 8.5” x 11” transparencies fit exactly in a Large sized Ziploc Freezer Bag - you can store several extras in your charting binder
2. Keep headband in separate Ziploc bag with screws and elastics attached to simplify assembly when needed
3. Spare fasteners and elastics are also easy to bring along

Optional - A longer strip allows for more holes for elastic attachment points to fit bigger and smaller head sizes. Use scissors to round off outer corners if you want, and include an extra screw and thumb nut in case one gets lost in use
Overhead Projector Transparency vs PETG

While projector transparency sheets are not very durable, they are inexpensive and easy to replace as needed, and really lightweight making the entire unit feel secure even in motion. Alternatively the design allows for use of flexible PETG sheet (0.030” / 0.8mm thick) for the shield instead of overhead projector transparencies - still hand cuttable and provides better clarity, cleanability, allows for different shield shapes, bigger gap between face and shield to reduce fogging, no modifications to headband necessary. PETG will be more expensive, harder to find in some places, and feel much heavier when worn for long periods.
Other Material Suggestions

COVID-19 related restrictions on travel, business closures and shipping delays may complicate people’s ability to get even the few items needed for this face shield. Here are some ideas for material substitutions.

<table>
<thead>
<tr>
<th>Material</th>
<th>Suggestion</th>
</tr>
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<tbody>
<tr>
<td><strong>Headband</strong></td>
<td>Use a plastic 4L milk or juice jug, which are often also made out of HDPE (you can check the recycling plastic code on the bottom). Cut a strip of plastic out of the middle (see pics). It’s not pretty but it works. Cardboard also works, but is not going to be reusable or waterproof.</td>
</tr>
<tr>
<td><strong>Transparent shield</strong></td>
<td>You can substitute A4 sized sheets, clear binder covers, scavenged polycarbonate from juice containers, retail packaging, etc. - just keep in mind you may need to adjust the locations of the attachment holes on the headband with different materials.</td>
</tr>
<tr>
<td><strong>Shield fasteners</strong></td>
<td>Different shaped screws and nuts than what we’ve used will also work to attach the transparent shield to your headband. Permanent fasteners can also work for single use variations - depending on the thickness of the headband materials you are able to find, try grommets, rivets, staples etc. - make sure the sharp ends of any of your fasteners are facing outwards, and the smooth sides are on the inside of the headband.</td>
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<tr>
<td><strong>Elastic</strong></td>
<td>Anything that can stretch a bit without breaking should work. String together some produce elastic bands (the thicker ones for broccoli &amp; asparagus), cut a strip off a cotton t-shirt, exercise band (eg. Theraband), balloon, etc.</td>
</tr>
</tbody>
</table>

Some of these suggestions are clearly less than ideal, but an appetite for tinkering will go a long way. Some material substitutions will not be reusable if they can’t be properly cleaned, but if readily available and there are no alternatives, consider if it may be simpler to make multiple sets of face shields to treat as single use supplies.
RELEASE, WAIVER OF LIABILITY, DEFENSE, INDEMNIFICATION AND HOLD HARMLESS AGREEMENT

You acknowledge that you understand that Sen-Huy Tan and Christopher Pond (“S&C”) are acting as good samaritans and independent volunteers providing dissemination of a design for the manufacture of face shields. We do not certify the design or components operate properly or satisfy any regulatory requirements. This Release, Waiver of Liability, Defense, Indemnification and Hold Harmless Agreement (“Agreement”) is meant to reflect the fact that S&C offer the design as an experimental device, without warranty of any kind.

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