This short paper briefly highlights the “10/90 gap” between high-income and low-income countries for both climate change as well as public health research. The term “10/90 gap” as used here is broadly reflective of the disequilibrium between high- and low-income countries in research and other investments in health interventions. The paper then goes on to discuss the significant overlaps and commonalities in terms of climate change impacts as well as solutions when considered against the broad unfinished public health agenda. Through the use of a few selected examples, readers are encouraged to think about how they can foster a holistic, comprehensive approach to address both climate change as well as public health within their jurisdictions.

The 10/90 gap in research and intervention in climate change

There is now irrefutable proof that climate change due to human activity is occurring, and will accelerate in the coming decades unless significant mitigation to reduce greenhouse gas emissions occurs. Empirical data from meteorology, agriculture, hydrology, ecology and other natural sciences is demonstrating the ecological impact of anthropogenic climate change.

Direct and indirect, short- and long-term effects of climate change on human health are being recognized. Data at the global and high-income country level is good. Data from low-income countries is improving. Researchers, policy-makers and civil society now need to use established knowledge translation tools and approaches to ensure that research informs practice and vise versa. Expanding empirical research only from high-income to low-income regions in itself will not be sufficient or timely to bring about change. This is especially true because some of the modelling exercises are complex and the impacts not easily generalizable to the local context.

Health, environmental, ecological and social sciences researchers have learnt a great deal about the value of linking researchers with civil society and policy-makers. These lessons learnt need to be applied broadly to the climate change and health agenda.

The 10/90 gap in research and intervention in public health

Many of the successes of public health that are now taken for granted in high-income countries remain unattainable for the majority of the population in low-income countries. There have been notable successes in public health achievements in low-income countries, such as childhood immunization programmes, resulting in reduction of childhood deaths from vaccine-preventable infectious diseases. However preventable illnesses due to issues such as unsafe water, malnutrition and vector-borne diseases such as malaria remain unacceptably high. It is pertinent to note that many of the existing gaps in public health in low-income regions continue to have a major environmental, nutritional or infectious disease component. These are the very issues that will be further negatively impacted by global climate change.

Research gaps are not limited to technical issues. They are also in governance, funding and operationalization. Therefore research should not only be on causes of morbidity and mortality due to climate change and surveillance of health effects, but also on feasibility of applying cost-effective interventions and evaluating their impact.

Opportunities for convergence in climate change and public health research and action

There is considerable overlap between research needs for public health and climate change when one considers protecting human populations from the adverse effects of climate change, especially for the worlds’ most vulnerable populations. For these populations, the greatest impact of climate change will not be some novel disease or other environmental stress; it will be an accentuation of existing challenges including vector-borne diseases such as malaria.

<table>
<thead>
<tr>
<th>Level of implementation</th>
<th>Key tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>Education</td>
</tr>
<tr>
<td>Household</td>
<td>Empowerment</td>
</tr>
<tr>
<td>Community</td>
<td>Information, resilience, facilitation</td>
</tr>
<tr>
<td>Region/country</td>
<td>Policy, regulation, financing, equity</td>
</tr>
<tr>
<td>Global</td>
<td>Collaboration, equity, financing</td>
</tr>
</tbody>
</table>

Table 1: Key tools for application of climate change research and interventions by level of implementation
and dengue; poor water quality and quantity; hunger and malnutrition; hot and unpredictable weather patterns; and more frequent storms and natural disasters2.

The direct effects of climate change such as thermal stress have been well quantified for high-income countries and are beginning to be modelled for low-income countries. Similarly, the indirect but early effects of climate change such as increase in water- and vector-borne diseases are also now beginning to be estimated. Long-term effects however, such as impact of ecological changes on food security, water accessibility and extreme weather events such as hurricanes and storms is harder to estimate globally3.

There is some debate about what the microclimatic impacts of climate change at the local level will be. It is a fair assumption that they will be predominantly negative for the majority of people living in low-income countries. They may be initially climate neutral or positive for a few people living in low-income countries and some in high-income countries. However, over time, the global impacts on health, economy, and ecology are now considered to be profoundly negative4.

Investments made in research in public health programmes and interventions that are impacted by climate change now and into the future are also, in many instances, issues that are or should also currently be high priority in terms of preventable public health disease burden5.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Do technical solutions exist?</th>
<th>Are technical solutions successfully implemented in low-income countries?</th>
<th>Barriers to implementation</th>
<th>Opportunities for research, knowledge translation, implementation and evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vector-borne diseases</td>
<td>Yes</td>
<td>Somewhat</td>
<td>Climate, geography, economy, governance</td>
<td>Solutions need to be appropriate, acceptable and sustainable</td>
</tr>
<tr>
<td>Disasters: hurricanes, cyclones</td>
<td>Limited</td>
<td>Limited</td>
<td>Populations already vulnerable</td>
<td>Increase state and community capacity and resiliency to predict and respond to natural disasters</td>
</tr>
<tr>
<td>Water stress</td>
<td>Limited</td>
<td>Limited</td>
<td>Loss of local control over water resources. Powerful competing interests on decreasing fresh water supplies</td>
<td>Resource poor communities have always traditionally conserved water; local knowledge and empowerment has to be linked to new technologies for water conservation</td>
</tr>
<tr>
<td>Safe water supply</td>
<td>Yes</td>
<td>Not uniformly</td>
<td>Macroeconomic limitations; lack of local training and infrastructure</td>
<td>Investment in infrastructure and point of use capacity</td>
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<td>Changing agricultural yield</td>
<td>Historically strong capacity to increase agricultural yields</td>
<td>Significant experience in translating research into improved agricultural yields</td>
<td>Some areas may have peaked in their capacity to sustain increasing yields</td>
<td>Understanding fundamental changes that may be required in crop types</td>
</tr>
<tr>
<td>Poverty and inequity</td>
<td>Limited</td>
<td>Significant successes related to micro credit, literacy and empowerment</td>
<td>Continuing unmet needs in female literacy and gender equity</td>
<td>Demonstrating how addressing poverty and inequity can increase community capacity and social capital</td>
</tr>
<tr>
<td>Conflict</td>
<td>Limited</td>
<td>Non conflict based dispute resolution as advocated by intergovernmental organizations and local and global civil societies</td>
<td>Perceived national self interest. Historical rivalries</td>
<td>Demonstration of non conflict based solutions as ultimately more sustainable</td>
</tr>
</tbody>
</table>


Table 2: Approach to application of technical knowledge in low-income settings

Innovating for health and development

Achieving the Millennium Development Goals (especially as they relate to hunger, universal primary education, gender equality, child mortality, malaria, environmental sustainability and a global partnership for development) will increase the resilience and adaptive capacity of the most vulnerable populations to the known and potential negative consequences of climate change, in addition to being a demonstrated public health goal in their own right3.

The “new public health” stresses not just the direct, proximate causes of ill-health, but also the more distal, broadly defined “determinants of health”. Application of these public health principles would foster a more holistic understanding of the approach to health protection and health promotion in the face of climate change2. Health should, after all, be “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”9.
The synergistic, catalytic power of this convergence has great potential. It can protect vulnerable populations from current known public health threats that are also being potentiated by climate change; and also make vulnerable populations more resilient to cope with future potentially unknown threats. Not seeking convergence of the climate change and public health research and intervention agenda, however, runs the risk of potentially undoing many of the public health gains of the recent past.

Innovative strategies for research in climate change and public health

Mitigation is preventing climate change in the first place, primarily by reducing greenhouse gas emissions and other anthropogenic activity contributing to climate change. Adaptation is adjusting to current and future impacts of climate change. The health sector needs to engage with and support research in both the mitigation as well as the adaptation sector. While research in mitigation is primarily seen as a responsibility of the energy sector. There are substantial potential co-benefits to health beyond reversal of climate change if health-centric approaches to mitigation are adopted. These include:

- Improved air quality with reduction of fossil fuel use and greater use of cleaner alternative energy sources.
- Reduction in injuries due to road traffic accidents with increased reliance on public transport and better urban,

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**Figure 1:** Framework for conceptual map of research areas and domains

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**Figure 2:** An approach to analysing the burden of a health problem to identify research needs. Relative shares of the burden that can and cannot be averted with existing needs.

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{x} = population coverage with current mix of interventions

{y} = maximum achievable coverage with a mix of available cost-effective interventions

{z} = combined efficacy of a mix of all available interventions

community and work life planning.

- Prevention of chronic diseases such as diabetes, stroke and heart disease by promoting active transport such as walking and cycling and healthier diets.

As the benefits for mitigation are global, for both high-income as well as low-income countries, momentum is building globally for a concerted effort to mitigate the health impacts of climate change. It is important to continue to document the health impacts of climate change as well as mitigation by enhanced surveillance systems to continue to provide evidence and impetus for climate change mitigation.

Meanwhile, it is essential that populations globally prepare to adapt to some of the inevitable adverse consequences of climate change until such time that mitigation efforts start to have a stabilizing effect.

The application of research for adaptation, while of global significance and import, has to be rooted in local contexts of geography, economics and culture.

It is important to have a conceptual map of what research is required (see Figure 1)

Research approaches need to be empirical but also ecological. The translation and application of existing and new research findings needs to act both at the community level in terms of empowerment as well as at a global/regional level in terms of policy and funding. Many public health interventions that will also protect vulnerable populations against progressive climate change act at a variety of levels including individual, household, community, national and regional (see Table 1)

Examples of successful interventions include:

- Household uptake of long-lasting insecticide-treated bed nets when combined with other more standard vector control programmes.
- Provision of effective, affordable, locally manufactured point-of-use water filters.

For each example of a successful or promising intervention, it is not sufficient just to know whether a technical solution exists. Research on cost-effective and sustainable implementation also needs to occur (see Table 2)

Conclusions

While the challenges are significant, so are the opportunities. Climate change seems to have acted as a catalyst promoting trans-disciplinary, holistic, global partnerships in research, knowledge generation, translation and action.

Many initiatives are currently underway especially in the environmental, agricultural and water resources sectors to assess impacts to and adaptation from a developing country perspective. The issue of health should be one of the explicit foci of these initiatives.

Innovative approaches from regional “second generation” assessments of the impacts of and adaptation to climate change done primarily in agriculture and water resources need to be replicated and expanded to include direct and indirect health impact and adaptation assessments.

Civil society is well prepared to engage with governments and researchers to advocate for and adopt contextually appropriate local interventions to mitigate and adapt to climate change. There is unprecedented open access for most if not all stakeholders to information thorough the World Wide Web.

Along with the expected increase in funding for climate change research and interventions, it is vital that this spirit of openness and collaboration is maintained. Innovation in climate change research and interventions potentially has the promise to address many existing and long-standing public health issues as well as prepare for future risks.

Key messages

- **Incorporation of climate change health impacts into public health planning:**
  a) Estimate current and future impacts of climate change when planning public health interventions.
  b) For each public health intervention assess if there will be an impact of climate change, and adjust for that.
  c) Climate change should be one of the variables when estimating the impact and outcomes of public health interventions.

- **Partnering with all stakeholders:**
  a) Partner with other stakeholders outside the health sector for climate change adaptation strategies.
  b) Continue to advocate for mitigation as the ultimate goal to address climate change.
  c) Maximize the diffusion of innovations through civil society and the Internet.
  d) Incorporate climate change mitigation and adaptation impacts in intra- and intersectoral planning. Should include all possible sectors such as transportation, housing, energy policy, education, health, agriculture, land use, environment, industries, trade etc.

- **Supporting innovation, collaboration and knowledge translation in research:**
  a) Include climate change as an element to consider for trans-disciplinary research funding.
  b) Make knowledge translation and collaboration with low-income countries a prerequisite for research funding approval in high-income countries.
  c) Support the establishment of public health surveillance systems that monitor the impact of climate change as an integral part of health status and assessment measures.
  d) Ensure research is translated into locally relevant, cost-effective and sustainable interventions.
Saqib Shahab is a physician specializing in public health and preventive medicine. He has trained and worked internationally, including in Pakistan, the UK, US and Canada. Within public health, Saqib has a special interest in environmental and occupational health, communicable and noncommunicable disease control, and surveillance systems. His current interests include incorporating climate change research and interventions as an integral part of public health practice.

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He has a long history of working internationally in global public health, including with the Global Forum for Health Research, with a special interest and expertise in enhancing health systems capacity to participate in and apply research, especially in developing country and resource poor settings. His recent focus has been emphasizing research not just on technical and biomedical issues, but also health system organization, policy, capacity and cost effectiveness.

References


