

PACIFIC JOURNAL OF MEDICAL SCIENCES
{Formerly: Medical Sciences Bulletin}
ISSN: 2072 – 1625



Pac. J. Med. Sci. (PJMS)

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Received: November 2010; Accepted: December 2010

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In recent years, Papua New Guinea (PNG) has seen a resurgence of interest from biological anthropologists wishing to carry out research projects. Generally speaking, biological anthropology (bio anth) draws on medical datasets in order to consider notions of human evolution. However, occasionally, in developing economies, questions are raised about the morality of collecting medical data to investigate evolution, when commonly national governments struggle to fund what might be considered routine public health programmes. Here we emphasise the point that bio anth, can produce interesting and productive synergies, including mutually beneficial datasets.

Broadly speaking, biological anthropology seeks to understand humans the world over, past and present, from an evolutionary perspective. This encompasses an understanding of humans in the context of other animals, in particular primates, the behaviour and biology of humans throughout their evolutionary history and the study of human populations today in terms

of their growth, development and health [1]. On the basis of this definition, there is clearly scope for overlapping research interests with medical sciences. In spite of this, bio anth is occasionally challenged to justify itself in the light of legitimate concerns; particularly in developing economies like PNG, questions such as “why are we allocating funds to biological anthropology when deaths during child-birth are at an unacceptably high level?” come to be asked. While this kind of emotive narrative is, of course, justified in discussions surrounding the national health policy, it can sometimes be a distraction.

There is, from time to time, a common misconception that bio anth projects draw funds away from pure medical research projects. However, in reality, grants for bio anth generally come from different funding agencies to those funding pure medical research. Or, if they do, as in the case of the National Science Foundation (US), the bio anth funds come from a different pool. One such organisation that funds bio anth and not medical science is The Wenner

Gren Foundation. Therefore, bio anth can, in fact, expand the pool of money from which medical science and public health programmes can potentially benefit. What follows is a brief outline of some current and potential bio anth projects that could produce data sets of possible interest to medical science and public health.

Studies into lifestyle diseases:

McDade is a biological anthropologist with an interest in human biology in relation to the surrounding cultural ecological contexts, particularly in relation to human life course, especially amongst youths. His research has developed a range of biomarker methods amenable to the constraints imposed by rural field research conditions [2]. In particular, McDade has investigated the relationship between stress and cultural change amongst Samoan youths. In an extremely successful study, he brought together methodological tools from psychoneuroimmunology with anthropological models of cultural change to investigate stress and its impact on society [3, 4].

In another recent study, this time situated in New Ireland (PNG), sputum samples were collected from which levels of cortisol were measured as an indicator of relative stress. This allowed the researchers to conceive of notions of the role of stress as an indicator

of human adaptability within an evolutionary framework. Suffice it to say, mental health is commonly neglected and could consequently benefit from more attention.

From a public health perspective, studies like these might allow medical scientists to gain a snapshot into the mental health baseline for the study area that might, given stringent assessment, be usefully applied or used as a guide for other parts of the country.

Deoxyribonucleic Acid (DNA):

In recent years, interest from both medical science and anthropology in DNA has dramatically expanded. From the perspective of anthropology, DNA is an extremely useful tool in confirming and creating genealogies. It allows biological anthropologists to interrogate notions of human evolution through charting human ancestry at a variety of scales, including the village (differentiate between families), the region, nations, as well as global population dispersals. For instance, DNA analyses have played a significant role in differentiating between the 'regional continuity' and 'out of Africa' models of human evolution and dispersals. While these studies clearly focus on anthropological questions, the data can equally be applied to issues in contemporary public health. In particular,

much medical research has been undertaken into identifying specific genes that give individuals greater or lesser capacity/resistance to specific diseases. Some knowledge of the genetic character of the PNG citizenry is essential, if we are to take full advantage of any future advances in this research. Curiously enough, a significant proportion of DNA research in PNG has been undertaken by researchers such as Kayser [5], Friedlander [6] and Matisoo-Smith [7], all of whom have a keen interest in biological anthropology. Notably, the latter is a collaborating Principal Investigator on the Genographic Project designed to gain a holistic view of the human genome. Once again, this project was funded by the National Geographic, an organisation which does not commonly fund medical research. Therefore, this project, and others like it, is generating valuable data supported by non-traditional medical science funders.

Additionally, an anecdotal experience reported from a community in the Bismarck Archipelago adds an unexpected twist in support of DNA research. Recently, a Professor of biological anthropology, on the occasion of returning the results of a study to the respective community, remarked that, upon receiving the results (accompanied by extensive explanation), a community leader remarked that it seemed strange that two

neighbouring communities were in the middle of a dispute, given that they were so closely genetically related.

Effectively, the results of the study were interpreted as a political avenue to unite two factions and end hostilities. In this context, the results of a bio anth driven DNA study were co-opted into a peace process that might in turn be seen as a preventative health mechanism.

Studies into the evolution of body size (stature):

Recent studies into human physiological stature based on data from a number of communities across the world have provided some interesting interpretative avenues in terms of human evolution. The interpretations were based on morphometric (and DNA) data reflecting human growth rates. Previously, short stature has been interpreted as a result of thermoregulatory, nutritional and/or locomotory adaptations to life in tropical forests. More recently, it has been suggested that short stature is the outcome of a life history trade-off in high mortality environments, where high mortality rates select for early reproduction - early sexual maturation and, consequently, early growth cessation [8]. This conclusion can immediately be considered in relation to our national health programme. This is because it readily identifies communities with a history of high mortality. Secondly, and by

extension, the data acquired in support of this study can also be extremely useful in planning for health service delivery. Given the genetic and environmental diversity of PNG, it is particularly important to ensure that public health is tailored to the specific needs of each community. Childhood growth is of particular importance to public health. In order to prescribe the best treatment to a particular patient, it is important to have some notion of the general health characteristics of the community from which they originate. In this context, the population profile provided by bio anth could be extremely helpful.

Elsewhere, biological anthropologists are forging ahead with studies into biomechanics. In particular, Shaw and Stock [9] and Shaw [10] sought to determine the relationship between bone morphology and muscle properties in order to gain insights into muscular strength, metabolic rate and other energetic attributes that might in turn be used as an analogue to model the physiology of extinct *hominins*. Shaw used peripheral quantitative computed tomography (pQCT) to measure long-bone cross-sections of European athletes as an analogue for highly active populations [10].

The pQCT technique of data collection has great potential to contribute useful data within bio anth. Conceivably, it could be

applied to consideration of issues such as the impact of rural urban drift on skeletal robusticity within an evolutionary framework. Given the propensity for bio anth to collect statistically relevant datasets, we would indirectly gain datasets that might give us some baseline data on the proportion of diseases such as osteoporosis in the sample population. This, in turn, might be useful in planning for, and directing future medical science research into aged care. There are also other useful spin-off benefits. On some occasions, bio anth researchers have put together teams of researchers that included a Medical Doctor. In one notable case, the project proposal included expenses for a practicing MD to visit a remote community on a regular basis (albeit for the 3 year life of the project). The MD was assigned two roles in the project. First was to assist in the bio anth data collection and, ultimately, in its interpretation; and, secondly, it allowed the community in question to have access to an MD - for the first time ever.

Lastly, and possibly most significant, is that bio anth considers medical data from both a biological and anthropological perspective. The ultimate output is, therefore, conceived from both medical and anthropological perspectives.

This cultural framework is important because, in some significant ways, culture

plays an important role in public health through life-style choices. Culture also plays an important role in considering how a given community is going to respond to medical services in terms of its receptiveness to treatment. Possibly one of the few areas where this is beginning to become well understood is in relation to HIV/AIDS in PNG.

Future directions in biological anthropology:

A recent conference at the McDonald Institute for Archaeological Research at the University of Cambridge brought together archaeologists, evolutionary theorists and neuroscientists with the notion of forging a road towards investigating what archaeologists call the sapient paradox [11]. In a nutshell, while biological anthropologists have determined the approximate timing of the speciation event that gave rise to *Homo sapiens sapiens*, the archaeological evidence for actual modern human behaviour does not begin until significantly later. As these collaborations are in their infancy, only time will tell what spin-off benefits will arise.

CONCLUSION:

When properly co-ordinated, biological anthropology projects can be mutually beneficial to medical science in a variety of ways. The examples described here

illustrate how biological anthropology research can have a net benefit for anthropological studies into human evolution, medical science and Public Health Programmes by producing datasets of relevance in all these fields. The crucial step then is to carefully co-ordinate biological anthropology results so as to maximise these benefits.

ACKNOWLEDGEMENTS:

I would like to thank Andrea Migliano (University College London), Lisa Matisoo-Smith (University of Otago), Robert Foley (University of Cambridge), Colin Shaw (Pennsylvania University), and Brigitte Holt (University of Massachusetts) for helpful discussions.

REFERENCES:

1. www.bioanth.cam.ac.k/pros_ug.htm
2. McDadeTW (www.groups.anthropology.northwestern.edu/1hbr/thomMcDade.html). Viewed on December 2010.
3. McDade, T.W. Status Incongruity in Samoan Youth: A Biocultural Analysis of Culture Change, Stress, and Immune Function. *Med Anthropology Quarterly* 2002; 16:123-150.
4. Mcade, T.W. and C.M. Worthman, Socialisation Ambiguity in Samoan Adolescents: A New Model for Research in Human Development and Stress in the Context of Culture Change. *Journal of Research in Adolescence*, 2004; 14:49-72.

5. Mona, S., M. Tommaseo-Ponzetta, S. Brauer, H. Sudoyo, S. Marzuki, and M. Kayser, Patterns of Y-Chromosome Diversity Intersect with the Trans-New Guinea Hypothesis. *Molecular Biology and Evolution* 2007; 24(11):2546-2555.
6. Friedlander, J. (Ed.) *Genes, Language and Culture History in the Southwest Pacific*. 2007; Oxford University Press.
7. Matisoo-Smith, E. Lapita: A Genetic Perspective. S. Chui, and C. Sand. (Eds.) *From Southeast Asia to the Pacific. Archaeological Perspectives on the Austronesian Expansion and the Lapita Cultural Complex*. 2007; Academia Sinica. Taipei.
8. Migliano, A., L. Vinicius, and M. Lahr, Life History Trade-offs Explain the Evolution of Human Pygmies. *Proceedings of the National Academy of Science* 2007; 104 (51): 20216-20219.
9. Shaw, C. And J. Stock, Habitual Throwing and Swimming Correspond with Upper Limb Diaphyseal Strength and Shape in Modern Human Athletes. *American Journal of Physical Anthropology*, 2009; 140: 160-172.
10. Shaw, C. Putting Flesh back on the bones? Can we predict soft tissue properties from skeletal and fossil remains? *Journal of Human Evolution*, 2010; 59: 484-492.
11. Renfrew, C. Neuroscience, Evolution and the Sapient Paradox: the Factuality of Value and of the Sacred. *Proceedings of the Royal Society B*. 2008; 363:2014-2047.