Review

Geographic information systems and the spiritual dimension of health: a short position paper
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Abstract
The WHO's well known definition of health stressed the indivisibility of human well-being, physical and otherwise, by stating that health is "not merely the absence of disease or infirmity". The spiritual dimension of health is well covered in the medical literature. Different locations on Earth are associated with different interrelated profiles: physical, biological, environmental, socio-economic, cultural, and also spiritual profiles, that do affect and are affected by health (including its spiritual dimension), disease, healthcare, and pastoral care. A number of reviews have been recently published covering the use of Geographic Information Systems (GIS) in understanding and harnessing the importance of location in the health sector. However, no publication so far has discussed the role of GIS in relation to the spiritual dimension of health. This position paper is an attempt to fill in this gap without going into deep details. GIS role in pastoral care ranges from assisting in pattern and trend detection, and in informed decision-making and resource management, to providing routing and educational functions, and even assessing the impact of missionary radio broadcasts. A review of some of the software tools that are currently available in this field is also provided. GIS are ideal tools for improving and coordinating the integration of the health (physical), social, and spiritual/ pastoral dimensions of individual and community care. However to achieve the full potential of GIS in these areas, we still need to combat many cultural and organisational barriers, while making the tools cheaper and much easier to learn and use.

Background and introduction
Beyond physical health: the spiritual dimension
The spirit of a man will sustain him in sickness, but who can bear a broken spirit? (The Holy Bible, Proverbs 18:14, NKJV)

The WHO's well known definition of health stressed the indivisibility of human well-being, physical and otherwise, by stating that health is "not merely the absence of disease or infirmity" (though it stopped short of explicitly mentioning the spiritual aspects of health) [1].

Religious beliefs affect human behaviour, lifestyle, and ultimately human health (e.g., teenagers' sexual purity or continence and its effects on the rates of sexually transmitted diseases and teenage pregnancy). Many health education programmes (e.g., pre-marital sexual abstinence programmes and anti-smoking campaigns) find it a good channel (among others) to reach more people and to positively modify their behaviour through religious education programmes and broadcasts.

The University of Texas Graduate School of Public Health at Houston, Texas, offers a course titled "Spiritual Aspects

of Health" http://www.ihpnet.org/ph4.htm among other related courses provided by the Faith and Health Consortium – The Interfaith Health Program http://www.ihpnet.org/, while Kluwer's Journal of Religion and Health http://www.kluweronline.com/issn/0022-4197/contents is fully dedicated to these issues of spirituality and health.

PubMed, a bibliographic service of the US National Library of Medicine, also indexes more than 60 journals and publications directly covering these topics http:w.ncbi.nlm.nih.gov/ entreery.fcgi?cmd=search&db=Journals&term=Christ*+OR+Pastor*+OR+Religion+OR+Catholic, in addition to the plethora of articles on the same subject that appear from time to time in mainstream medical and health journals, e.g., Leibovici's paper on the effects of remote, retroactive intercessory prayer on outcomes in patients with bloodstream infection that was published in the British Medical Journal [2], and Feudtner et al's paper titled "Spiritual care needs of hospitalized children and their families: a national survey of pastoral care providers' perceptions" that was recently published in Pediatrics (the official journal of the American Academy of Pediatrics) [3].

On location and spirituality
Different locations on Earth are usually associated with different interrelated profiles. These include not only physical, biological, environmental, socio-demographic, economic, and cultural profiles, but also spiritual profiles, that do affect and are affected by health (including its spiritual dimension), disease, healthcare, and pastoral care. These profiles and associated health and disease conditions may also change with time (the temporal dimension) [4].

On the use of geographic information systems in the health sector
Geographic Information Systems (GIS) and related technologies like Global Positioning Systems (GPS) are a rather new information management vehicle. GIS go beyond conventional database and spreadsheet tables. They help us discover and visualise new patterns, trends and relationships in space and time. They allow different geographically-referenced information layers to be matched, interlinked, queried, analysed and visualised together in many ways, thus producing new knowledge (spatial analysis). GIS can be also used to study and monitor temporal changes (that occur over time), provided that data sets of the locations and events under consideration are available at various snapshots in time (spatio-temporal analysis).

In 2003, the US National Library of Medicine added the term "Geographic Information Systems" to its controlled vocabulary thesaurus known as MeSH (Medical Subject Headings – see http://www.nlm.nih.gov/cgi/mesh/200MB_cgi?term=GEOGRAPHIC+INFORMATION+SYSTEMS, a step reflecting the importance and growing use of GIS in health and healthcare research and practices. ("Religion" and "spirituality" are already included in MeSH.)

On the purpose of this paper
A number of reviews of the use of GIS in the health sector have been recently published [4]. However, none of the papers published so far have discussed the role of GIS in relation to the spiritual dimension of health. This paper is an attempt to fill in this gap without going into deep or very technical details. A review of some of the software tools that are currently available in this field is also provided.

It should be noted that this paper is not intended as a review of GIS methods and techniques. These topics are covered elsewhere in many excellent reviews, and the reader is urged to consult them if needed [4].

Using GIS to monitor and improve the spiritual dimension of health
Detecting patterns and trends, and assisting in informed decision-making
In the setting of a church or parish catchment area, GIS can help pastors and Church leaders look after the spiritual well being of their flocks. GIS can assist in knowing people's locations, assessing their needs (knowing the makeup of the "harvest field" – spiritual, socio-demographic, etc.) and determining factors affecting them. With GIS, ministry progress can be tracked and monitored, and workloads can be divided efficiently and effectively among priests and servants (into service areas tailored according to individual priest capabilities and location).

Resource management: planning resources and actions wisely
This set of functions builds on the above-mentioned role of GIS in detecting patterns and trends in the "harvest field", and assisting in informed decision-making. GIS allow resources (human, financial, printed material, equipment, etc.) to be planned and allocated wisely according to needs. They can assist in predicting the outcomes of any action before making any financial commitments. They can also help in continually monitoring and analysing deployed actions, their impact and any relevant changes in the "harvest field".

Routing functions
Thanks to GIS, maps and optimal driving routes can be drawn with extreme precision for visitations and preach-

ing. By optimal driving routes we mean the most efficient and effective visitation routes regarding time utilisation, number of homes visited and car fuel consumption/ transport costs. GPS receivers can be used by mobile pastors and servants to help them easily follow GIS-generated routes. Using GIS (e.g., through a Web-based interface), individuals can also quickly find the nearest church/ ministry centre that is able to fulfil their needs, especially when they travel away from their primary residential location (church locator with maps and driving directions based on user's starting location, e.g., http://www.christi anitytoday.com/churchlocator/.

Educational functions
GIS can also help in studying biblical geography, nations, history, and archaeology. Imagine, for example, an interactive, GIS-driven map of St. Paul's three missionary journeys with different layers (themes) and levels of associated information to access and manipulate. Temporal animations (dynamic maps) can be used to illustrate Old Testament historical events and timelines from a geographic perspective. Finally, GIS can even help in mapping the Christian Web or cyberspace (based on what has been achieved in other topic areas of the Web [5]).

Other uses
Far East Broadcasting Company (FEBC), a missionary radio, broadcasts 627 hours daily to 154 distinct language/ people groups whose total population in Asia, East Africa, the Middle East and Russia is nearly 2.9 billion people. FEBC uses GIS and maps to study their broadcast locations, and (locations of) people's responses to their programming http://www.febc.org/ mapindex_frames.html. This certainly helps them adjust their programming to different areas around the world (timing and content) for maximum impact and outreach.

A review of existing specialised software tools
Global ministry mapping system from global mapping international
Global Mapping International is a Christian inter-denominational missionary research agency based in Colorado Springs, US. Their product, Global Ministry Mapping System Version 3.0 for ESRI ArcView 8.3 (GMMS – http:// www.gmi.org/products/gmms.htm, is a suite of GIS software and data tools specifically designed to facilitate Christian cross-cultural ministry, especially in the developing world. GMMS provides information on locations of ethno-linguistic peoples, and provides global coverage of at least first-level (states, provinces) sub-national political subdivisions, city and town locations, with more than 50 additional layers of information that can be used to give geographic context to missionary maps. It also includes statistical and demographic databases from many research sources in the Christian ministry community, and more than 170 sample map projects on mission-

related themes that may be modified as desired. Users can edit existing data and add/ import their own data. Optional extras include 3-D landforms and a more detailed world data supplement (based on the 5th edition of the Digital Chart of the World).

Kingdom combine software from the mapping centre for evangelism and church growth
The Mapping Centre for Evangelism and Church Growth is a not-for-profit, Florida-based ministry serving all denominations in America. Their US-centred Mapping Centre Kingdom Combine software http://www.map pingcenter.org/ can help with visitations, small groups, and many types of pastoral outreaches. Church members and visitors (church homes) can be easily imported from any church management software and plotted on a map. Users can also view a demographic report of church catchment area. They can plot maps to answer questions like "what is the percentage of people aged 0–17 in a particular area?" Maps of church home can be queried for demographics. More detailed household-level demographics are also available (known as LifeStyles). Current church homes and potential ones can be coded with a unique LifeStyle code identifying information such as marital status, income, presence of children, and more. Users can learn what LifeStyle clusters are prevalent in their pastoral care area and make informed decisions accordingly. Church homes can be linked with their closest small group host home or leader and assigned to them according to distance and LifeStyle. Carers can set follow-up dates and print reports for those who need to be contacted on a certain date or date range. Route maps and directions from any home to any home can be also printed. Points can be selected right on a map to display the route. Other reports for outreach, visitation, and small groups can be also printed and/ or e-mailed. The software can generate mailing list labels, and map and track response to a mailing campaign.

Conclusions
GIS offer many opportunities and have great potential to assist in monitoring, improving and nurturing the spiritual dimension of human health, and for reaching more people, understanding their needs and serving them in much better ways. GIS are also ideal tools for improving and coordinating the integration of the health (physical), social, and spiritual/ pastoral aspects of individual and community care. This should ultimately contribute to the improvement of the overall health and well being of targeted communities.

There are already some good specialised software tools in the market that can help achieving these goals. However to achieve the full potential of GIS in these closely interrelated areas of health, social, and pastoral services, we still

need to combat many cultural and organisational barriers, including "spatial illiteracy" among field workers, while making the tools cheaper and much easier to learn and use. Professional education and hands-on training courses in GIS are extremely important in achieving this goal [4].

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