Factors affecting job satisfaction and retention of medical laboratory professionals in seven countries of Sub-Saharan Africa

Francesco Marinucci1, Mtebe Majigo2*, Matthew Wattleworth1, Antonio Damiano Paterniti1, Mian Bazle Hossain1,3 and Robert Redfield1

Abstract

Effective implementation and sustainability of quality laboratory programmes in Sub-Saharan Africa relies on the development of appropriate staff retention strategies. Assessing the factors responsible for job satisfaction and retention is key for tailoring specific interventions aiming at improving the overall impact of health programmes. A survey was developed to assess these factors among 224 laboratorians working in the laboratory programme the University of Maryland implemented in seven Sub-Saharan African countries. Lack of professional development was the major reason for leaving the previous job for 28% of interviewees who changed jobs in the past five years. Professional development/training opportunities was indicated by almost 90% (195/224) of total interviewees as the most important or a very important factor for satisfaction at their current job. Similarly, regular professional development/opportunities for training was the highest rated incentive to remain at their current job by 80% (179/224). Laboratory professionals employed in the private sector were more likely to change jobs than those working in the public sector (P = 0.002). The findings were used for developing specific strategies for human resources management, in particular targeting professional development, aiming at improving laboratory professionals within the University of Maryland laboratory programme and hence its long-term sustainability.

Keywords: Laboratory professionals, Job satisfaction, Retention, Sub-Saharan Africa

Introduction

One of the major challenges in implementing health programmes in Sub-Saharan Africa is the reliability of medical laboratory services. The diagnostic support of laboratories is essential for a wide range of diseases and testing purposes, both from clinical [1] and public health perspectives [2]. Numerous global initiatives in Africa have focused on clinical laboratory harmonization and standardization [3], and on laboratory accreditation [4]. As a consequence, many programmes over the last decade have been dedicated to building quality laboratory services through training laboratory professionals, upgrading infrastructure at medical facilities, installing new instruments and equipment, and strengthening supply chain systems [5-7]. However, the first barrier for quality improvement at any level of the health care system is human capacity development, which continues to be a gap in implementing health programmes [8-12]. The lack of trained healthcare personnel is widely addressed in numerous programmes [13-15], but often without integrating this training into human resources management at the health facility level.

The quality of medical laboratory operations is driven by technical skills, quality management systems and the motivation of human resources. The technical competency of personnel plays a critical role in ensuring strict adherence to the numerous procedures of the total testing process as defined by the quality management system [16]. To achieve proficiency, laboratory professionals need both targeted training and an appropriate working environment to turn acquired knowledge into technical skills. Numerous efforts have focused on expanding basic coverage of HIV care and treatment, which has resulted in the widespread implementation of new technology throughout Africa. The expanded HIV testing capacity at different levels of the health system, both in terms of
the amount of equipment and in technology, requires additional skills for laboratory professionals. Many laboratory programmes that have implemented new technology have not effectively supported the process of developing technical skills with appropriate training and incentives. Due to lack of exposure and incomplete training on new automation, laboratory technicians can see new technology as additional work instead of being able to do more work more efficiently. The laboratory scale-up poses challenges if technologies are implemented without supporting and training laboratory professionals.

The direct repercussion of this is suboptimal service provided to patients. High turnover rates lead to periods of understaffing in the laboratory, creating increased workloads for remaining staff. Overworked laboratory professionals are more likely to ignore Good Laboratory Practice, thereby increasing the number of mistakes and accidents. The magnitude of high turnover rates due to brain drain is not well understood, hence, the need for monitoring health professionals’ movement within and outside specific programmes.

High turnover of laboratory professionals is a drain on programme funds, as more time and resources need to be devoted to advertise, interview, hire, and train new laboratory professionals. High employee-turnover also makes introducing new diagnostics and techniques, research protocols, quality improvement systems, and policies difficult to implement because new staff lack prerequisite training and do not have the foundation on which to build.

The Institute of Human Virology of the University of Maryland School of Medicine (IHV-UMSOM) assessed the factors affecting satisfaction and incentives for job retention of laboratory professionals at the supported sites in seven African countries. This survey and its results were useful for developing targeted strategies for human resources management aiming at improving laboratory professionals’ retention and therefore, the long-term sustainability of University of Maryland laboratory programmes.
as name and address, were not collected. This study was cleared by University of Maryland, Baltimore applicable to federal regulation 45 CFR §46.101(2) exempted design.

Results
Demographics of laboratory professionals
A total of 257 laboratory professionals completed the survey. Thirty-three incomplete questionnaires were excluded from the analysis. The frequency distribution for 224 laboratorians, according to demographic and work-related variables, is shown in Table 1. A total of 60% (134/224) of participants were male and 40% (90/224) were female. Forty-nine percent (109/224) of the participants had either Laboratory Technologist or Medical Laboratory Scientist degrees and were referred to as highly trained laboratory professionals. Respondents had an average age of 34 years, with the youngest laboratory professional interviewed being 20 years of age and the oldest 64 years of age.

In terms of professional experience, 46% (104/224) of the participants had less than 5 years of working experience in the medical laboratory field. Twenty-nine percent (66/224) of the laboratory professionals were employed in the public sector, whereas those hired in the private sector, 8% (12/158), 80% (127/158), and 12% (19/158), were employed in non-governmental, faith-based, or private laboratories, respectively: 85% (190/224) of the participants worked in health centre and district hospital laboratories, or equivalent. The remaining 34 laboratory professionals held jobs at provincial or regional hospitals. A total of 57% (128/224) of laboratory professionals switched jobs at least once over the past 5 years, and among those, 90% (115/128) indicated the reason for leaving their last job; only 22% (25/115) said this was due to relocation. The frequency distributions for reasons for leaving the previous job are shown in Table 2, with lack of professional development being the major motive for changing jobs. Male workers were more inclined to change jobs (56%, 75/134), whereas female laboratory professionals (56%, 50/90), were more likely to stay at their current positions.

Table 1 Total and sub-group frequency distribution by demographic and job-related variables

| Demographic variables | Total (n = 224) | Less highly trained laboratory technicians (n = 115) | Highly trained laboratory technicians (n = 109) |
|-----------------------|----------------|--------------------------------------------------|--------------------------------------------------|
| Gender                |                |                                                  |                                                  |
| Male                  | 134 (59.8%)    | 70 (60.9%)                                       | 64 (58.7%)                                       |
| Female                | 90 (40.2%)     | 45 (39.1%)                                       | 45 (41.3%)                                       |
| Age group, years      |                |                                                  |                                                  |
| <25                   | 18 (8.0%)      | 11 (9.6%)                                        | 7 (6.4%)                                         |
| 25 to 29              | 60 (26.8%)     | 36 (31.3%)                                       | 24 (22.0%)                                       |
| 30 to 34              | 56 (25.0%)     | 18 (15.6%)                                       | 38 (34.9%)                                       |
| 35 to 39              | 34 (15.2%)     | 21 (18.2%)                                       | 13 (11.9%)                                       |
| 40 to 44              | 26 (11.6%)     | 11 (9.6%)                                        | 15 (13.8%)                                       |
| 45 to 49              | 11 (4.9%)      | 7 (6.1%)                                         | 4 (3.7%)                                         |
| >50                   | 19 (8.5%)      | 11 (9.6%)                                        | 8 (7.3%)                                         |
| Level of facility     |                |                                                  |                                                  |
| Health centre         | 48 (21.4%)     | 30 (26.1%)                                       | 18 (16.5%)                                       |
| District hospital     | 96 (42.9%)     | 51 (44.3%)                                       | 45 (41.3%)                                       |
| Provincial hospital   | 10 (4.5%)      | 1 (0.9%)                                         | 9 (8.3%)                                         |
| Regional hospital     | 24 (10.7%)     | 12 (10.4%)                                       | 12 (11.0%)                                       |
| Other a               | 46 (20.5%)     | 21 (18.3%)                                       | 25 (22.9%)                                       |
| Years in professional working experience | |                                                  |                                                  |
| <1                    | 10 (4.4%)      | 10 (8.7%)                                        | 0 (0.0%)                                         |
| 1-2                   | 18 (8.0%)      | 9 (7.8%)                                         | 9 (8.2%)                                         |
| 2-3                   | 36 (16.1%)     | 19 (16.5%)                                       | 17 (15.6%)                                       |
| 3-5                   | 40 (17.9%)     | 19 (16.5%)                                       | 21 (19.3%)                                       |
| >5                    | 120 (53.6%)    | 58 (50.5%)                                       | 62 (56.9%)                                       |
| Laboratory jobs held in the past 5 years | |                                                  |                                                  |
| 1                     | 96 (42.8%)     | 53 (46.1%)                                       | 43 (39.4%)                                       |
| 2                     | 94 (42.0%)     | 44 (38.2%)                                       | 50 (45.0%)                                       |
| 3                     | 19 (8.5%)      | 8 (7.0%)                                         | 11 (10.1%)                                       |
| 4                     | 5 (2.2%)       | 4 (3.5%)                                         | 1 (0.9%)                                         |
| 5                     | 10 (4.5%)      | 6 (5.2%)                                         | 4 (3.7%)                                         |

aFaith-based or private laboratories not equivalent to any level.

Table 2 Total and sub-group frequency distribution by reasons for leaving last job

| Reason for leaving last job | Total (n = 115) | Less highly trained laboratory technicians (n = 57) | Highly trained laboratory technicians (n = 58) |
|-----------------------------|-----------------|--------------------------------------------------|--------------------------------------------------|
| Relocation/left area/family preferences | 26 (22.6%) | 13 (22.8%)                                       | 13 (22.4%)                                       |
| Excessive/unequal workload | 4 (3.5%)       | 4 (7.0%)                                         | 0 (0.0%)                                         |
| Lack of appreciation/recognition from management | 11 (9.6%) | 3 (5.3%)                                         | 8 (13.8%)                                        |
| Poor working conditions    | 15 (13.0%)     | 10 (17.5%)                                       | 5 (8.7%)                                         |
| Lack of benefits           | 27 (23.5%)     | 13 (22.8%)                                       | 14 (24.1%)                                       |
| Lack of professional development | 32 (27.8%) | 14 (24.6%)                                       | 18 (31.0%)                                       |
Rating factors important for job satisfaction

Professional development/opportunities for training were rated highest for job satisfaction by almost 90% (195/224) of interviewees. The second and third highest rated categories were working environment/working conditions and benefits; these were selected as most/very important by 42% (95/224) and 38% (85/224) of the participants respectively. Appreciation and recognition from management and/or hospital administration was the second least selected factor and it was indicated as most/very important by 28% (64/224) of participants. Vacation/time off was rated as most/very important by only 4% (9/224) of laboratory professionals. The rating for job satisfaction factors in the whole sample is shown in Table 3.

Rating of incentives important for job retention

Among the incentives important for job retention the category that included regular professional development/opportunities for training was the highest rated for staying at a current position by 80% of total interviewees (179/224). The second highest rated category was addition of benefits indicated as most/very important by 44% (99/224), and laboratory upgrades was chosen by 43% (96/224) of the participants.

A total of 27% (60/224) of laboratorians indicated increased appreciation and recognition from management and/or hospital administration as most/very important in keeping them at their current job. The least rated incentive was increased vacation/paid time off, which was selected as most/very important by only 5% (11/224) participants. The rating for job retention incentives for the whole sample is shown in Table 4.

Weighted Cohen's kappa coefficients (κ) were calculated to assess agreement between factors for job satisfaction and incentives for job retention among highly trained and less highly trained laboratory professionals (Tables 5 and 6). The degree of agreement between these factors was important to tailor the interventions for the two groups of participants.

The agreement between satisfaction factors and incentives was estimated using the Landis and Koch classification [23], whereby kappa coefficients of 0.21 to 0.40 indicate fair agreement, 0.41 to 0.60 moderate agreement, 0.61 to 0.80 substantial agreement and 0.81 to 1.00 almost perfect agreement. According to this classification, kappa coefficients for agreement between factors for job satisfaction and job incentives for less highly trained laboratory professionals were almost perfect for the categories of professional development, appreciation from management, and vacation/time off. For the categories of benefits and working environment/working conditions, the kappa coefficients were substantial for this group. For highly trained laboratory professionals agreement was almost perfect for the categories appreciation from management, and vacation/time off, and was substantial for the remaining three factors.

Discussion

In the group over 45 years of age, only 23% (7/30) were female workers, whereas in the age group 25 to 29 years, women represented 55% (33/60) of this specific population. The decrease in number of female workers over time was not affected by the type of health facility nor the title earned, because the distribution of all laboratory professionals was very similar between the two genders across health facilities.

The years of laboratory experience seemed to be an important determinant for changing jobs, with 57% (66/115) of those who changed jobs in the past five years having between two and four years of experience. It was likely that less highly qualified laboratory professionals were more inclined to stay at their current job because their experience and educational level was less marketable and therefore, they had limited employment opportunities. On the other hand, highly trained laboratorians did not

Table 3 Rating of factors important for job satisfaction

| Rating of job satisfaction factors | Professional development | Working environment | Benefits | Appreciation from management | Vacation/time off |
|-----------------------------------|--------------------------|---------------------|----------|-------------------------------|------------------|
| Most/very important               | 195 (87%)                | 95 (42%)            | 85 (38%) | 64 (28%)                      | 9 (4%)           |
| Not very important                | 21 (10%)                 | 52 (23%)            | 61 (27%) | 72 (33%)                      | 61 (27%)         |
| Least important/somewhat important| 8 (3%)                   | 77 (35%)            | 78 (35%) | 88 (39%)                      | 154 (69%)        |

N = 224 respondents.

Table 4 Rating of incentives important for job retention

| Rating of job retention incentives | Professional development | Benefits | Laboratory upgrades | Appreciation from management | Vacation/time off |
|-----------------------------------|--------------------------|----------|---------------------|-------------------------------|------------------|
| Most/very important               | 179 (80%)                | 99 (44%) | 96 (43%)            | 60 (27%)                      | 11 (5%)          |
| Not very important                | 27 (12%)                 | 54 (24%) | 68 (30%)            | 68 (30%)                      | 69 (31%)         |
| Least important/somewhat important| 18 (8%)                  | 71 (32%) | 60 (27%)            | 96 (43%)                      | 144 (64%)        |

N = 224 respondents.
change their job as frequently because, most likely, their current job already matched their experience and educational level. In the countries where the survey was carried out, laboratory professionals tend to continue their studies while working, thereby explaining the correspondence between working experience and educational level at the time of relocation.

Laboratory professionals employed in the private sector were more likely to change jobs than those working in the public sector ($P = 0.002$). The lower workforce turnaround found in government facilities was dependent on country-specific factors, mainly salary scale, benefits, and allowances. In some countries the government employment is permanent with accumulated benefits received on retirement, when leaving before retirement results in loss of all benefits. In addition to these elements, an important role was played by the career prospects available in the public compared to the private sector.

Regardless of the satisfaction factors and incentives under consideration, the degree of agreement should be taken into account in the development of corrective actions and policies. As an early warning indicator, policy makers should consider those areas where moderate agreement between satisfaction factors and incentives has been observed. This approach would likely improve the adoption and implementation of national policies at each health facility by tailoring them to the specific findings observed locally.

A limitation of this study was that it did not comprise many laboratories in urban settings, because the majority of the health facilities included in this survey were located in rural and peri-urban areas. At these levels of the health system, demographics and some factors, such as working environment, working conditions and benefits, differed substantially from those present in urban settings and upper level laboratories.

Besides this, factors that might influence the behavior of local labour markets among countries were not considered, and their impact on willingness to seek other jobs should be explored further. In Zambia, laboratory technicians’ salaries in the public sector were more than three times lower than those in the private sector and between 23% and 46% of those paid by non-governmental organizations [24]. This different salary scale probably contributed to the deficiency of laboratory technicians in the public sector in Zambia. In Nigeria it was likely that policies based on rural area incentives of 25% of salary and other benefits contributed to higher staff turnover in the private sector than in the public sector [25]. In addition to government strategies, donors’ interventions also may influence domestic labour markets. In Kenya, where loss of laboratory staff was higher at lower-level facilities [26], gratuity allowances ranged from 12% to 23% from one province to another in the context of the same project [27]. In Tanzania, fluctuations of health sector budget affected allocations to human

| Factors important to job satisfaction | Incentives to stay at current job | Regular professional development | Increased appreciation/recognition | Addition of benefits | Increased vacation/paid time | Laboratory upgrades |
|--------------------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------|-----------------------------|-------------------|
| Professional development             | 82.6 (0.28)**                    | -                               | -                                | -                   | -                           | -                 |
| Appreciation/recognition             | -                                | 85.1 (0.53)**                   | -                                | -                   | -                           | -                 |
| Benefits                             | -                                | -                               | 73.9 (0.34)**                    | -                   | -                           | -                 |
| Vacation/time off                    | -                                | -                               | -                                | 81.3 (0.53)**       | -                           | -                 |
| Working environment                  | -                                | -                               | -                                | -                   | 72.2 (0.42)**               | 71.0 (0.42)**     |

Results are presented as % agreement (kappa coefficient).

| Factors important to job your satisfaction | Incentives to stay at current job | Regular professional development | Increased appreciation/recognition | Addition of benefits | Increased vacation/paid time | Laboratory upgrades |
|--------------------------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------|-----------------------------|-------------------|
| Professional development                   | 77.6 (0.55)**                    | -                               | -                                | -                   | -                           | -                 |
| Appreciation/recognition                   | -                                | 91.3 (0.24)**                   | -                                | -                   | -                           | -                 |
| Benefits                                   | -                                | -                               | 96.3 (0.31)**                    | -                   | -                           | -                 |
| Vacation/time off                          | -                                | -                               | -                                | -                   | 72.2 (0.43)**               | -                 |
| Working environment                        | -                                | -                               | -                                | -                   | 71.0 (0.42)**               | -                 |

Results are presented as % agreement (kappa coefficient).
resources in particular for recruitment, incentives, retention and capacity building [28]. Despite the different strategies adopted to address local needs, national labour markets have similar dynamics due to the chronic problem of understaffed health care facilities. In this scenario it is likely that the mobility of laboratory professionals was not significantly influenced by determinants such as socio-economic factors and educational background.

Conclusions
This was the first study to assess satisfaction of laboratory professionals within HIV laboratory programmes in seven Sub-Saharan African countries. It contributed to the evidence that specific strategies for human resources management are part of the necessary activities for implementing quality medical laboratory programmes, particularly in areas where new technologies are available for diagnostic purposes (for example, HIV/AIDS treatment programmes).

Based on the data collected, the first type of intervention should focus on the need for training and professional development to bridge this gap. In particular, new approaches for in-service training should be applied to reduce education-related absences from the workplace. Building capacity and training laboratory professionals without disrupting health services is achievable by promoting blended learning techniques aimed at augmenting traditional learning. Blended learning has the advantages of reducing cost and reaching a greater number of students.

A second intervention aimed at improving the retention of laboratory professionals should encompass a more structured strategy for human resource management at health facility level. In-service trainings should be integrated into professional development plans without compromising any incentive other than the proficiency certificate upon completion. The overall goal of retaining laboratory professionals is to improve their competency through the continuous improvement of Good Laboratory Practices in their routine work. Highly motivated staff adhere more strictly to laboratory procedures defined by the Laboratory Quality Management System with the ultimate outcome of improving the quality of medical laboratory services. Strict adherence to diagnostic protocols supports clinical management of patients and also reduces waste of resources. Laboratory professionals who comply with standard operating procedures make fewer errors with lower volumes of invalid and repeated tests.

A third intervention should address gender-specific factors affecting reasons for leaving the job over time. It is therefore important to explore better these factors and develop flexible retention plans accordingly. Without integrating new strategies for laboratory professionals’ retention, the numerous investments in expanding care and treatment will continue to have a substantial drain on resources due to the repetitive re-hiring, and re-training of new staff within the same laboratory.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
FM and MW conceived the study, and designed the overall research project. FM prepared the first draft of this paper. MM and ADP contributed and commented on the draft. MBH participated in the design of the study and performed the statistical analysis. MW commented on drafts. RR commented on drafts and gave final approval of the version to be published. All authors read and approved the final manuscript.

Acknowledgements
This study was part of the activities the Institute of Human Virology carries out in Nigeria, Ethiopia, Uganda, Kenya, Tanzania, Rwanda and Zambia, in the context of the Presidential Emergency Plan for AIDS Relief, to enhance the integration of quality interventions with the broader health and development programmes of the US Government, country partners, multilateral organizations, and other donors. The authors would like to acknowledge IHV-UMSOM in-country laboratory teams in Nigeria, Ethiopia, Uganda, Kenya, Tanzania, Rwanda and Zambia for their support in carrying out this survey. We also wish to express thanks to the respondents who participated in this study.

Author details
1Institute of Human Virology, University of Maryland School of Medicine, Baltimore 21201, USA. 2Maryland Global Initiatives, Dar es Salaam, Tanzania. 3School of Community Health and Policy, Morgan State University, Baltimore, MD 21251, USA.

Published: 17 August 2013

Received: 17 May 2012 Accepted: 5 August 2013

References
1. Petti CA, Polage CR, Quinn TC, Ronald AR, Sande MA: Laboratory medicine in Africa: a barrier to effective health care. Clin Infect Dis 2006, 42(3):377–382.
2. Amos B, Kisały A, Maleka D, Mudhune S, Mwanasemi H, Nansera D, Ngiwir T, Wamna M, English M: Behind the data: establishing the Network for Surveillance of Pneumococcal Disease in the East African Region. Clin Infect Dis 2009, 48(5):S162–S171.
3. Nkengasong JN, Ntabuga P, Nwanyanwu O, Gershy-Damet GM, Roscigno G, Bultens M, Schoub B, DeCook KM, Bix D: Laboratory systems and services are critical in global health: time to end the neglect? Am J Clin Pathol 2010, 134(3):368–373.
4. Gershy-Damet GM, Rozz P, Cross D, el Belabbes H, Cham F, Ndihokubwayo JB, Fine G, Zeh C, Njukeng PA, Mboup S, Sesse DE, Messele T, Bix D, Nkengasong JN: The World Health Organization African region laboratory accreditation process: improving the quality of laboratory systems in the African region. Am J Clin Pathol 2010, 134(3):393–400.
5. PEPFAR President’s emergency plan for AIDS relief: fact sheet: celebrating life: latest PEPFAR treatment results. [http://www.pepfar.gov]. Accessed 10 October 2011.
6. World Health Organization: Antiretroviral Therapy for HIV Infection in Adults and Adolescents in Resource-Limited Settings: Towards Universal Access: Recommendations for a Public Health Approach. Geneva, Switzerland: World Health Organization, 2006. [http://www.who.int/hiv/pub/guidelines/ artadultguidelines.pdf]. Accessed 10 October 2011.
7. UNAIDS: Financial resources required achieving universal access to HIV prevention, treatment and support. 2007. [http://data.unaids.org/c婆yp/Report/2007/20070925_advocacy_gme2_en.pdf]. Accessed 5 October 2011.
8. Manafa O, McAllister E, Maseko F, Bowie C, MacLachlan M, Normand C: Retention of health workers in Malawi: perspectives of health workers and district management. Hum Resour Health 2009, 7:65. doi:10.1186/1478-4491-7-65.
9. Marchal B, De Brouwere V, Kegels G: Viewpoint: HIV/AIDS and the health workforce crisis: what are the next steps? Trop Med Int Health 2005, 10:300–304.
10. Dielman M, Cuong PV, Anh LV, Martineau T: Identifying factors for job motivation of rural health workers in North Viet Nam. Hum Resour Health 2003, 1:10. doi:10.1186/1478-4491-1-10.

11. Anyangwe SC, Mtonga C: Inequities in the global health workforce: the greatest impediment to health in Sub-Saharan Africa. Int J Environ Res Public Health 2007, 4:93–100.

12. Henderson LN, Tulloch J: Incentives for retaining and motivating health workers in Pacific and Asian countries. Human Resour Health 2008, 6:18. doi:10.1186/1478-4491-6-18.

13. Liverpool School of Tropical Medicine: Effective health care alliance programme (EHCAP). [http://www.liv.ac.uk]. Accessed 8 October 2011.

14. Pakenham-Walsh N, Priestly C, Smith R: Meeting the information needs of health workers in developing countries. Br Med J 1997, 314:93.

15. World Health Organization: World report on knowledge for better health. Geneva: World Health Organization; 2004. [http://www.who.int/tph/meetings/world_report_on_knowledge_for_better_health.pdf]. Accessed 12 October 2011.

16. Smundic AM, Blicz-Zulle L, Nikolac N, Supak-Smalovic V, Horonic L, Avram S, Beregovaya E, Dobranu M, Guimarães JT, Kovaci GL, Singh NM, Sierra-Amor RI, Sypniewska G, Zima T: The quality of the extra-analytical phase of laboratory practice in some developing European countries and Mexico - a multicentric study. Clin Chem Lab Med 2011, 49:215–228.

17. Crucitti T, Fransen K, Maharaj R, Tenywa T, Massinga Loembé M, Murugavel KG, Mendonca K, Abdellati S, Beelaert G, Van Damme L: Obtaining valid laboratory data in clinical trials conducted in resource diverse settings: lessons learned from a microbicide phase III clinical trial. L. PloS One 2010, 5. doi:10.1371/journal.pone.0013592.

18. Stevens W: Good Clinical Laboratory Practice (GCLP): the need for a hybrid of good laboratory practice and good clinical practice guidelines /standards for medical testing laboratories conducting clinical trials in developing countries. Qual Assur 2003, 10:83–89.

19. Mathauer I, Unhoff I: Health worker motivation in Africa: the role of non-financial incentives and human resource management tools. Hum Resour Health 2006, 4:24.

20. Verlander EG, Evans MR: Strategies for improving employee retention. Clin Leadersh Manage Rev 2007, 21:64.

21. van de Looij F, Benders J: Not just money: quality of working life as employment strategy. Health Manpower Manage 1995, 21:27–33.

22. McCoy D, Bennett S, Witter S, Pond B, Baker B, Gow J, Chand S, Ensor T, McPake B: Salaries and incomes of health workers in Sub-Saharan Africa. Lancet 2008, 371:675–681.

23. Landis JR, Koch GG: The measurement of observer agreement for categorical data. Biometrics 1977, 33:159–174.

24. Herbst CH, Medder M, Campbell K, Sjoblom M, Soucat A: The human resources for health crisis in Zambia an outcome of health worker entry, exit, and performance within the national health labor market. World Bank Working Paper No. 214. Washington D.C: The World Bank; 2011.

25. Labiran A, Mafe M, Onajole B, Lambo E: Human Resources for Health Country Profile – Nigeria. Africa Health Workforce Observatory. 2008 [http://www.hrh-observatory.afro.who.int/images/Document_Centre/nigeria_country_profile.pdf].

26. Chankova S, Muchiri S, Kombe G: Health workforce attrition in the public sector in Kenya: a look at the reasons. Hum Resour Health 2009, 7:58–65.

27. Campbell J, Stillwell B: Kenya: Taking forward action on Human Resources for Health (HRH) with DFID/OGAC and other partners. Integrate and The Capacity Project report; 2008. [http://www.who.int/workforcealliance/knowledge/publications/partner/ifa_kenya.pdf].

28. The United Republic of Tanzania Ministry of Health and Social Welfare: Human resource for health strategic plan 2008–2013; 2008. [http://www.urtpa.org/isowmy/resources/docs/library/R223_MOHTanzania_2008_HRH_Strategic_Planning_2008_2013.pdf].

Cite this article as: Marinucci et al.: Factors affecting job satisfaction and retention of medical laboratory professionals in seven countries of Sub-Saharan Africa. Human Resources for Health 2013 11:38.