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Achieving public and global health competencies: A teaching case study of Botswana's cervical cancer screening program

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Abstract

Objectives: To design and implement a case study on the cervical cancer screening program in Botswana to teach public and global health competencies to undergraduate nursing students.

Design and Sample: The case study was developed following a review of the literature on the epidemiology and health policies of cervical cancer in Botswana, and an interview with an obstetrician/gynecologist engaged in both clinical practice and research in Botswana. The case study has been implemented over seven semesters to students enrolled in the *Nursing in the Community* course at the University of Pennsylvania. Approximately 75-100 students are enrolled each semester.

Measures: Student's perceptions of epidemiologic skills gained and group functioning. Students responded to an open-ended question about lessons learned and offered suggestions to improve the learning experience.

Results: Faculty assessment of student deliverables demonstrated that students achieved the learning objectives and mastered necessary competencies. More than 70% (n = 69) of the students indicated that they acquired relevant skills at greater than a satisfactory level. Generally, students had great experiences working in groups measured across five dimensions: *engagement/contribution*, *creativity/resilience*, *on task/works independently*, *social interaction/communication*, and *preparedness*. However, isolated cases of poor group functioning were reported for *engagement/contribution*, and *creativity/resilience*.

Conclusion: The case study, which has been revised with respect to length, content and group processes, has been valuable in educating undergraduate nursing students in a more engaging way that mimics real life public health nursing scenarios. Students achieved both public and global health competencies through participation in the case study.

KEYWORDS

case study, cervical cancer screening, global health, public health nursing, visual inspection with acetic acid

1 | INTRODUCTION

Nursing and public health as both academic disciplines and practice professions have been historically linked. However, an analysis of the public health workforce in the United States reveals a shortage of qualified public health professionals including public health nurses (Merrill, Btoush, Gupta, & Gebbie, 2003). In addition, public health nursing scholars report that nursing education does not adequately prepare students to operate efficiently in public health systems (Robert Wood Johnson Foundation, 2011). Furthermore, the rapid globalization and

geographic mobility of populations and nurses call for training nurses with global health competencies including awareness of varying cultural and political factors and their influence on health.

The Quad Council Coalition of Public Health Nursing Organizations (The Council on Linkages between Academia and Public Health Practice, 2014) recommends that upon completion of a baccalaureate nursing education program, graduates should meet certain competencies in eight domains, including analytical/assessment skills, policy development/program planning skills, communication skills, cultural competency skills, community dimension of practice skills, public health science skills, financial planning and management skills, leadership, and systems thinking skills. In addition, the Consortium of Universities for Global Health (CUGH) developed a set of global health competencies for individuals pursuing careers in global health. These include an understanding of the global burden of disease, globalization of health and healthcare, social and economic determinants of health, collaboration, partnering and communication, ethics, professional practice, health equity and justice and sociocultural and political awareness (Consortium of Universities for Global Health, 2017; Wilson et al., 2012).

Effective ways of teaching are needed to ensure that nurse trainees attain these competencies. The use of case studies has been frequently cited as an effective teaching and learning strategy (Dutra, 2013; Grossman, Krom, & O'Connor, 2010; Majeed, 2014; Swanson et al., 2012). This participatory teaching method engages students in active and reflective learning. Case studies have been shown to facilitate collaborative learning through discussion and collective problem solving (Hofsten, Gustafsson, & Haggstrom, 2010) and have been used in nursing education (Dutra, 2013; Grossman et al., 2010). Swanson et al. (2012) employed case studies to increase graduate level nursing students' knowledge of complementary and alternative medical therapies (CAM) and the role of CAM in health. Another study compared nursing students who were grouped into either case study learning or lecture learning; 71% (n = 86) of students enrolled in case study learning showed more improvement in their knowledge about the subject than those in the lecture learning group (Majeed, 2014).

Team-based learning (TBL) has also been found to promote enthusiasm, motivation to learn, and skills applicable to lifelong learning (Tomey, 2003). TBL relies on small-group interactions, exposes students to course content, and gives students opportunities to apply learned content in problem solving (Michaelsen, Sweet, & Parmelee, 2011). In a TBL environment, students progress beyond simple knowledge acquisition and develop in depth understanding of the material (Michaelsen et al., 2011). Through this process, students reflect on their individual strengths and weaknesses as learners and as team members. In addition, students develop an appreciation for problem solving through teamwork. The interactive nature of TBL also allows for the development of interpersonal skills and professionalism.

The purpose of this article is to describe the development, implementation, and evaluation of a case study for undergraduate nursing students enrolled at the University of Pennsylvania, an environment supportive of TBL. This case study was designed to allow students to develop epidemiological skills necessary for a career in public health nursing. Skills emphasized include increasing competencies in cervical cancer screening, and appreciating the differences in disease prevalence, treatment strategies, and healthcare systems outside the United States. The case study is modeled on a cervical cancer screening program in Bostwana, a Sub-Saharan African country.

2 | CASE STUDY DEVELOPMENT

2.1 | Topic selection

In 2014, the *Nursing in the Community* course at the University of Pennsylvania was revised to prioritize teaching approaches (i.e., simulation and case studies) to enhance learning public health competencies, including epidemiology. To teach screening and prevention competencies within the context of global health, the case of cervical cancer in Botswana was selected. Cervical cancer is the most common cancer in women of all ages in Botswana and the second leading cause of cancer-related deaths (Bruni et al., 2017).

Cervical cancer and screening in Botswana was chosen given: (1) the existing partnership between the University of Pennsylvania and the government of Botswana; (2) the opportunity to interview Dr. Doreen Ramogola-Masire, an obstetrician-gynaecologist who provided clinical care to women in Botswana and conducted research to determine the feasibility and efficacy of using visual inspection with acetic acid (VIA) as a cervical cancer screening tool among HIV-infected women in Botswana (Ramogola-Masire et al., 2012) and spearheaded Botswana's development of its first comprehensive national cervical cancer prevention program; and 3) the presence of a public health-trained, Botswana national (H.O.) on the case study development team.

2.2 | Learning objectives

The goal of the case study was to build skills in epidemiology among undergraduate nursing students while meeting both the public health nursing competencies articulated by the Quad Council and the global health competencies outlined by CUGH. In particular, we sought to address essential public health nursing competencies necessary for shaping healthcare delivery and policy including: advocacy and leadership, population health, consideration of vulnerable populations, and communication to diverse stakeholders. To develop learning objectives, an immersive reading of Botswana's national cervical cancer screening program and existing literature on cervical cancer screening in the country was undertaken (Denny, 2012; Denny, Kuhn, Pollack, Wainwright, & Wright, 2000; Denny et al., 2005; Dutra, 2013; Hilton et al., 2003; Ibekwe, Hoque, & Ntuli-Ngcobo, 2010; McFarland, 2003, 2009; Sherris et al., 2009). Next, Dr. Ramogola-Masire was interviewed by the first and last authors to obtain a deeper understanding of cervical cancer screening in a local clinic in Gaborone, Botswana. In parallel, these authors, who have taught epidemiology in our institution's Master of Public Health (MPH) program, identified specific skills and competencies related to screening and prevention from the epidemiology curriculum. We then synthesized these sources into learning objectives for the case study (Table 1). These processes were similar to those outlined for designing case studies (Carr, 2015).

TABLE 1 Learning objectives for the simulation/case study of cervical cancer screening

Learning objective (LO)
LO1. Describe important factors to consider when designing/recommending a screening program
LO2. Interpret cervical cancer screening results
LO3. Define, calculate, and interpret sensitivity and specificity
LO4. Define, calculate, and interpret positive predictive value and negative predictive value
LO5. Explain the relationship between prevalence of disease and positive predictive value
LO6. Apply learned concepts in a decision-making case; VIA vs. pap smear in Botswana
LO7. Conduct a needs assessment that will inform the development of a screening program
LO8. Communicate with the public regarding a screening program

2.3 | Student deliverables

Students were provided materials (electronic job offer with the Ministry of Health as a public health officer and a secondment letter to a clinic in Gaborone, Botswana) outlining their role in the case prior to the start of the activity. They were told that they were recently employed public health officers with the Ministry of Health and would be joining Dr. Ramogola-Masire's team as epidemiologists. The case study consisted of three parts. In part 1, students were charged with describing the epidemiology of cervical cancer in Botswana, evaluating the efficacy of the Pap smear screening program in Botswana, and assessing the feasibility of introducing VIA as an alternative method for cervical cancer screening.

Part 2 required students to consider how to scale up VIA, including a cost–benefit analysis given specified budget constraints. Six different geographical districts in Botswana (all with specific challenges) were selected and students were assigned into groups representing these districts. Two or more groups were randomly selected to present their findings to the rest of the class, providing an opportunity for students to appreciate the district-specific challenges, the advantages of teamwork, and the necessity of creating policies for a heterogeneous population. The final part of the case required students to prepare two communication tools: (1) the text for a public service announcement or news article about cervical cancer and VIA, and (2) a voice-over presentation to train nurses on the epidemiologic (vs. clinical or technical) features of VIA screening (i.e., sensitivity, specificity, and positive and negative predictive value of the screening method). The case study concludes with the formulation of an evidence-based policy for cervical cancer screening for the Ministry of Health based on all of the groups' part 2 deliverables.

2.4 | Pilot testing and courseware implementation

The case study was piloted with six MPH and undergraduate nursing students. Four faculty (two with expertise in nursing and two with expertise in public health/epidemiology) had access to a detailed instructor's manual and observed the pilot. This pilot was scheduled for approximately 7 hr, divided into 2, 3-hr sessions with a 1-hr break between sessions. All of the preparatory and case study materials were available on Canvas (https://www.canvaslms.com/), the courseware platform used at our institution. This allowed instructors to control the timing of the release of different parts of the case study to students, to set specific deadlines for assignment submission, and to grade assignments within the existing course site.

3 | TEACHING THE CASE STUDY

Approximately 75–100 students are enrolled in the *Nursing in the Community* course every summer and fall term. Students were randomly assigned to one of six groups (described above) and they were required to complete several preparatory assignments, including reading: (1) the World Health Organization's (WHO) executive summary about cervical cancer and available screening methods (World Health Organization, 2002), and (2) a transcript from a National Public Radio (NPR) broadcast entitled, "Botswana Doctors Stop Cervical Cancer With a Vinegar Swab" that details the use of VIA in Botswana (Beaubien, 2012). Second, students attended 2, 3-hr lectures on basic epidemiologic principles and methods, including approaches to screening and prevention, constructing and interpreting two-by-two tables, and calculating sensitivity, specificity, and positive and negative predictive values for screening tests.

On the day of the case study, the lead instructor (H.O.) welcomed the students in Setswana (the local language in Botswana) and informed them, in English, of their role as epidemiologists on Dr. Ramogola-Masire's team. Of note, the instructor's manual includes a script for the opening session that can be delivered by any instructor. After the introduction, groups were dismissed to their respective breakout rooms to begin part 1 of the case. Ideally, groups have their own workspace (e.g., rooms with computers and screens); students have also used individual laptops and tablet devices. Cloud- or web-based software for document sharing (e.g., Google docs) were integrated into the courseware platform and were useful for preparing assignments and deliverables.

While students prepared the deliverables, faculty members circulated among the groups to check on their progress, answer questions, and offer feedback. Faculty feedback was tailored to each group's progress. For example, extra support was provided to a group having difficulty understanding case-specific content or broader epidemiologic concepts. Groups advancing quickly through the case study were challenged with additional questions or analyses at the discretion of the faculty. To further support students, a discussion board was launched within the courseware platform, which allowed students to pose questions to the entire class that were then answered by other students or a faculty member. Students also had the option to return to the main classroom to ask the faculty questions as needed.

Because each group was assigned a specific district for part 2, faculty compiled the different recommendations from each group

into a slide presentation. The compiled presentation was shared with the students after they completed part 3. The aim was to sensitize students to the heterogeneity of the population of Botswana, and more importantly to involve them in formulating a unified policy document. This task situated the students in the role of policy makers allowing them to appreciate the challenge and importance of developing an evidence-based cervical cancer screening policy for the country. In the final stage, students were regrouped in the main classroom. There, the lead instructor (H.O.) delivered a brief lecture to emphasize the main takeaway points (epidemiology, challenges, successes, and real events taking place) that defined the cervical cancer screening program in Botswana. The case study concluded with a debriefing session where students shared their experiences and asked questions.

4 | ASSESSING STUDENT PERFORMANCE

Deliverables were assessed using a grading tool which was developed by the first author (H.O.), and validated by (H.O.) and the second author (T.J.S.) who each independently graded five student assignments. The grading tool included both objective and subjective measures of mastery. An example of an objective measure was correctly calculating VIA sensitivity and specificity; subjective measures focused on persuasive, evidence-based conclusions, and clear writing. The first author completed all grading in consultation with the course director (A.B.). This case study has been used seven times since summer 2014. Across terms students have demonstrated mastery of content and application of critical thinking and quantitative reasoning; all students across terms received either an A or A- for this assignment.

5 | CASE STUDY EVALUATION AND REVISIONS

5.1 | Student feedback

In 2014, 69 students completed a paper-based evaluation of the case. The form asked students to assess skills acquired as a result of participation in this case study, evaluate the group functioning along five dimensions (listed below), and to provide open-ended responses to questions about key takeaways and suggestions for improvements. We asked specifically about the group's decision-making on work flow for part 1 where they had the choice to divide up the three tasks across the team to work in parallel vs. having the entire group work on the three tasks sequentially.

As shown in Figure 1, more than 70% of the students reported that skills had been developed *a lot* or to *a great extent* for all learning objectives. For most learning objectives, fewer than 10% of students felt they had developed relevant skills only *a little*. With respect to group functioning, out of a possible score of 5 (1: seriously deficient, 2: some deficiencies, 3: average, 4: very good, and 5: outstanding), students' average ratings for *engagement/contribution*, *creativity/resilience*, *on task/works independently*, *social interaction/communication*, and *preparedness* were between 4.3 and 4.6. The lowest individual score was 2, with scores of 2 observed more frequently for *engagement/contribution* and *creativity/resilience*.

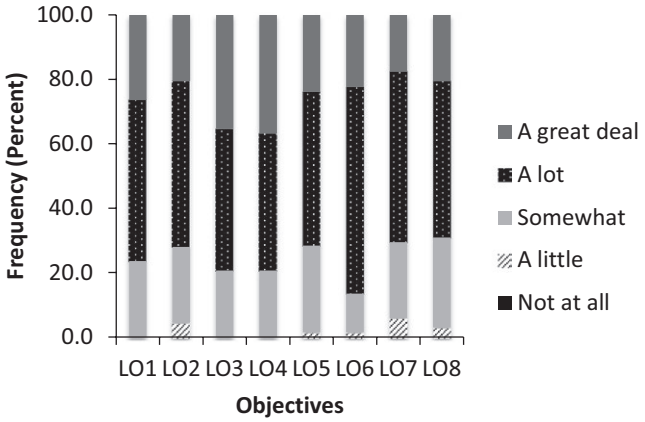

FIGURE 1 Students assessment of skills and expertise developed with respect to each learning objective, as a result of their participating in the case study, Fall 2014
LO1 = Describe important factors to consider when designing/recommending a screen program; LO2 = Interpret screening results; LO3 = Define, calculate and interpret sensitivity and specificity; LO4 = Define, calculate and interpret positive predictive value and negative predictive value; LO5 = Explain the relationship between prevalence of disease and positive predictive value; LO6 = Apply learned concepts in a decision making case; VIA vs. pap smear in Botswana; LO7 = Conduct a needs assessment that will inform the development of a screening program; LO8 = Communicate with the public regarding a screening program.

Data from open-ended questions indicate that overall students had positive experiences during the case study. Seven categories were identified among open-ended responses: (1) development of skills, (2) data availability and collection, (3) realism, (4) group dynamics, (5) communication, (6) time, and (7) insight (see Table 2 for illustrative quotes for each category). In contrast to high numeric ratings for the full sample, students writing about group work in open-ended responses were decidedly ambivalent; some felt that group functioning was effective while others felt that the group did not work efficiently and were concerned that the group dynamics might influence the group grade. There was also mixed feedback about how groups chose to approach the deliverable for part 1: some students were happy to "divide and conquer" to get the subparts done quickly, while others felt they had missed out on an opportunity for skill development in the subparts they did not work on.

Interestingly, the students identified the importance of effective communication with the public on such an important health issue. They addressed in their responses the importance of using lay language and not epidemiology terms. They recognized the need to consider the literacy level of the population and even the choice of words to use.

5.2 | Peer evaluation

Student feedback suggested that not all group participants contributed equally to and yet benefitted from a uniform group grade.

TABLE 2 Emerging themes and selected quotes on the simulation experience (both content and group functioning)

Emerging themes	Quotes
Development of skills	"Learned new skills of calculating sensitivity and specificity"
	"Lots of calculations for PPV, NPV, sensitivity and specificity really do tell a lot about the test."
	"I also learned a good deal about how to effectively use power point in communicating health information"
Data availability and collection	"It's surprisingly difficult to find relevant information."
	"Accurate data collection is key!"
	"Data analysis sometimes requires 'putting the pieces together.'"
Realism	"It is an incredibly complex process to develop a screening program."
	"It was very helpful to put the concepts we learned in class to a realistic scenario. Mostly doing out the math."
	"It takes a lot of critical thinking to decide which populations should be targeted by a screening program."
Group dynamics	"Great team process!"
	"Had an awesome team that relied on each other a lot and trusted each other."
	"Difficult team dynamics. Several people left without tasks/didn't participate as actively. Some not receptive to teamwork."
	"Some group members moved way to fast for others so we were never on the same page."
Communication	"When communicating with the public through service announcements or public nurses, it is important to use words commonly used."
	"Communicating results and what they mean to patients."
	"Things to consider when making a public service announcement (e.g., literacy level, wording)"
Time	"Future epi case studies should be shorter if possible. It's a long day. Interesting, but long and exhausting."
	"Far too long. Please make it shorter, I could have learned the same amount in a lot less time."
	"I enjoyed the timing of this case study a lot more. It was helpful to have more time on fewer projects in terms of allowing more absorption of info."
	"Really enjoyed this CASE STUDY! I think it was nice having more time per assignment so we could actually absorb and learn"
Insight	"I found the activity to very interesting. I'd like to do more activities like this."
	"Epidemiology is an interesting way of viewing the healthcare system."
	"It was interesting to consider the many comorbidities that could influence decision-making."
	"I learned a lot about VIA, a type of screening that I had not heard of before."

Peer evaluation is an essential part of TBL (Levine, 2012). Fellow learners have the potential to provide the most valuable feedback to each other. For this case study, the Michealsen method for peer evaluation was adopted (Levine, 2008). In keeping with this method, students were asked to assign team members a score reflecting the extent they believe their team members contributed to overall team performance. For example, in a group of five students, each student had 40 points to distribute among her/his team members. Two conditions had to be met: not all 40 points had to be assigned, and no one team member could be awarded more than 15 points. For our students, peer evaluation grades ranged from 7.25 to 11 with an average grade of 9.9/10. Students with scores greater than 10 were viewed by their peers to have contributed significantly to the team.

5.3 | Faculty reflection and case revision

Faculty reviewed evaluations and student performance following each implementation of the case study. These, coupled with formal and informal debriefing sessions among faculty, facilitated revisions to case content, student deliverables, and logistics. The case has changed substantially from its first offering in 2014 to the present. For example, early iterations had faculty assess group functioning by visiting breakout rooms and recording group dynamics by hand using a brief rating system developed specifically for this assignment. Later iterations relied on anonymous student evaluations (not included in the final grade), which freed up faculty to engage with groups during breakout room visits rather than standing on the sidelines observing and evaluating. Explanations of and instructions for completing deliverables were revised to increase clarity and reduce confusion. Deliverables were also streamlined to minimize non-essential tasks and to focus student effort on substantive content areas.

The time to complete the entire case study has been decreased. As stated previously, the case study was originally scheduled for 7 hr. This timeframe was subsequently decreased to 5 and then 4 hr, and currently is able to be completed in 90 min as deliverables have been condensed. Each iteration has required trade-offs. While the longer sessions allowed for more content, application of methods, time for group interactions, and full class debriefing, the 90-min version is

more flexible and responsive to the course schedule, and it can be taught within an existing class period. The modifications to the time requirement for the case study directly address students' feedback that a 4 to 7 hr assignment led to feelings of "overload," "burnout," and "exhaustion." Due to the many iterations of the case study faculty now have multiple versions, any of which can be used/adapted based on available time and faculty interest each term.

6 | DISCUSSION

A case study to train undergraduate students enrolled in a community health course in both public and global health competencies was developed using cervical cancer screening in Botswana. Modeling the case on an existing Ministry of Health screening program in a Sub-Saharan African country exposed students to the reality of public health nursing work aimed at protecting the health of the public through practice, research, policy, and communication within a global context.

Specifically through the case study, students interacted with data and learned the epidemiology of cervical cancer in Botswana including the incidence and prevalence and the distribution of cervical cancer by age, region, and HIV infection status. While Pap smear is the standard screening method for cervical cancer in the United States, students learned that the local healthcare system and limited resources (both personnel and equipment) hinder its implementation in Botswana. Based on evidence collected in Botswana, students familiarized themselves with the VIA screening guidelines in the context of a vulnerable population and gained experience in communicating the importance of cervical cancer screening to the population.

As the nursing program at the University of Pennsylvania aims to train students in public and global health competencies, it was important to engage partners globally. Having the Botswana-University of Pennsylvania partnership and a Botswana national on the case study team made the case study development more authentic. The information contained in the case study included the most recent data from Botswana. Students appreciated the use of real-life data in the learning process. Having a native of Botswana in character was a strength for this case study. This faculty member served as a link to the culture, currency and costs, healthcare system, and government that many of the students were unfamiliar with. Competencies addressed included managing health in low-resource settings, evidence-based practices, risk status of populations, and adaptation strategies in low-resource settings experiencing healthcare personnel shortages.

Consistent with the call that nurses must achieve a higher level of education and training (National Academy of Sciences, Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, at the Institute of Medicine, 2010), case studies have been explored and utilized in teaching nursing students (Dutra, 2013; Grossman et al., 2010; Majeed, 2014; Swanson et al., 2012). Grossman et al. (2010) report that the use of case studies improved final examination scores and enhanced communication and decision-making skills, which translated to improved independent provision of care. Data from nurse educators indicate that the use of case studies promotes critical thinking and engages students as active learners and not just as listeners (Dutra, 2013). In our experience, students learned to apply knowledge previously gained in didactic lectures, from the guidance of faculty though direct and virtual contact, and from peers through group discussions, group presentation, and class discussions. The deliverables submitted coupled with the grades attained by the students, demonstrated high-order thinking and that the students met the case study learning objectives.

Compelling reasons to support group work exist (Mello, 1993). Case study development should account for incorporating real-world scenarios involving group work and promoting collaboration while allowing each student to individually develop relevant skills. Furthermore, group dynamics should be considered carefully since in isolated cases, low ratings for *engagement* and *contribution in group functioning* assessments suggests that not all members of the group contributed equitably to the learning process. Poor group functioning (either the presence of a dominant personality or a disengaged/disruptive member) may have affected the learning experience of other students. Suboptimal group functioning might diminish the overall learning experience of the other group members.

Communication skills have been articulated in Domain 3 of the Public Health Nursing competencies (The Council on Linkages between Academia and Public Health Practice, 2014). Rimer and Kreuter (2006) have made some suggestions on how to prepare relevant public health messages; match the content to the needs of the population; frame the information in a contextually appropriate manner; and use media and designs that are appealing to the population. There is a need, therefore, to consider the demographic, behavioral, and cultural aspects of the population, which is usually heterogeneous. The underpinning requirement is that information be communicated at a literacy level that will generate the most impact. Equally, there is a need to gauge the health literacy of the population. Students recognized the need to prepare material at a literacy level equivalent that of the target population.

The continuous monitoring and evaluation of the case study through faculty observations and documentation, and student feedback led to several formats of this case study. Through this process, the various iterations offer the following qualities: relevance, efficiency, impact, and effectiveness. Additionally, the use of the case study over seven semesters demonstrates the sustainability of the case study. The main adjustments to the case study have streamlined the content to suit shorter time allocations and to improve the clarity of instructions within it.

7 | CONCLUSION

We demonstrated the feasibility, acceptability, and efficacy of using a case study to teach epidemiology skills to undergraduate nursing

students, and recommend this pedagogical tool to other faculty in schools of nursing. Using the case of the cervical cancer screening program in Botswana allowed the incorporation of global health competencies. Assessment of student deliverables by faculty showed the students were able to work collaboratively, analyze and interpret data, and think critically in a complex setting.

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