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Educational Research Methodologies for Enhancing Effectiveness of Dental Public Health Programs

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Introduction

Dental Public Health could be defined as the science and practice of preventing oral diseases, promoting oral health and improving quality of life through organized efforts of the society and evidence based practice [1]. Research has great importance in evidence based practice. Effective dental public health programs should be able to apply knowledge and experience in oral health disease prevention and promotion with strong support from research. Research should be foundation for oral health programs [2]. Application of appropriate research methods can improve the effectiveness of public health programs by saving resources and time [3,4]. Tailoring of programs to underlying population characteristics has been shown to result in better public health outcomes [5].

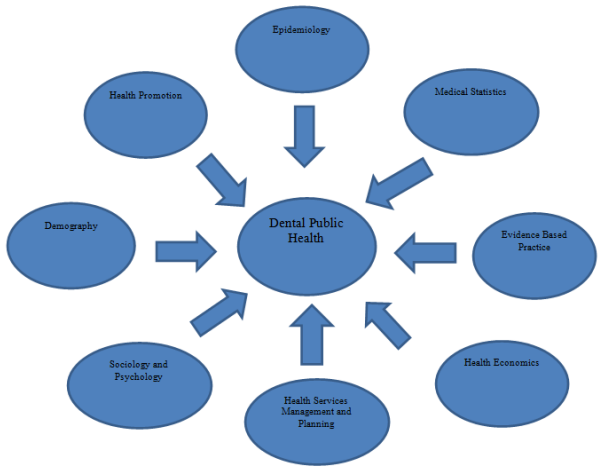

Figure 1: Sciences and disciplines underpinning dental public health.

Every research design has its own strengths and weaknesses. It is imperative that an expert research team or researcher possess adequate knowledge about available research methods so as to select the most suitable method. In this article, we focus on educational research methods that could be used to improve effectiveness of public health programs.

Science and disciplines underpinning dental public health are epidemiology, medical statistics, evidence based practice, health economics, health services management and planning, sociology and psychology, demography and health promotion [1] (Figure 1).

Dental public health (DPH) researchers have traditionally relied on quantitative methods for scientific enquiry. It is high time that qualitative methodology is also used in dental public health knowledge and practice, as this could allow researchers to answer important questions of relevance to procedure and policy that are difficult to answer satisfactorily using quantitative methods alone [6]. So we discuss three qualitative (action research, case study and ethnography), and two quantitative research designs (survey research and experimental research) in this article.

Action research

In simple terms action research is collaborative activity among colleagues searching for solutions to everyday problems that are close to their field of activity. Action research is typically undertaken as an iterative continuum addressing practical concerns of stakeholders while also contributing to scientific advancement.

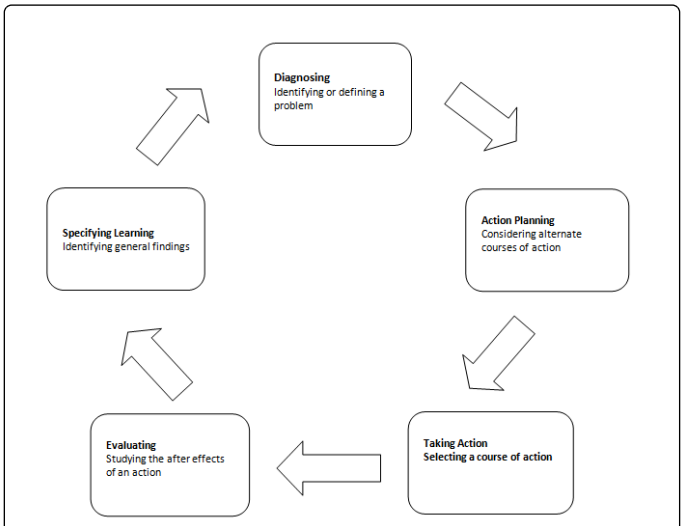

Figure 2: Gerald Susman's illustration of action research.

Thus, "there is a dual commitment in action research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction" [7]. Accomplishing these twin goals requires the active collaboration of the researcher and subjects, and thus it stresses the importance of co-learning as a primary aspect of the research process. Action research generates local knowledge and often leads to change in practice. The continuum of action research is illustrated in the Figure 2.

Initially, a problem is identified and data is collected for a more detailed diagnosis. This is followed by a collective postulation of several possible solutions, from which a single plan of action emerges and is implemented. Data on the results of the intervention are collected and analyzed, and the findings are interpreted in light of how successful the action has been. At this point, the problem is re-assessed and the process begins another cycle. This process continues until the problem is resolved.

In the context of public health, action research is particularly suitable for solving problems with special emphasis on operational complexities encountered by public health researchers and program implementers in local target populations. It could also be used to pilot new strategies and practices that could subsequently enhance the quality and uptake of public health programs. There are several types of action research methodologies with subtle variations from the main theme. Some of them are described.

Participatory action research: Participatory action research Lays special emphasis in active involvement of all stakeholders including the subject in framing and conducting research which in turn generates knowledge about a shared problem. Framing and writing of the research question, collecting data, analyzing data, interpreting data and writing reports are all undertaken in a truly collaborative manner [8]. This type of activity is particularly suitable for public health issues with substantial subjective component. For example, in a study focusing on reasons for high incidence of oral cancer in a population, the active participation of the subjects could be key to identify the risk factors and unhealthy behaviors. The subjects might in contact with carcinogenic materials as part of their food practices, culture and custom. If the participants have a say in the research, they are more likely to take ownership of the study and open up to researchers [1].

Critical action research: Critical action research Places more focus on empowerment of those with less power in communities and target population [8]. This type of research helps to give more say to the sections of a community marginalized on the basis of social status, ethnicity, race, cast, tribe, etc. allowing discovery and exploration of power differentials in the research relationship as well as in the community under study.

Feminist action research: Feminist action research Views the world through a feminist lens. This type of research raises consciousness about women's issues and gives a strong voice to women in public health. The goal of this type of research is to improve the life of women in society addressing the inequalities in societies [8]. This could lead to empowering the women to make autonomous decision of their own health [Table 1].

Strengths	Weakness
Integrates practice and theory	Difficult to generalize results
Empowers both researchers and participants	Limited knowledge and information creation
Produces lifelong learners	Weak research design and questions
Research model supports social change	Less scientific rigour
Easily conductible at local level	Time consuming

Table 1: Strengths and Weakness on this Research Design.

Case Study

Case study research methodology operates by effectively telling a story about a bounded system. This methodology helps us to understand the complexities within a bounded system. The bounded system could be an individual person, work places, groups and community [8]. Case studies could be classified into 3 major types.

Classic Intrinsic case studies

Classic Intrinsic case studies focus on understanding a specific case/situation. The public health researcher focuses on understanding, interpreting and analyzing a particular case or situation. The advantage of this model is that a public health researcher/program implementer can focus all their time and resources into the study of one case for an in depth understanding. The disadvantage is that generalizing findings from a single case to larger population could be erroneous as the findings may not be the true or actual representation of the real characteristics of underlying phenomenon.

Instrumental case studies

Instrumental case studies have a more universal goal than a particular goal. The researcher can use this design to make conclusions beyond the particular case and more to the target population or group as a whole. This helps the public health researcher to understand "why" and "how" a phenomenon is functioning in a particular environment or system. Instrumental case studies help to understand a phenomenon in the bigger picture. For example, the researcher focuses on why the target community is having higher incidence of oral cancer and focuses on the risk factors, behaviors and living styles of the community as a whole. The disadvantage of this design is the inability of the model to capture all characteristics of a phenomenon in focus.

Collective case studies

Collective case studies are characterized by concurrent analysis of multiple cases as part of one overall research study. This design is usually more instrumental than intrinsic.

Intrinsic case study

Intrinsic case study is the study of a case (e.g. Person, specific group, occupation, department, organization) where the case itself is of primary interest in the exploration.

Instrumental case study

Instrumental case study is the study of a case (eg. Person, specific group, occupation, department, organization) where the primary interest is a particular theory or phenomenon than the case itself. So the purpose of the study differentiates both studies. Instrumental case study facilitates understanding of a theory or a phenomenon in a bigger picture and the intrinsic case study focuses on the uniqueness of the case itself.

Typically, in a collective case study, a researcher compares and contrasts multiple cases for similarities and differences. This model also helps in generalizing results and findings as analysis is drawn from multiple cases. One possible drawback of this research model is that it is resource intensive and the depth of analysis may be not optimal.

Ethnography

Ethnography can be described as a form of systematic study focused on discovering and describing the culture of a group of people or target population. A researcher that does this type of research is called as an ethnographer. An Ethnographer uses the cultural frame of the population for analysis. Ethnographer spends long time living within a cultural group or setting to observe and record their daily life actions.

This qualitative research model could be classified into four types [8].

Classical ethnography

It originated around the turn of 20th century in the discipline of Anthropology. Ethnos means people, race or cultural group and graphia means writing or representing [9]. So Ethnography literally means "writing about people." This research model focuses on discovering and describing the culture of a group of people or target population. Researchers spend lot of time in the field with the people being studied. The public health researcher could typically be a participant or a non-participant observer. Data collection and data collection of ethnographic research is more of a concurrent and alternating nature. Classical ethnography helps to understand the current and developing trends in the culture of the population. Here a researcher lives physically in a community watching and making notes of their behaviors and action. Community members using carcinogenic food is captured by the researcher by observation in this model.

Ethnology

This type of ethnography focuses on comparative study of cultural groups. This involves conducting a series of separate ethnographic studies of the same or different cultural groups to uncover general patterns and rules of social behavior in target populations. This study model helps to view and analyze the actions of the target community based on their actions. Uncovering their general pattern or rules of social behaviors could be vital in addressing the incidence and prevalence of communicable and non-communicable diseases in the target population.

Ethnohistory

This is the study of cultural past of a group of people or target population. An ethnohistory is usually done before or on the beginning of ethnography to unravel the group member's cultural roots and cultural evolution. Understanding the cultural evolution of the population in helps a public health professional to understand the factors that lead to the evolution of current lifestyles and habits.

Autoethnography

This research is like an autobiography written by a qualitative researcher with components of self-reflection, self-examination and fitting the researcher's own life to the cultural and contextual description. This self-reflection into ones one role could help the public health researcher to enhance one's own knowledge and skills in art of problem framing, implementation and improvisation [10]. Also this self-reflection based research design could be used to improve the public health researcher's learning and reform future professional actions [11].

Quantitative Research Designs

Survey research

A survey gives a snap shot of current state of affairs in a target population [12]. Surveys basically collect information that are behavioral, descriptive or preferential or a combination of each. The questions in a survey questionnaire should be clear, acceptable and comprehensive for better results and true representation of population characteristics. The questions could be open ended or closed ended or both based on what type of information is attempted to be captured. Survey research could be classified into three types [8].

Telephonic survey research: In this survey model, randomly selected participants are telephoned. Random selection minimizes bias to a great extent. The drawback of this method is high refusal rate over telephone, lack of personal contact with the subject and challenges with the authenticity of some details. Telephonic surveys have proved to be effective data collection methods in measuring behavioral risk factors in U.S adults (e.g. Behavioral Risk Factor Surveillance System (BRFSS) [13,14].

Face-to-face survey research: This type of research can derive high quality data as the information is captured directly and personally from the participants. The drawback is that face to face surveys are time consuming and involve complex logistics. This type of survey can be used in directing the research inquiry with subjects in an effective way so that direct relational and correlational factors are exposed. For instance, to find out risk factors for oral cancer in the target population, face-to-face interview opens a great opportunity for the interviewer to ask more questions and get to the root causes and health belief models of the population. This interview method helps to explore and understand the views, experience and motivation of the individuals on focus in the target population.

Experimental research

Experimental research is best used to unravel cause- and-effect relationship in a target population. Experimental model helps the researcher to observe and identify casual relationships and provides control over confounding extraneous variables. This research model is highly effective in improving the internal validity of a public health

research or program and enhancing the efficiency and success of a program [8].

Experimental research could of three types:

Field experiment: Field experiment is a research study done in a real life setting. The advantage is the possible adaptability to a larger target population with higher effectiveness. This model could be used in dental health programs in rural and urban population. For example, if large number of patients from a particular rural area suffer from advanced periodontitis, specific experimental interventions like better brushing techniques, brushing with tooth paste and tooth brush and effective oral hygiene techniques can be introduced. The population is continuously followed up for incidence and prevalence of periodontitis.

Laboratory experiment: Laboratory experiments are conducted in the controlled environment of a laboratory. The advantage of this design is that the researcher can easily change the variables to understand the effects. Disadvantage is that as these are not real life situations, a laboratory experiment results may be different from the real environment. This method could be used understand the underlying correlational risk factors without any direct risk to the population on study.

Internet experiment: This is the experimental study conducted over the instruments administered over the World Wide Web. This model is gaining popularity and can combine many characteristics of both the field and experimental designs. It is also cost effective, easy to access in for culturally and demographically diverse populations. The disadvantages are higher selection bias due to self-selection of the study population and lack of real life experimental control over environment. This model is particularly useful in understanding the epidemiology of communicable and non-communicable diseases in the population.

Dental Public health concepts and development of dental public health competencies have been largely recommended as one of the objectives of dental academic institutions. Although not frequently examined openly, universities have broad responsibilities in assessing the composition and activities of the workforce in dentistry. Implementation of innovative courses, definition of competencies and good educational planning for the dental workforce is very much required.

Conclusion

These research methods outlined in this article could be used in improving the efficacy and cost effectiveness of current and future Dental public health programs. Knowledge translation of advances in oral health research could thus be used for the benefit of disadvantaged rural and low income population [2].

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