A. Non-Communicable Diseases

Health Examination Surveys

Basch, P. Concepts, Reality and Risk in Technological Innovation. Vaccines and World Health. Oxford University Press. Chapter 1 (pp. 4-27);1994.

Fischer G, Pappas G, Limb M. Prospects, problems, and prerequisites for national health examination surveys in developing countries. Social Science Medicine 1996;42(12):1639-50.

Timaeus I, Harpham T, Price M, Gilson L. Health surveys in developing countries: the objectives and design of an international programme. Social Science Medicine 1988;27(4):359-68.

Author:	**Basch, P**
Title:	**Concepts, Reality and Risk in Technological Innovation**
Source:	**Vaccines and World Health. Oxford University Press. Chapter 1 (pp. 4-27);1994**

This chapter outlines the history of biotechnological innovations. The author discusses the need for and relevance of technological advancements in the context of improving global public health. The basic parameters and functions of immunization as well as the process of vaccine development are introduced. In the last section of this chapter the author briefly discusses risks and benefits of biotechnological innovations.

Author:	**Fischer G, Pappas G, Limb M**
Title:	**Prospects, problems, and prerequisites for national health examination surveys in developing countries**
Source:	**Social Science Medicine 1996;42(12):1639-50**

This paper discusses Health Examination Surveys (HES) which are found to be an appropriate method for meeting data needs for health planning, program design and evaluation activities in developing countries. Compared to Health Interview Surveys that collect data by using a standardized questionnaire, HES combine results from interviews and physical examinations enhancing the study of health status with data which have greater comparability and are more objective. The potential of such surveys in developing countries taking into consideration the constraints and limitations are explored. Prerequisites for conducting HES in developing countries are outlined. In the concluding section recommendations are made to health information system planners and policy makers in developing countries who are designing health sector activities and health information systems.

Author:	**Timaeus I, Harpham T, Price M, Gilson L**
Title:	**Health surveys in developing countries: the objectives and design of an international programme**
Source:	**Social Science Medicine 1988;27(4):359-68**

This article discusses the current debate around the issue of health surveys in developing countries. One type of study is longitudinal in which continuous monitoring is combined with a variety of specialized and intensive investigations. Another method uses a series of single round, retrospective household interview surveys to collect nationally representative data.

Population based investigations of health can be of value in some countries, because they provide representative information on the health status and service use of the whole population and they provide person-based rather than episode-based estimates of the extent of ill-health and use of services. However, serious problems are being caused by the unintegrated, conflicting, duplicating, and expensive information-gathering activities already taking place in many developing countries. Surveys typically include questions on mortality, general morbidity, cause-specific morbidity, nutritional status, coverage and use of services, knowledge of and attitudes towards health practices and services, and many other variables.
Concerning morbidity, diagnostic questions (algorithms) have been used by interviewers and have given promising results in the diagnosis of neonatal tetanus, measles, diarrhea/dysentery,

and whopping cough. More validation is needed for low birth weight, acute lower respiratory tract infections, tuberculosis, and severe protein-calorie malnutrition. Recall appears to be good up to 10-12 months after death.

General morbidity studies typically use a 14-day recall period and ask questions about illness severity, functional disability, use of services (traditional and biomedical), and attitudes toward services. One problem with these studies is that one cannot extrapolate a morbidity rate based on a recall period of less than 12 months into an annual rate because of the seasonality of most conditions.

Questions about chronic disability have problems, because both the type and severity of disability need to be defined and measured. In addition, confusion arises from the casual use of terms such as impairments, disabilities, and handicaps.

Generally questions about nutrition are technically straightforward, reliable, and accurate. However, indicators based on weight for height, weight for age, height for age, and mid upper arm circumference are all best regarded as both non-specific and indirect, because body size at a given time is a result of the interaction of nutritional and infectious disease processes.
The article lists other topics that health surveys should include such as sex, age, education, household possessions, housing type, environmental contamination, water and sanitation, hygiene, crowding, air pollution to name a few. People who design these surveys should consider the seasonality of many infectious diseases and famine when planning fieldwork operations; the article recommends the model adopted for the Living Standards Measurement Surveys (LSMS) of the World Bank in which a limited number of interviewers conduct work evenly spaced out across an entire calendar year.

Disability

Chamie M. Can childhood disability be ascertained simply in surveys? Epidemiology 1994;5(3):273-5

Durkin MS, Wang W, Shrout PE, Zaman SS, Hasan ZM, Desai P, Davidson LL. Evaluating a ten questions screen for childhood disability: reliability and internal structure in different cultures. Journal of Clinical Epidemiology 1995;48(5):657-66

Durkin M, Zaman S, Thorburn M, Hasan M, Davidson L. Population-based studies of childhood disability in developing countries. International Journal of Mental Health 1991;20(2):47-60

Msall ME, DiGaudio K, Rogers BT, LaForest S, Catanzaro NL, Campbell J, Wilczenski F, Duffy LC. The functional independence measure for children (WeeFIM). Clinical Pediatrics 1994;421-30

Stein RE, Bauman LJ, Westbrook LE, Coupey SM, Ireys HT. Framework for identifying children who have chronic conditions: the case for a new definition. The Journal of Pediatrics 1993;122(3):342-7

Zaman SS, Khan NZ, Islam S, Banu S, Dixit S, Shrout P, Durkin M. Validity of the 'Ten Questions' for screening serious childhood disability: results from urban Bangladesh. International Journal of Epidemiology 1990;19(3):613-20

Author:	**Chamie M**
Title:	**Can childhood disability be ascertained simply in surveys?**
Source:	**Epidemiology 1994;5(3):273-5**

This paper lists the four major methods of survey assessment for childhood disability: 1) interview child caretaker about the child's limitations; 2) ask questions about reduction in the child's activities of daily life; 3) report children who receive services for disability; and 4) test children on their performance. Durkin *et al.* used the Ten Questions screen for childhood disability for interviewing caretakers of children in developing countries; if tested in developed countries too, it might be possible to establish childhood disability indicators for international comparison. Children in developing countries who had been previously tested and/or treated for vision and hearing problems were more likely to be reported, and those who had never been test or treated were more likely to be reported erroneously. Sometimes performance testing has been shown to be more valid and reliable than caretaker reporting.

Author:	**Durkin MS, Wang W, Shrout PE, Zaman SS, Hasan ZM, Desai P, Davidson LL**
Title:	**Evaluating a ten questions screen for childhood disability: reliability and internal structure in different cultures**
Source:	**Journal of Clinical Epidemiology 1995;48(5):657-66**

This study evaluated the Ten Questions screening instrument for the detection of serious childhood disabilities in 2-9 year olds. The researchers asked one main question – to what extent does the screen produce similarly systematic data in the three different populations of Bangladesh, Jamaica, and Pakistan? The research team used five different methods to assess the reliability and cross-cultural comparability of the Ten Questions. The screen is intended as a rapid and low cost method of case-finding in communities such as those in developing countries where many disabled children have never received any services or treatment. The authors found the Ten Questions to be a reliable questionnaire such that indicators of its reliability are comparable across populations that differ in culture and levels of socioeconomic development.

Author:	**Durkin M, Zaman S, Thorburn M, Hasan M, Davidson L**
Title:	**Population-based studies of childhood disability in developing countries**
Source:	**International Journal of Mental Health 1991;20(2):47-60**

This article proposes the use of a measure of the prevalence of childhood disability as an index of health status, because childhood disability has direct implications for the health needs of the community in both the short and long-term. In developed countries, case identification in epidemiological studies usually relies on service records, but in developing countries where these services are scarce, other low cost methods are required. In the past, a question on the national census or reliance on key informants in the community have been used to identify these children, but these methods have many shortcomings. This article proposes a three phase method - 1) door to door household surveys, 2) screening of all children using the Ten Questions, and 3) clinical evaluation of all children who screened positive. The Ten Questions have a few limitations including the variability in parents' perceptions and reporting practices and the existence of an environmental risk factor such as iodine deficiency that would make the 'norm' inappropriate for comparison. In the clinical evaluation, a professional uses the Medical Assessment Form (MAF) that identifies the same five disabilities covered by the Ten Questions. Overall, this three-phase

method is rapid, inexpensive, relies minimally on scarce professionally trained personnel, and gives standard, repeatable, internationally comparable results.

Author:	**Msall ME, DiGaudio K, Rogers BT, LaForest S, Catanzaro NL, Campbell J, Wilczenski F, Duffy LC**
Title:	**The functional independence measure for children (WeeFIM)**
Source:	**Clinical Pediatrics 1994;421-30**

The purpose of this article is to describe the conceptual framework, purpose, and pilot use of the functional independent measure for children, the WeeFIM, as applies to children with developmental disabilities. Initial field testing of the WeeFIM occurred in four settings – a university hospital community pediatric ambulatory clinic, a private group pediatric practice, a hospital affiliated day-care center, and a church-sponsored preschool. There was excellent agreement between age of the child in months and total WeeFIM, and the instrument demonstrated excellent psychometric properties for school-aged children with motor impairment. Five studies involving children with limb deficiencies, Down's syndrome, spina bifida, cerebral palsy, and extreme prematurity demonstrated that the WeeFiM was a valid measure of disability.

Author:	**Stein RE, Bauman LJ, Westbrook LE, Coupey SM, Ireys HT**
Title:	**Framework for identifying children who have chronic conditions: the case for a new definition**
Source:	**The Journal of Pediatrics 1993;122(3):342-7**

This article begins with the premise that efforts to identify children with health conditions usually rely on lists of diagnoses, but these lists are not desirable because 1) the lists cannot include all disorders; 2) clinicians may inconsistently apply diagnoses; 3) condition labels do not convey the extent of morbidity; 4) there is bias towards those kids who use the medical care system; and 5) a gap often exists between emergence of symptoms and diagnosis. The authors prefer a non-categorical or generic approach to determine ongoing health conditions and eligibility for services and benefits. The approach uses consequences of disorders rather than diagnostic labels, because lists have been shown to be a cumbersome, inconsistent, incomplete, and impractical way to identify children with chronic health conditions.

Author:	**Zaman SS, Khan NZ, Islam S, Banu S, Dixit S, Shrout P, Durkin M**
Title:	**Validity of the 'Ten Questions' for screening serious childhood disability: results from urban Bangladesh**
Source:	**International Journal of Epidemiology 1990;19(3):613-20**

This paper examines the data from Dhaka, Bangladesh to determine whether the Ten Questions childhood disability screen does in fact appear valid for both genders as well as for older and younger children between ages 2 and 9. Examiners tested the Ten Questions on 2576 children (1230 girls and 1346 boys); all children with positive screening results plus a random sample of those with negative results were clinically evaluated.

	All children	Boys	Girls	Older children (5-9 years)	Younger children (2-4 years)
Sensitivity	1	1	1	1	1
Specificity	.95	.94	.96	.94	.95
+ predictive value	.22	.2	.26	.23	.21
- predictive value	10	1.	1.	1	1
Prevalence per 1000	16	17	15	17	12

The Ten Questions is a sensitive screen but most of the children who screen positive are not seriously disabled. With such a low positive predictive value, the Ten Questions cannot function well on its own as a case-finding tool for epidemiological studies or as a basis for referring seriously disabled children to rehabilitation. The positive predictive values show a gender difference (20% for boys versus 26% for girls) which may be a result of parents' tendency to display more concern for sons than for daughters. The Ten Questions is best used as a screen test whereby children with positive results are referred for more definitive evaluations.

Hearing Loss

Gell FM, Whilte EM, Newell K, Mackenzie I, Smith A, Thompson S, Hatcher J. Practical screening priorities for hearing impairment among children in developing countries. Bulletin of the World Health Organization 1992;70(5):645-55

Lyn C, Jadusingh WA, Ashman H, Chen D, Abramson A, Soutar I. Hearing screening in Jamaica: prevalence of otitis media with effusion. The Laryngoscope 1998;108:288-90

Mackenzie I, Thompson S, Smith A, Bal IS, Hatcher J. Practical advice on field studies into hearing impairment in a developing country. Tropical Doctor 1995;25:25-8

McPherson BD, Holborrow CA. School screening for hearing loss in developing countries. Scandinavian Audiology. Supplementum 1988;28:103-10

McPherson B, Knox E. Test-retest variability using the Liverpool screening audiometer in a field environment. British Journal of Audiology 1992;26:139-41

McPherson B, Swart SM. Childhood hearing loss in sub-Saharan Africa: a review and recommendations. International Journal of Pediatric Otorhinolaryngology 1997;40:1-18

Author:	**Gell FM, Whilte EM, Newell K, Mackenzie I, Smith A, Thompson S, Hatcher J**
Title:	**Practical screening priorities for hearing impairment among children in developing countries**
Source:	**Bulletin of the World Health Organization 1992;70(5):645-55**

This article reviews screening methods for hearing impairment used in developed countries, identifies problems expected to occur when using these methods in developing countries, and proposes appropriate and realistic screening methods for these settings. The first year screening test for hearing impairment includes testing the infant's hearing using the distraction technique and questioning the mother about the developmental status, communication abilities, and hearing behavior of her infant. The distraction test involves the production of an orienting response to meaningful sounds of different frequency ranges. Various sounds at specific decibel levels are recommended. Insufficient training of hearing testers, poor test techniques, lack of sound-level meters, and inaccurate stimulus intensity and frequency may account for low levels of detection in developed countries. In developing countries, additional problems include the difficulty of staff training, lack of equipment, lack of a quiet distraction-fee testing environment, and overburdening of understaffed health units.

For 2-3 year olds, the verbal-auditory test is usually used in which the child is required to point to a picture representing a word that is spoken aloud. The test for 3-4 year olds is a performance test in which the child is trained by play-conditioning to manipulate objects in response to either speech or pure-sound stimuli. These tests are culture specific, depend greatly on level of formal education, and require familiarity with test materials. Another screening method for 2-3 year olds is play audiometry, but these tests require trained audiologosts or audiological technicians and a quiet testing environment; unfortunately no simple, accurate, low cost alternatives are currently available.

For school aged children, screening audiometry using either pure tone or speech stimuli is the most common method used in developed countries. Unfortunately there is no consensus on the determination of pass/fail criterion for screening. In addition, speech audiometry is more appropriate and useful for assessing the extent of hearing disability, particularly with preschool children who will not respond to pure tones. In developing countries, clinics in large cities often have expensive, complicated diagnostic audiometers, but finding spare parts, training skilled operators, and transporting them to rural areas hinder their use. Even the simpler, portable audiometers do not travel well. The Liverpool Field Audiometer was produced in response to these problems, because it is simple, robust, and inexpensive.

Increasing concern about fluid in the middle ear has led to the use of typanometry - a quick, objective, reliable method. Where CSOM is a greater problem (as is generally the case in developing countries), accurate tympanometry may not be possible. In this case, inspection of the ear for a purulent discharge using otoscopy is the best screening method. Otoscopy, or the tuning fork test, requires the skill of an experienced examiner and is usually not effective for mass screening by less experienced screeners.

Author:	**Lyn C, Jadusingh WA, Ashman H, Chen D, Abramson A, Soutar I**
Title:	**Hearing screening in Jamaica: prevalence of otitis media with effusion**
Source:	**The Laryngoscope 1998;108:288-90**

This study sought to determine the prevalence of otitis media with effusion (OME) in urban Jamaican children aged 5-7. 2202 children were screened by an audiologist technician using tympanometry and a pure-tone audiogram screen. Children who failed the screen were further evaluated at an ear, nose, and throat clinic. Of the 2202 tested, 108 or 4.9% failed of which 5.1% attended government owned schools and 4.5% attended private schools. Of these children who failed the screen, 57% had wax impaction and 39% had OME. Evoked otoacoustic emissions are being increasingly used as a screening test for neonates, with those who fail undergoing auditory brainstem response (ABR). Otoacoustic emissions are inexpensive, performed quickly, and require minimum training; ABR is not so inexpensive, rapid, or easy. In the past, screening of neonates was limited to high risk groups, but this practice fails to identify half of the children with hearing problems. The authors recommend that in developing countries, health workers should learn to identify wax impaction and remove it by syringe. In addition, for any successful hearing screening program, good equipment and adequate training of audiometric technicians are necessary.

Author:	**Mackenzie I, Thompson S, Smith A, Bal IS, Hatcher J**
Title:	**Practical advice on field studies into hearing impairment in a developing country**
Source:	**Tropical Doctor 1995;25:25-8**

This article summarizes the practicalities of organizing a study of the prevalence of ear problems and hearing impairment and conducting a clinical trial of simple treatment for chronic suppurative otitis media.

Audiometry The Kamplex AS7B audiometer with Amplifier Audiocups was reliable, sturdy, and portable but had the disadvantage that it only measures air conduction. Furthermore, the leads could be damaged during packing and needed replacement every few months. Screening in a sound proof room gave the most accurate results, but oftentimes soundproofing is not available or affordable. The battery operated, sturdy, and reliable Cirrus CRL 412 A measured the background noise well but required frequent battery replacement.

Otoscopy Wickman headlamps by Gowlands illuminate the ear for examination and make it much easier to clean the ears, but they are cumbersome and fatigue the electrical connections, requiring simple soldering. The auroscope has the advantage of being small, but it is also expensive. The Welch-Allyn fibre-optic otoscope could be easily damaged by inserting batteries.

Tympanometry Tympanometry is a simple test that determines the type of deafness. The Welch-Allyn portable tympanometer proved reliable, robust, and easy to use but required recharging overnight at the base camp because it needs means electricity which none of the schools possessed.

In addition, the authors discussed the cleaning of equipment, supplementary equipment, batteries, logistics, staff, and testing at schools. Concerning staff, it is helpful if at least one member of the study team speaks the local language. Testing at schools has the advantage of giving access to a

large group of people at one location, however absenteeism (especially for nonpayment of school fees) was high.

The authors conclude that surveys of hearing impairment in developing countries require reliable, sturdy equipment that can withstand harsh conditions and travel over difficult terrain.

Author:	**McPherson BD, Holborrow CA**
Title:	**School screening for hearing loss in developing countries**
Source:	**Scandinavian Audiology. Supplementum 1988;28:103-10**

This article begins by listing five important aspects of hearing impairment screening programs in developing countries. First, studies must determine the type of disorders most commonly found in the population and their prevalence. Second, the health system must have the capacity to handle the cases discovered by the screening program. Third, screening tests will not work well in noisy classrooms or at schools with high ambient noise levels. Fourth, the examiners must have a high level of motivation and discipline as well as the technical skills to correctly perform the screening tests. Fifth and finally, maintenance, transport over rugged terrain, calibration, power supply (battery or electricity), size, and sturdiness are important factors to consider when choosing equipment.

The authors also listed some general observations made during a study conducted in the Gambia. Generally children with hearing impairment do not attend school but rather learn domestic or farming tasks at home, so studies undertaken at schools undercount the true prevalence of the condition. The study identified middle ear infections as common conditions that often resulted in hearing loss or chronic discharge. Otitis externa was also seen and resulted in irritation of the ear canal, pain, and school absence.

The authors conclude by repeating the importance of conducting a survey to identify the most prevalent hearing disorders and then developing a screening procedure based on these disorders.

Author:	**McPherson B, Knox E**
Title:	**Test-retest variability using the Liverpool screening audiometer in a field environment**
Source:	**British Journal of Audiology 1992;26:139-41**

This study investigated the test-retest variability of the Liverpool Field Audiometer (LFA) as a screening device in a field environment of a developed country (Australia). The LFA is a robust, low-cost screening test designed for use in developing countries. The LFA manual recommends the use of four test frequencies – 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz. A training session taught "12 relatively unsophisticated testers" to use the LFA as a screening device. The twelve testers screened 275 children from four Brisbane primary schools in the quietest rooms available. Each child was screened twice, once by each of the two LFAs. The overall failure rate (right and left ears conbined) was 52.5% at 500 Hz, 13.5% at 1000 Hz, and 1.5% at both 2000 Hz and 4000 Hz. The authors found the LFA to be sturdy, easy to learn and use, and acceptable by the students. Concordance between testers in this field test had over 90% agreement for frequencies 1000 Hz, 2000 Hz, and 4000 Hz, and children referred at these frequencies generally have a low rate of false positives. However, at the 500 Hz level, testers should interpret the results with

caution. Other studies have also found that at the 500 Hz level, the LFA tends to give high levels of false positive results compared to conventional audiometery.

Author:	**McPherson B, Swart SM**
Title:	**Childhood hearing loss in sub-Saharan Africa: a review and recommendations**
Source:	**International Journal of Pediatric Otorhinolaryngology 1997;40:1-18**

This article reviews research on childhood hearing loss in sub-Saharan Africa and makes recommendations for future research activities. The observations and suggestions are based on studies conducted in Gambia, Nigeria, Sierra Leone, Angola, Kenya, Tanzania, Ethiopia, Zimbabwe, Swaziland, and South Africa. The research indicates a prevalence of severe bilateral hearing loss 3-4 times higher than in the developed world and a high rate of otitis media in infancy that declines with age. Studies of middle ear disorder in infants and children show that the prevalence and type may vary from region to region. Surveys conducted at schools do not give an accurate indication of profound hearing loss because these children do not usually attend school. The article also discusses the etiology of severe to profound childhood hearing loss and provides an overview of all of the studies previously conducted in sub-Saharan Africa. The authors conclude by making six recommendations to improve hearing loss research. First, accurate epidemiological information must be collected to clearly establish the relative importance of etiological factors in the study area. Second, surveys must include all children, especially those with other disabilities. Third, local beliefs must be taken into consideration when designing studies and preventive programs. Fourth, researchers should clearly describe techniques, methods, and classifications so study findings will be comparable. Fifth, hearing loss research might act as an index of overall community health, so researchers should look further into this area. Sixth and finally, field equipment must withstand difficult conditions, various terrains, and different climates.

Low Vision

Kay H. New method of assessing visual acuity with pictures. British Journal of Ophthalmology 1983;67:131-3

Keeffe JE, Lovie-Kitchin JE, Maclean H, Taylor HR. A simplified screening test for identifying people with low vision in developing countries. Bulletin of the World Health Organization 1996;74(5):525-32

Thylefors B. Vision screening of illiterate populations. Bulletin of the World Health Organization 1977;55:115-9

Author:	**Kay H**
Title:	**New method of assessing visual acuity with pictures**
Source:	**British Journal of Ophthalmology 1983;67:131-3**

The Beale-Collins and Clement-Clarke tests use pictures to assess the vision of young children, but most would agree that as visual acuity tests they are not as accurate as tests with shapes and a key card. This study developed a vision assessment test that is easily understood by 2-3 year old children, practicable for both examiners and children, and graded by the Snellen's system. Fifty-six children of this age group tested the assessment materials by trying to identify pictures and objects; a high majority could correctly identify the images. Then 160 adults and older children with Snellen's vision from 6/6 to 1/60 inclusive were also tested with pictures. When testing children's vision, a compromise must be sought to maintain the child's interest in the test (for example, use may pictures) while providing a reasonably accurate and replicable assessment of vision. The authors conclude that this method gives a far more accurate recording of visual acuity than do other picture tests.

Author:	**Keeffe JE, Lovie-Kitchin JE, Maclean H, Taylor HR**
Title:	**A simplified screening test for identifying people with low vision in developing countries**
Source:	**Bulletin of the World Health Organization 1996;74(5):525-32**

This article describes the development and validation of a kit for assessment of low vision in adults and children of developing countries. The kit contains a visual acuity test-card, a pinhole mask to detect refractive errors, and two manuals. The methods section of the article describes the screening of distance and near vision using this kit and provides criteria for determination of different levels of visual impairment. Field tests were conducted in 32 countries of Africa, Asia, and Eastern Europe. Over 60% of the 127 students attending schools for the blind in Kenya and Uganda were categorized as having low vision using the distance vision test. Compared to the Snellen test, the simplified distance test had a sensitivity of 85% and a specificity of 96%. Compared to the conventional test, the new near vision test had a sensitivity of 100% and a specificity of 84%. The acuity test card is appropriate for developing countries, easy to learn, and simple to use in a variety of settings. In the validation study, it also performed well; it did not miss a single person with low vision and only missed 3% of those with poor distance vision.

Author:	**Thylefors B**
Title:	**Vision screening of illiterate populations**
Source:	**Bulletin of the World Health Organization 1977;55:115-9**

The E test of Snellen is a widely used method to study visual acuity, but it may pose problems for the testing of illiterate populations and therefore give a high untestability rate. This study compared Sjögren's hand-test with Snellen's E test. 929 people from Côte d'Ivoire, Ghana, and Upper Volta (Burkina Faso) were tested using the E-test chart, 1098 using the E-test cards, and 1163 using the hand-test. The untestability rates show a highly significant difference ($P < 0.001$) between the total results with the E-chart and E-cards, and also between both versions of the E-test and hand-test. The total reliability rates for the E-chart, E-test cards, and hand-test, calculated from the number of examined eyes with an identical visual acuity level on both test occasions, were 83.4%, 84.2%, and 92.5% respectively. Overall the visual chart has the disadvantage of being difficult to understand and providing very few test-types for the 6/60 level of visual acuity. This method also has the risk of recording a severe degree of visual impairment when in fact the patient sees well but is untestable. Concerning the hand test, the oval outline of the hand may assist the test taker in locating the direction of the fingers. Furthermore, the metric scale of the hand test does not correspond exactly to the E test levels. The authors conclude that "the hand-test was shown to be of value for screening illiterate populations, and it showed a correlation sufficient to enable vision levels to be categorized with a high degree of accuracy."

Hypertension

Anand NK, Tandon L. Prevalence of hypertension in school going children. Indian Pediatrics 1996;33:377-81

Ashour Z, Ibrahim MM, Appel LJ, Ibrahim AS, Whelton PK. The Egyptian national hypertension project (NHP): design and rationale. Hypertension 1995;26(6)Part 1:880-5

Ataman SL, Cooper R, Rotimi C, McGee D, Osotimehim B, Kadiri S, Kingue S, Muna W, Fraser H, Forrester T, Wilks R. Standardization of blood pressure measurement in an international comparative study. Journal of Clinical Epidemiology 1996;49(8):869-77

Ibrahim MM. Hypertension surveys in the developing world. Lessons from the Egyptian national hypertension project (NHP). Journal of Human Hypertension 1997;11:709-26

Ikeme AC. Hypertension studies in developing countries [review]. Clinical and Experimental Hypertension – Part A, Theory and Practice 1989;11(5-6):825-39

Nissinen A, Böthig S, Granroth H, Lopez AD. Hypertension in developing countries. World Health Statistics Quarterly 1988;41:141-54

Schmidt GJ, Stensel DJ, Walkuski JJ. Blood pressure, lipids, lipoproteins, body fat and physical activity of Singapore children. Journal of Paediatric Child Health 1997;33:484-90

Singh RB, Beefom R, Ghosh S, Niaz MA, Rastogi V, Rastogi SS, Singh NK, Nangia S. Epidemiological study of hypertension and its determinants in an urban population of North India. Journal of Human Hypertension 1997;11:679-85

Author:	**Anand NK, Tandon L**
Title:	**Prevalence of hypertension in school going children**
Source:	**Indian Pediatrics 1996;33:377-81**

This study sought to evaluate the normal range of blood pressure in different age groups, prevalence of hypertension, and aggravating factors. For the 5000 participating school-aged children (2043 girls and 2957 boys), the researchers recorded three blood pressure measurements and took the mean. Examiners also measured height and weight and interviewed parents about family history of hypertension. Blood pressure greater than two standard deviations above the mean for age and sex was categorized as hypertensive, and by this definition only 23 of the 5000 children (.46%) were found to be hypertensive. Important influencing factors in the development of hypertension included obesity and family history of hypertension. The findings of the present study revealed that the rise in blood pressure was directly proportional to the increase in age in both the sexes with a spurt of about 5 mm HG in SBP at age 12. The authors recommend screening to detect asymptomatic hypertension.

Author:	**Ashour Z, Ibrahim MM, Appel LJ, Ibrahim AS, Whelton PK**
Title:	**The Egyptian national hypertension project (NHP): design and rationale**
Source:	**Hypertension 1995;26(6)Part 1:880-5**

The Egyptian National Hypertension Project determined the prevalence of hypertension and blood pressure-related complications in Egypt, identified environmental factors associated with high blood pressure, and established an infrastructure for research and education. Representative samples from the 1986 census chosen during the three stages of the project made possible estimates of prevalence of hypertension. Persons with systolic BP >=140 mm HG and/or diastolic BP >= 90 mm HG were considered to be hypertensive. Besides BP, examiners also recorded weight, height, and waist and hip circumference. Laboratory samples included blood samples for fasting and postprandial blood sugar, serum lipids, blood urea nitrogen, serum creatinine, uric acid, and serum electrolytes. A urine sample provided information about elecytrolytes concentration, protein, sugar, and schistosomiasis. The participants then had a resting electrocardiogram (ECG) and echocardiogram. Ambulatory BP glycosylated hemoglobin, skin color reflectance, cartoid wall thickness measurements, glycosylated hemoglobin, fasting, and post prodial insulin were also obtained for selected persons. The article ended by mentioning strengths and limitations of the Egyptian project.

Author:	**Ataman SL, Cooper R, Rotimi C, McGee D, Osotimehim B, Kadiri S, Kingue S, Muna W, Fraser H, Forrester T, Wilks R**
Title:	**Standardization of blood pressure measurement in an international comparative study**
Source:	**Journal of Clinical Epidemiology 1996;49(8):869-77**

This study sought to evaluate standardization of the measurement of blood pressure, because comparison of mean levels of blood pressure is highly sensitive to differences in technique. After undergoing thorough training and assessment, examiners took 26,937 blood pressure readings of 8,981 individuals in Nigeria, Cameroon, Barbados, St. Lucia, Jamaica, and the United States using a standard mercury sphygmomanometer. Although digit preference for a terminal zero was modest, excessive digit preference persisted with all three readings in one site. In response to digit preference, special sphygmomanometers have been developed; unfortunately these devices

tend to be expensive, heavy, and cumbersome, especially for community studies and surveys. Given the fact that staff are likely to perform better in a test setting than in the field, some anonymous and ongoing means of verifying the accuracy of field readings would be ideal for survey research.

Author: **Ibrahim MM**
Title: **Hypertension surveys in the developing world. Lessons from the Egyptian national hypertension project (NHP)**
Source: **Journal of Human Hypertension 1997;11:709-26**

This article discusses lessons learned from the Egyptian National Hypertension Project. The following table provides information on the scope of hypertension surveys previously conducted in developing countries.

	Funds	Data collected	Research instruments
A	Limited	BP distribution	Brief questionnaire forms Sphygmomanometers
		Hypertension prevalence	
B	Moderate	BP distribution	Detailed questionnaire forms Sphygmomanometers, scales for weight and height, simple biochemical lab
		Hypertension prevalence	
		Hypertension awareness, treatment, and control	
		Some hypertension risk factors	
C	Large	B+ detailed hypertension risk factors	B+ Ophthalmoscope, ECG, Echo, elaborate biochemical lab, spectrophotometer, cardiac duplex ultrasound, ABP, recorder
		Hypertension complications	
		Other CV risk factors	
		Special studies: ABP, ASO changes, skin color, drinking water, noise, etc	

The article also provides suggestions for writing the research proposal, fund raising, survey design, field operations, data handling, reporting and publishing, and collaborating with foreign organizations.

Author: **Ikeme AC**
Title: **Hypertension studies in developing countries [review]Clinical and Experimental Hypertension – Part A, Theory and Practice**
Source: **1989;11(5-6):825-39**

The prevalence of hypertension in African adults ranged from 2% to over 18% in the studies evaluated, but much of this variation may be due to differences in the rate of rise of blood pressure with age and methodological differences such as cutoff points and variations in age structure. Urban areas usually have higher pressures and higher prevalences of hypertension than rural areas. Some, but not all studies in sub-Saharan Africa, have shown as association between *S. haematobium* prevalence and renal hypertension.

Author:	**Schmidt GJ, Stensel DJ, Walkuski JJ**
Title:	**Blood pressure, lipids, lipoproteins, body fat and physical activity of Singapore children**
Source:	**Journal of Paediatric Child Health 1997;33:484-90**

The purpose of the study was to determine predicted body fat percents from anthropometry and measure blood pressure, plasma glucose, lipid, and lipoprotein concentrations in a sample of Singaporean school children aged 6-18. The examiners measured blood pressure using a stethoscope and aneroid sphygmomanometer; weight; body fat using two skin fold measurements taken at the triceps and calf; and blood plasma, total cholesterol (TCHOL), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), and glucose (GLU) using a finger prick of blood. Low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein cholesterol (VLDL-C) were also calculated. Examiners also interviewed the children about their physical activity. Differences between the active and non-active children were found in coronary risk factors TCHOL, LDL-C, TG, TCHOL/HDL-C, and percent body fat. No differences were shown between the two groups in HDL-C, GLU, and blood pressure.

Author:	**Singh RB, Beefom R, Ghosh S, Niaz MA, Rastogi V, Rastogi SS, Singh NK, Nangia S**
Title:	**Epidemiological study of hypertension and its determinants in an urban population of North India**
Source:	**Journal of Human Hypertension 1997;11:679-85**

This study aimed to report the prevalence rate of hypertension based on the WHO/International Society of Hypertension (ISH) criteria. 1806 North Indian subjects (902 women and 904 men) participated in this study by agreeing to answer interview questions about dietary intake, age, socioeconomic status, past and family history of hypertension, diabetes, hypercholesterolaemia, alcohol intake, physical activity, and smoking. Examiners also took blood pressure, body weight, and waist and hip girths. Essential hypertension was diagnosed if systolic BP > 140 mmHG or diastolic BP > 90 mmHg or both. Central obesity was considered if waist to hip ratio was > .85 units for women or > .88 units for men. Higher and middle socioeconomic status, higher BMI, and central obesity were strong predictors of hypertension in the study. Higher dietary fat and slat intake also correlated with hypertension.

Diabetes

Dowse GK, Zimmet P. A model protocol for a diabetes and other noncommunicable disease field survey. World Health Statistical Quarterly 1992;45:360-9

Forrest RD, Jackson CA, Gould BJ, Casburn-Budd M, Taylor JE, Yudkin JS. Four assay methods for glycated hemoglobin compared as screening tests for diabetes mellitus: the Islington diabetes survey. Clinical Chemistry 1988;34(1):145-9

Hanson RL, Nelson RG, McCance DR, Beart JA, Charles MA, Pettitt DJ, Knowler WC. Comparison of screening tests for non-insulin-dependent diabetes mellitus. Archives of Internal Medicine 1993;153:2133-2140

McCance DR, Hanson RL Charles MA, Jacobsson LTH, Pettitt DJ, Bennett PH, Knowler WC. Comparison of tests for glycated haemoglobin and fasting and two hour plasma glucose concentrations as diagnostic methods for diabetes. British Medical Journal 1994;308(6940):1323-8

Shera AS, Rafique G, Khwaja IA, Ara J, Baqai S, King H. Pakistan national diabetes survey: prevalence of glucose intolerance and associated factors in Shikarpur, Sindh Province. Diabetic Medicine 1995;12:1116-21

Singer DE, Samet JH, Coley CM, Nathan DM. Screening for diabetes mellitus. Annals of Internal Medicine 1988;109:639-49

Author:	**Dowse GK, Zimmet P**
Title:	**A model protocol for a diabetes and other noncommunicable disease field survey**
Source:	**World Health Statistical Quarterly 1992;45:360-9**

This article presents a model protocol and survey manual for diabetes and non-communicable disease (NCD) surveys, especially non-insulin dependent diabetes mellitus and cardiovascular disease. This model has been successfully used in several Pacific island nations, Mauritius, and Singapore. The protocol begins with advice on sampling, nonresponse, and schedule, accommodation, and transportation. It describes how the fasting blood should be taken, glucose load should be measured, blood pressure should be taken, ECG should be recorded, and a two-hour blood sample should be taken. The article ends with suggestions about quality control, ethics, and data entry and analysis. The authors conclude by stating that "the model presented has been successfully used in developing countries, for both rural and urban communities, over more than a decade" and recommend that it be modified for local conditions.

Author:	**Forrest RD, Jackson CA, Gould BJ, Casburn-Budd M, Taylor JE, Yudkin JS**
Title:	**Four assay methods for glycated hemoglobin compared as screening tests for diabetes mellitus: the Islington diabetes survey**
Source:	**Clinical Chemistry 1988;34(1):145-9**

This study evaluated four assay methods – agar gel electrophoresis, agar gel electrophoresis of hemolysate, boronate affinity chromatography, and isolectric focusing – for glycated hemoglobin as screening tests for diabetes mellitus. 214 subjects recalled in the second phase of a community study of 1084 subjects in North London participated in this study. The glucose tolerance status of the subjects was assessed by the concentration of glucose in capillary blood in fasted subjects and 2 hours after a 75 g oral glucose load. Values for glycated hemoglobin after fasting show considerable overlap between groups of subjects with normal tolerance, impaired glucose tolerance, and diabetes. The distribution of post-load values for glycated hemoglobin shows a similar degree of overlap.

Assay	Specificity	Positive predictive value
Fasting blood glucose	93.6	45.5
Total GHb	59.3	12.6
Stable GHb	86.0	34.5
Affinity chromatography	90.9	39.4
Iso-electric focusing	74.0	25.7

Glucose tolerance tests (GTT) have many problems such as their poor reproducibility, complexity to perform, and ability to measure blood-glucose only at the moment that blood is sampled. The assay of blood glucose after fasting was more nearly accurate as a screening test than were any of the post-load assays of glycated hemoglobin. Affinity chromatography may better distinguish subjects with impaired glucose tolerance from normal individuals than do the other methods. This assay may also have greater precision than the others even though the confidence intervals

are wide. In detecting subjects with any degree of glucose intolerance, the confidence intervals for all fasting and post-load assays overlap indicating that no method was considerably better.

Author:	**Hanson RL, Nelson RG, McCance DR, Beart JA, Charles MA, Pettitt DJ, Knowler WC**
Title:	**Comparison of screening tests for non-insulin-dependent diabetes mellitus**
Source:	**Archives of Internal Medicine 1993;153:2133-2140**

This research project compared screening tests for non-insulin dependent diabetes mellius (NIDDM) to help choose between screening methods. 2092 fasting and 237 non-fasting Pima Indians, a population known to be at high risk for NIDDM, participated in the study. Fasting plasma glucose (FPG) levels and the measures of glycated hemoglobin (HbA1, HbA1c) were compared for the fasting subjects, and glycated hemoglobin, quantitative glycosuria, and dipstick glycosuria were compared for the non-fasting individuals.

	Sensitivity	Specificity	+ Predictive Value	- Predictive Value
Non-fasting				
Quantitative glycosuria				
>=1.39 mmol/L	80.6	90.5	60.4	96.3
>=1.94	80.6	98.0	87.9	96.7
Dipstick				
>=trace	64.3	98.8	90.0	94.4
>=1	57.1	99.4	94.1	93.4
Hemoglobin A				
>=6.96%	96.4	89.0	61.4	99.3
>=7.3%	92.9	98.1	89.7	98.7
Fasting subjects				
Hemoglobin A1c				
>=5.8%	92.0	89.0	64.6	98.1
>=6.3%	80.3	98.3	91.0	95.8
Hemoglobin A1				
>=6.9%	90.0	88.4	57.4	98.1
>=7.5%	78.8	97.9	86.7	96.3
Fasting plasma glucose				
>=6.1 mmol/L	95.3	90.0	62.9	99.1
>=6.83 mmol/L	88.0	98.3	90.0	97.9

The authors summarize that “FPG and glycated hemoglobin have similar properties in screening for NIDDM in Pima Indians although the sensitivity of FPG is slightly higher, particularly at very high specificities.” The tests of glycosuria have limited ability to detect individuals with diabetes and moderate hyperglycemia, but they reliably detect severe hyperglycemia. Each of the tests has sensitivity near 80% at 98% specificity for detecting diabetes using WHO criteria. All four methods are sensitive for detecting severe hyperglycemia. The authors recommend that the cost, convenience, and availability will determine the choice of screening tests.

Author:	**McCance DR, Hanson RL Charles MA, Jacobsson LTH, Pettitt DJ, Bennett PH, Knowler WC**
Title:	**Comparison of tests for glycated haemoglobin and fasting and two hour plasma glucose concentrations as diagnostic methods for diabetes**
Source:	**British Medical Journal 1994;308(6940):1323-8**

The objective of this study was to compare the ability of test measuring two-hour plasma glucose, fasting plasma glucose, and glycated haemoglobin concentrations in predicting the specific microvascular complications on non-insulin dependent diabetes mellitus. The oral glucose tolerance test is an accepted means of diagnosing diabetes mellitus, but this test is also inconvenient, variable, expensive, and non-physiological in nature. Pima Indians residing in Arizona served as the study population, because this population has a high prevalence of diabetes mellitus. This study found that when two hour and fasting plasma glucose and glycated haemoglobin concentrations are examined in relation to long term complications of diabetes, each of the three variables has a similar association with previous and five year incidence of those complications. These findings suggest that the choice of a measure of glycaemia for diagnostic purposes might well favor glycated hemoglobin or fasting plasma glucose concentration.

Author:	**Shera AS, Rafique G, Khwaja IA, Ara J, Baqai S, King H**
Title:	**Pakistan national diabetes survey: prevalence of glucose intolerance and associated factors in Shikarpur, Sindh Province**
Source:	**Diabetic Medicine 1995;12:1116-21**

This article describes the first phase of the Pakistan national diabetes survey using the WHO diagnostic criteria. Oral glucose tolerance tests were performed in a stratified random sample of 967 adults (580 women and 387 men) above the age of 25. After a 10-14 hour overnight fast, a fasting blood sample was taken and then 82.5 g of glucose was given in water. Examiners also measured height, weight, and waist-hip ratio; physicians interviewed all subjects and filled out a questionnaire. The article provides prevalence data for diabetes and impaired glucose intolerance by age and sex.

Author:	**Singer DE, Samet JH, Coley CM, Nathan DM**
Title:	**Screening for diabetes mellitus**
Source:	**Annals of Internal Medicine 1988;109:639-49**

This article describes the many screening methods for the two types of diabetes – type I insulin dependent and type II non-insulin dependent. Diabetes diagnosis should identify persons with abnormal glucose levels and indicate an increased risk for vascular complications. Diagnosis is normally straightforward, but oftentimes population surveys fail to diagnose asymptomatic people with abnormal glucose metabolism. The oral glucose tolerance test can diagnose these people, and recently new standards (with a considerably higher glycemic threshold) have been established for interpretation of results. Screening aims at identifying people with disease in asymptomatic populations. Screening should only be recommended when treatment begun in the pre-symptomatic phase of disease is more effective than treatment begun after symptoms lead a person to seek medical care. The article shows the results of a cost-effectiveness study of screening for gestational diabetes. The authors do not recommend screening for non-insulin dependent diabetes mellitus, because, among other reasons, treatment of asymptomatic persons

does not seem to improve complications. Likewise, the authors advise against screening for insulin-dependent diabetes mellitus.

Cholesterol

Gan IET, Schier GM. Comparison of Chemcard cholesterol test and laboratory cholesterol Measurements. Australian New Zealand Journal of Medicine 1995;25:716-9

Gottschling HD, Reuter W, Ronquist G, Steinmetz A, Hattemer A. Multicentre evaluation of a non-wipe system for the rapid detemination of total cholesterol in capillary blood Accutrend Cholesterol on Accutrend GC. European Journal of Clinical Chemistry and Clinical Biochemistry 1995;33:373-81

Law WT, Doshi S, McGeehan J, McGeehan S, Gibboni D, Nikolioukine Y, Keane R, Zheng J, Rao J, Ertingshausen G. Whole-blood test for total cholesterol by a self-metering, self-timing disposable device with built-in quality control. Clinical Chemistry 1997;43(2):384-9

Miller WG, McKenney JM, Conner MR, Chinchilli VM. Total error assessment of five methods for cholesterol screening. Clinical Chemistry 1993;39(2):297-304

Rogers EJ, Misner L, Ockene IS, Nicolosi RJ. Evaluation of seven cholestech L·D·X analyzers for total cholesterol determinations. Clinical Chemistry 1993;39(5):860-4

Statland BE. A review of the analytic performance of the Reflotron system for cholesterol testing. Clinical Therapeutics 1990;12(3):281-6

Author:	**Gan IET, Schier GM**
Title:	**Comparison of Chemcard cholesterol test and laboratory cholesterol measurements**
Source:	**Australian New Zealand Journal of Medicine 1995;25:716-9**

This study evaluated the simple, quasi-quantitative Chemcard cholesterol test as a tool to identify patients with elevated cholesterol as part of an assessment of risk of coronary heart disease. 200 subjects (94 women and 106 men) participated in this study by giving blood. Examiners tested the blood using Chemcard, Kodak Ektachem, and the reference method. The Chemcard results show close agreement, 94.2% reliability compared to the 96.4% claimed by the manufacturer. For cholesterol levels less than 5.2 mmol/L, reliability decreased to 57.7%. The poor agreement between Chemcard and the lab method and the potential misclassification by Chemcard suggest that it is not a reliable test system. The authors conclude "the inaccuracy found in this study refutes the manufacturer's claims and does not eliminated the need for formal laboratory cholesterol measurement."

Author:	**Gottschling HD, Reuter W, Ronquist G, Steinmetz A, Hattemer A**
Title:	**Multicentre evaluation of a non-wipe system for the rapid detemination of total cholesterol in capillary blood, Accutrend Cholesterol on Accutrend GC**
Source:	**European Journal of Clinical Chemistry and Clinical Biochemistry 1995;33:373-81**

This study evaluated Accutrend Cholesterol, a new, rapid, test for the determination of total cholesterol, against the cholesterol oxidase/p-aminophenazone (CHOD-PAP) method. Accutrend Cholesterol is a non-wipe test that requires the application of a drop of finger blood to the test strip. Results take three minutes. 584 patients donated capillary blood samples that were tested at four different clinical centers. Capillary blood samples with cholesterol concentrations from 3.88 to 7.76 mmol/l measured with Accutrend Cholesterol on Accutrend GC produced results with systematic deviation of –3.2% to +2.5% when compared with the CHOD-PAP values. Thus the system showed +-5% agreement with the comparison method. The values for several specimens measured with the Accutrend system showed deviations of more then +-15%. These specimens might have been subject to interference by high doses of dobesilate, gentisic acid, or methylaminoantipyrine. Blood volumes of less the 15 micronL may result in values that are too low. The authors conclude “in view of the small size of the meter, the simple Accutrend Cholesterol system may serve as a helpful tool for screening purposes and offer the possibility of home use for patients at high risk.”

Author:	**Law WT, Doshi S, McGeehan J, McGeehan S, Gibboni D, Nikolioukine Y, Keane R, Zheng J, Rao J, Ertingshausen G**
Title:	**Whole-blood test for total cholesterol by a self-metering, self-timing disposable device with built-in quality control**
Source:	**Clinical Chemistry 1997;43(2):384-9**

This paper describes the ENA.C.T Total Cholesterol Test that uses a low-cost disposable flow device to test total cholesterol in fingerstick whole blood. The device meters the sample, separates plasma from erythrocytes, and precisely times plasma flow into various reagent compartments. The accuracy of the ENA.C.T. test devices was established by direct comparison with the Abell-Kendall method. The average bias of ENA.C.T. for all four sites combined at the

medical decision levels of 2000 and 2400 mg/L, were 1.6% and 0.9% respectively. Within-run and between-run studies gave results ranging from 2.11% to 4.8% and from 2.58% to 5.04%. The authors believe this one-step disposal system is precise, accurate, easy to use, requires no technological expertise or training, can be performed anywhere, and quickly gives results in less than 20 minutes.

Author: **Miller WG, McKenney JM, Conner MR, Chinchilli VM**
Title: **Total error assessment of five methods for cholesterol screening**
Source: **Clinical Chemistry 1993;39(2):297-304**

This report assessed five methods of cholesterol screening Reflotron, Vision, Ektachem DT-60, QuickRead, and Liposcan in terms of accuracy, precision, total analytical errors, and patient misclassification. These compact instruments measure cholesterol in capillary whole blood, venous whole blood, and venous plasma. The comparison method for determining accuracy was an enzymatic cholesterol procedure standardized by the CDC. 100 asymptomatic ambulatory adult subjects participated in the study; no subject was tested by all five devices.

Device	Average Percent Bias (and n)			Total Imprecision Determined with Frozen Serum Pools		
	Capillary blood	Venous blood	Venous plasma	Pool 1 (5.04 mmol/L, 1.95 g/L)	Pool 2 (6.49 mmol/L, 2.51 g/L)	Pool 3 (7.19 mmol/L, 2.78 g/L)
Reflotron	4.1 (92)	-0.8 (98)	-0.3 (97)	6.4	5.3	4.3
Vision	8.4 (60)	4.0 (87)	3.6 (87)	3.6	3.6	4.9
DT-60	2.6 (56)	n/a	2.4 (59)	3.3	2.8	3.1
QuickRead	18.4 (88)	16.5 (97)	1.8 (61)	13.3	7.6	7.7
QuickREad (hct>=39%)	16.2 (52)	14.6 (59)	n/a			

Both QuickRead and Liposcan methods produced very unreliable results. Reflotron did a good job with venous plasma samples and a poorer job with venous whole blood, but it reported many false positive results with capillary samples. Vision had no false negative results but did have the largest false positive rate, particularly with capillary samples. DT-60 had the smallest overall miscategorization rate but still had an excessive error rate (>5%) with capillary samples. In summary, none of the methods met performance recommendations of 3% CV with 3 percent bias.

Author: **Rogers EJ, Misner L, Ockene IS, Nicolosi RJ**
Title: **Evaluation of seven Cholestech L·D·X analyzers for total cholesterol determinations**
Source: **Clinical Chemistry 1993;39(5):860-4**

This study compared the performance of seven Cholestech L·D·X analyzers for the measurement of total cholesterol. The examiners measured cholesterol on four types of samples - venous whole blood (VB) and plasma (VP), venous serum (VS), and capillary fingerstick whole blood (FB) given by 18 individuals. Results were compared with reference values generated using standardized methods certified by the CDC. Results of this study indicate that in a tightly controlled lab setting, the performance of the seven Cholestech instruments for the measurement of total cholesterol in FB samples exceeds the accuracy and precision criteria of <= 3.0%. The

overall average bias for all instruments for each type of specimen versus reference values were 1.9%, 4.3%, 6.6%, and 7.0% for FB, VB, VP, and VS. It appears that Cholestech has produced a portable screening analyzer that is both precise and accurate for the measurement of TC in capillary specimens. It is self-calibrating, easy to use, and compact for easy transport.

Author:	**Statland BE**
Title:	**A review of the analytic performance of the Reflotron system for cholesterol testing**
Source:	**Clinical Therapeutics 1990;12(3):281-6**

This article provides a review of seventeen studies that assessed the performance of the Reflotron system for cholesterol testing. Reflotron is a simple, desktop chemistry analyzer that uses only 30 micro L of whole blood, plasma, or serum to produce cholesterol results within three minutes. Concerning precision, the within-run CV of the test with control materials was quite low, usually less than 2% and the total CV was rarely above 4%. Regarding accuracy, the authors summarized the data for bias and for correlation between the Reflotron test and other reference methods. The correlation coefficient was consistently above .9 and bias ranged from .4% to 6.3%. Reflotron provides reliable and accurate results that can usually be improved with training and experience.

Cervical Cancer

Diaz-Rosario LA, Kabawat. Preformance of a fluid-based thin-layer papanicolaou smear method in the clinical setting of an independent laboratory and an outpatient screening population in New England. Archives of Pathology and Laboratory Medicine 1999;123:817-821

Lamont RF, Hudson EA, Hay PE *et al.*. A comparison of the use of Papanicolaou-stained cervical cytological smears with Gram-stained vaginal smears for the diagnosis of bacterial vaginosis in early pregnancy. International Journal of STDs & AIDS 1999;10:93-97

Lazcano-Ponce EC, Moss S, De Ruiz PA, *et al*. Cervical cancer screening in developing countries: why is it ineffective? The case of Mexico. Archives of Medical Research 1999;30:240-250

Megevand A, Denny L, Dehaeck K *et al.*. Acetic acid visualization of the cervix: an alternative to cytologic screening. Obstetrics and Gynecology 1996;88(3):383-385

Sehgal A, Singh V, Bhambhani S. Screening for cervical cancer by direct inspection. Lancet 1991;338:282

Author:	**Diaz-Rosario LA, Kabawat**
Title:	**Preformance of a fluid-based thin-layer papanicolaou smear method in the clinical setting of an independent laboratory and an outpatient screening population in New England**
Source:	**Archives of Pathology and Laboratory Medicine 1999;123:817-821**

A patented, fluid-based, thin-layer method for preparation of Papanicoloau (pap) smears (ThinPrep Pap test) has been reported to be significantly more effective than the conventional smear. This study investigates this position by comparing the cytologic diagnosis and specimen adequacy results obtained using the ThinPrep method with data from conventional Pap smears obtained from a similar population. The use of ThinPrep for cervicovaginal cytology produced a 75.14% increase in the detection of low grade squamous intraepithelial lesions and a higher diagnosis. Overall ThinPrep produced increased detection of premalignant precursors, the main purpose of Pap smear testing.

Author:	**Lamont RF, Hudson EA, Hay PE *et al.***
Title:	**A comparison of the use of Papanicolaou-stained cervical cytological smears with Gram-stained vaginal smears for the diagnosis of bacterial vaginosis in early pregnancy**
Source:	**International Journal of STDs & AIDS 1999;10:93-97**

The objective of this study was to compare the efficacy of using papanicolaou (pap) stained cervical cytology smear with a standardized method of interpreting Gram-stained vaginal smears for the diagnosis of Bacterial vaginosis (BV) in pregnancy. Women between 9 and 24 weeks gestation were recruited at their first antenatal care visit for this prospective observational study. Compared with the Gram-stained method for the diagnosis of BV, there was good agreement between pap stain interpretation by a single observer; sensitivity and specificity 87 and 97%, respectively. However, the agreement was not as good with pap stain interpretation by multiple cytotechnicians; sensitivity and specificity 80.7 and 90.7%, respectively. Pap stained cervical cytology to diagnose BV are less reliable and diagnosis based on standardized interpretation of Gram-stained vaginal smear should be encouraged.

Author:	**Lazcano-Ponce EC, Moss S, De Ruiz PA, *et al.***
Title:	**Cervical cancer screening in developing countries: why is it ineffective? The case of Mexico**
Source:	**Archives of Medical Research 1999;30:240-250**

Mexico established a national cervical cancer-screening program in 1974. Despite the implementation of the program, there was a steady mortality trend of 16 per 100,000 women, and determinants of non-participation. The low effectiveness of screening on cervical cancer is principally due to factors associated with quality and coverage. Pap quality is deficient. 64% of a random sample of specimens lacked endocervical cells. Reading centers presented false negative indices of between 10 and 54%. Women seek screening in a late stage of disease. Knowledge of what the Pap is used for, strongly determines the use of screening. In rural areas, only 40% of women are informed about the purpose of the Pap test. A proposal to reorganize Mexico's screening program includes five main strategies, including increased coverage, improved quality

control of how cervical smears are taken, better interpretation of Pap tests, guaranteed treatment for those whose tests show abnormalities and improved follow-up.

Author:	**Megevand A, Denny L, Dehaeck K *et al.***
Title:	**Acetic acid visualization of the cervix: an alternative to cytologic screening**
Source:	**Obstetrics and Gynecology 1996;88(3):383-385**

Despite the prevalence of cervical cancer in developing countries, few effective screening programs are available. Cytologic screening of the cervix with appropriate treatment and follow-up is the only proven strategy for the prevention of cervical cancer. The aim of this paper is to investigate the value of acetic visualization of the cervix as an alternative to cytologic screening. A prospective study was conducted in a squatter area in Cape Town, South Africa. A mobile clinic was taken to the squatter area and patients were drawn from the resident population. The patients underwent speculum examination, naked eye inspection of the cervix after application of acetic acid, and cytologic smear. Results of these two screening tests were compared. Study limitations included that the false negative rates of the two screening methods were not known, thus no comment could be made on sensitivity and specificity and positive and negative predictive values. Cytology remains the best method available in screening for cervical cancer.
Diagnostic Methods – Cervical Cancer Screening

Author:	**Sehgal A, Singh V, Bhambhani S**
Title:	**Screening for cervical cancer by direct inspection**
Source:	**Lancet 1991;338:282**

Since cytology based screening programs for cervical cancer cannot be provided on a large scale in developing countries, this study was conducted to investigate whether visual inspection of the cervix is an adequate alternative approach. Women with cytological evidence of dysplasia were followed up cytologically and colposcopically until cancer was detected and the gross appearance of the cervix was recorded. Although only 40-50% of cancers were accompanied by abnormal-looking cervices, where71% were detectable on cytology and 87% on colposcopy, visual inspection may be useful in areas where cytological screening programs are not available.